8 (A-B). SPINY LOBSTER FISHERY MANAGEMENT PLAN

Today's Item **Information** ☐ **Action** ☒

This item is to adopt two documents related to the California Spiny Lobster Fishery Management Plan (FMP):

(A) Adopt a negative declaration pursuant to the California Environmental Quality Act (CEQA) for the California Spiny Lobster Fishery Management Plan (FMP) and proposed regulatory amendments for CA lobster fishery; and

(B) Adopt the California Spiny Lobster Fishery Management Plan (FMP)

Summary of Previous/Future Actions

- Receive draft FMP — Dec 9-10, 2015; San Diego
- Discuss FMP — Feb 10-11, 2016; Sacramento
- **Today adopt CEQA document, adopt FMP** — **Apr 13-14, 2016; Santa Rosa**

Background

The Marine Life Management Act (MLMA) requires that FMPs form the primary basis for managing California's sport and commercial marine fisheries (Section 7072 et seq., Fish and Game Code). The process for FMP approval and regulations are set forth in Fish and Game Code sections 7075-7078. FMPs provide the framework within which implementing regulations are then adopted; once an FMP is adopted, any proposed regulations that are not consistent with an FMP would require an amendment to the FMP prior to adoption. To date FGC has adopted three FMPs (white seabass in 1996 with an update in 2002, nearshore in 2002, and market squid in 2005) and two are currently under development (red abalone and spiny lobster).

Pursuant to the mandates of the MLMA, an FMP for California spiny lobster has been under development since 2012, to guide the future sustainable management of the fishery. The Lobster Advisory Committee (LAC), a multi-stakeholder advisory body, developed recommendations based on consensus for the FMP and implementing regulations, which were presented to MRC and recommended by MRC for FGC support. The draft FMP (this agenda item), and proposed regulations necessary to implement the plan (see Agenda Item 8C), were prepared by DFW based on LAC recommendations and MRC and FGC input.

FGC received the draft California Spiny Lobster FMP in Dec 2015 following required scientific peer review as well as tribal review. A discussion hearing was held in Feb 2016, at which FGC provided direction to include a list of near-consensus LAC recommendations and potential future management needs in a revised draft FMP. For today's adoption hearing, DFW has provided a summary and response to comments received through March 29, and a revised draft FMP that reflects public comment and Commission direction (exhibits B2-B4). A copy of the FMP and list of statutes proposed to be made inoperative through FMP adoption has been provided to the California State Legislature for review by the Joint Committee on Fisheries and Aquaculture as mandated in Fish and Game Code 7078(d).

Pursuant to CEQA, an initial study of the proposed FMP and implementing regulations was completed and, based on that study a Negative Declaration was proposed and circulated for a 45 day public comment period, ending Mar 7, 2016. The proposed final Negative Declaration, including responses to comments, is provided for FGC approval today (Exhibit A1) prior to adoption of the FMP (this item) and proposed regulations (scheduled for discussion under 8C today and adoption in Jun 2016).

Significant Public Comments

1. California Lobster and Trap Fishermen's Association (CLTFA) provided comments on a range of topics, challenged economic and biological statements within the FMP, and provided a list of technical "clean-up items" such as glossary specifics (see Exhibit B5).

Recommendation

Staff: Staff supports adoption of the Negative Declaration pursuant to CEQA, and adoption of the California Spiny Lobster FMP with edits as recommended by DFW.

***MRC*:** Support FMP content as recommended by the LAC and DFW (March 2015 MRC meeting).

DFW: Accept proposed edits in the final draft FMP as presented and adopt FMP.

Exhibits

A1. Final Initial Study-Negative Declaration, dated Mar 2016
B1. DFW presentation
B2. DFW memo, received Apr 5, 2016
B3. DFW Summary of Comments on draft FMP, dated Mar 22, 2016
B4. Draft California Spiny Lobster FMP, dated April, 2016
B5. Email from California Lobster and Trap Fish Association, received March 30, 2016

Motion/Direction

Moved by _____ and seconded by _____ that the Commission adopts the Negative Declaration pursuant to California Environmental Quality Act for the California Spiny Lobster Fishery Management Plan and proposed regulatory amendments for the California spiny lobster fisheries.

Moved by _____ and seconded by _____ that the Commission adopts the California Spiny Lobster Fishery Management Plan as submitted by DFW.

Final Initial Study/Negative Declaration

California Spiny Lobster Fishery Management Plan and Proposed Regulatory Amendments

March 2016

PREPARED FOR:

Final Initial Study/Negative Declaration

California Spiny Lobster Fishery Management Plan and Proposed Regulatory Amendments

PREPARED FOR:

California Fish and Game Commission
1416 Ninth Street, Suite 1320
Sacramento, CA 95814

Contact: Tom Mason
California Department of Fish and Wildlife
Senior Environmental Scientist

PREPARED BY:

Ascent Environmental, Inc.
455 Capitol Mall, Suite 300
Sacramento, CA 95814
Contact: Curtis E. Alling, AICP
Michael Eng

March 2016

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COMMENTS AND RESPONSES TO COMMENTS

This chapter of the Final Initial Study/Negative Declaration (Final IS/ND) contains the comment letters received during the 45-day public review period for the Draft Initial Study/Negative Declaration (Draft IS/ND), which commenced on January 21, 2016 and closed on March 7, 2016. The Notice of Completion was provided to the State Clearinghouse on January 21, 2016 and the IS/ND was circulated to the appropriate state agencies.

COMMENTERS ON THE DRAFT IS/ND

Table 1 below indicates the numerical designation for the comment letters received, the author of the comment letter, and the date of the comment letter. Comment letters have been numbered in the order they were received by the California Department of Fish and Wildlife (CDFW).

Table 1 List of Commenters

Letter	Agency/Organization/Name	Date
1	Native American Heritage Commission	February 8, 2016
2	William Barnett	January 29, 2016
3	Ken Kurtis, Reef Seekers Dive Co.	January 31, 2016
4	A. Talib Wahab, Avicena Network, Inc.	March 6, 2016
5	Center for Biological Diversity	March 7, 2016
6	Christopher Miller	March 7, 2016

COMMENTS AND RESPONSES ON THE DRAFT IS/ND

The written comments received on the Draft IS/ND and the responses to those comments are provided in this chapter of the Final IS/ND. Comment letters are reproduced in their entirety, followed by response(s). Each comment is indicated by a bracket and identifying number in the margin of the comment letter. Responses are numbered, corresponding to the comment number in the bracketed letter.

Following the completion of the public review period for the Draft IS/ND, revisions to Section 3.5, Cultural Resources, Chapter 4, References, and the appendices were made to describe the project's tribal consultation approach and compliance with Assembly Bill (AB) 52 (Statutes of 2014). These changes are shown in the responses to comments below and the corresponding chapter/section of the Draft IS/ND and are denoted by strikeout (~~strikeout~~) for deletions and underline (<u>underline</u>) for additions. This response to comment chapter is followed by the revised Draft IS/ND reflecting these changes. Inclusion of clarifying information on the AB 52 compliance that occurred for the project does not alter the conclusions of the Draft IS/ND.

Letter 1

STATE OF CALIFORNIA Edmund G. Brown Jr., Gove
NATIVE AMERICAN HERITAGE COMMISSION
1550 Harbor Blvd., Suite 100
West Sacramento, CA 95691
Phone (916) 373-3710
Fax (916) 373-5471
Email: nahc@nahc.ca.gov
Website: http://www.nahc.ca.gov
Twitter: @CA_NAHC

February 8, 2016

Tom Mason (CDFW)
California Fish and Game Commission
P. O. Box 944209
Sacramento, CA 94244

sent via e-mail:
tom.mason@wildlife.ca.gov
Number of pages:

Re: SCH#2016011055, California Spiny Lobster Fishery Management Plan and Proposed Regulatory Amendments Project, Negative Declaration, Santa Barbara, Los Angeles, San Luis Obispo, and Ventura Counties, California

Dear Mr. Mason:

Introduction

The Native American Heritage Commission (NAHC) has reviewed the Negative Declaration for the project referenced above. The California Environmental Quality Act (CEQA) (Pub. Resources Code § 21000 et seq.), specifically Public Resources Code section 21084.1, states that a project that may cause a substantial adverse change in the significance of an historical resource is a project that may have a significant effect on the environment.[1] If there is substantial evidence, in light of the whole record before a lead agency, that a project may have a significant effect on the environment, an environmental impact report (EIR) shall be prepared.[2] In order to determine whether a project will cause a substantial adverse change in the significance of a historical resource, a lead agency will need to determine whether there are historical resources with the area of project effect (APE).

Please reference the following sections (if checked):

1. Documentation of Contact/Consultation with Tribes
2. Documentation of Mitigation for the Protection of Tribal Cultural Resources and Native American Human Remains
3. Documentation of Cultural Resources Assessment
4. Problematic Wording
5. Best Practices

CEQA was amended significantly in 2014. Assembly Bill 52[3] (AB 52) amended CEQA to create a separate category of cultural resources, "tribal cultural resources"[4] and provides that a project with an effect that may cause a substantial adverse change in the significance of a tribal cultural resource is a project that may have a significant effect on the environment.[5] Public agencies shall, when feasible, avoid damaging effects to any tribal cultural resource.[6] **AB 52 applies to any project for which a notice of preparation or a notice of negative declaration or mitigated negative declaration is filed on or after July 1, 2015.** If your project is also subject to the federal National Environmental Policy Act (42 U.S.C. § 4321 et seq.) (NEPA), the tribal consultation requirements of Section 106 of the National Historic Preservation Act of 1966 (154 U.S.C. 300101, 36 C.F.R. § 800 et seq.) may also apply.

The NAHC recommends consultation with California Native American tribes that are traditionally and culturally affiliated with the geographic area of your proposed project as early as possible in order to avoid inadvertent discoveries of Native American human remains and as best practices to mitigate impacts to tribal cultural resources. Below are the NAHC comments on the project referenced above. **Consult your legal counsel about compliance with AB 52 as well as compliance with any other applicable laws.**

☒ **Documentation of Contact/Consultation with Tribes**

1. *There is no information in the document of the completion of mandated contact or consultation with California Native American tribes for this project.*

AB 52 has added to CEQA the additional requirements listed below, along with many other requirements:

- Application/Decision to Undertake a Project: Within fourteen (14) days of determining that an application for a project is complete or of a decision by a public agency to undertake a project, a lead agency shall provide formal notification to a designated contact of, or tribal representative of, traditionally and culturally affiliated California Native American tribes that have requested notice, to be accomplished by at least one written notice that includes: 1-1
  - A brief description of the project.
  - The lead agency contact information.
  - Notification that the California Native American tribe has 30 days to request consultation.[7]
  - A "California Native American tribe" is defined as a Native American tribe located in California that is on the contact list maintained by the NAHC for the purposes of Chapter 905 of Statutes of 2004 (SB 18).[8]

[1] (Pub. Resources Code § 21084.1; Cal. Code Regs., tit.14, § 15064.5 (b) (CEQA Guidelines Section 15064.5 (b)).
[2] (Pub. Resources Code § 21080 (d); Cal. Code Regs., tit. 14, § 15064(a)(1) (CEQA Guidelines § 15064 (a)(1)).
[3] (Gatto, Chapter 532, Statutes of 2014)
[4] (Pub. Resources Code § 21074)
[5] (Pub. Resources Code § 21084.2).
[6] (Pub. Resources Code § 21084.3 (a)).
[7] (Pub. Resources Code § 21080.3.1 (d)).
[8] (Pub. Resources Code § 21073).

- When to Begin Consultation: A lead agency shall begin the consultation process within 30 days of receiving a request for consultation from a California Native American tribe that is traditionally and culturally affiliated with the geographic area of the proposed project.[9] and prior to the release of a negative declaration, mitigated negative declaration or environmental impact report.[10].
  - For purposes of AB 52, "consultation shall have the same meaning as provided in Gov. Code § 65352.4 (SB 18).[11]

- Conclusion of Consultation: Consultation with a tribe shall be considered concluded when either of the following occurs:
  - The parties agree to measures to mitigate or avoid a significant effect, if a significant effect exists, on a tribal cultural resource; or
  - A party, acting in good faith and after reasonable effort, concludes that mutual agreement cannot be reached.[12]
- Prerequisites for Environmental Documents with a Significant Impact on an Identified Tribal Cultural Resource: **An environmental impact report may not be certified, nor may a mitigated negative declaration or a negative declaration be adopted unless one of the following occurs:**
  - The consultation process between the tribes and the lead agency has occurred.[13]
  - The tribe that requested consultation failed to provide comments to the lead agency or otherwise failed to engage in the consultation process.
  - The lead agency provided notice of the project to the tribe in compliance with Public Resources Code section 21080.3.1 (d) and the tribe failed to request consultation within 30 days.[14]

1-1 cont.

Documentation of Mitigation for the Protection of Tribal Cultural Resources and Native American Human Remains

1. *The Cultural Resources section 3.5.1 and part (b) does not document that mitigation measures were developed in consultation with traditionally and culturally affiliated Native American tribes pursuant to Public Resources Code section 21080.3.2 (a), which provides for mandatory topics of Consultation if requested by a tribe.*
2. ***The Cultural Resources section does not address Tribal take and access to sites as a protected use of cultural resources.***

Mitigation should be discussed in consultation with California Native American Tribes.

- Mandatory Topics of Consultation: The following topics of consultation, if a tribe requests to discuss them, are mandatory:
  - Alternatives to the project.
  - Recommended mitigation measures.
  - Significant effects.

- Discretionary Topics of Consultation: The following topics are discretionary topics of consultation:
  - Type of environmental review necessary.
  - Significance of the tribal cultural resources.
  - Significance of the project's impacts on tribal cultural resources.
  - If necessary, project alternatives or appropriate measures for preservation or mitigation that the tribe may recommend to the lead agency.[15]

- Confidentiality of Information Submitted by a Tribe During the Environmental Review Process: With some exceptions, any information, including but not limited to, the location, description and use of tribal cultural resources submitted by a California Native American tribe during the environmental review process shall not be included in the environmental document or otherwise disclosed by the lead agency or any other public agency to the public, consistent with Government Code sections 6254 (r) and 6254.10. Any information submitted by a California Native American tribe during the consultation or environmental review process shall be published in a confidential appendix to the environmental document unless the tribe that provided the information consents, in writing, to the disclosure of some or all of the information to the public.[16]

- Discussion of Impacts to Tribal Cultural Resources in the Environmental Document: If a project may have a significant impact on a tribal cultural resource, the lead agency's environmental document shall discuss both of the following:
  - Whether the proposed project has a significant impact on an identified tribal cultural resource.
  - Whether feasible alternatives or mitigation measures avoid or substantially lessen the impact on the identified tribal cultural resource.[17]

- Recommending Mitigation Measures Agreed Upon in Consultation in the Environmental Document: Any mitigation measures agreed upon in the consultation conducted[18] shall be recommended for inclusion in the environmental document and in an adopted mitigation monitoring and reporting program, if determined to avoid or lessen the impact[19] and shall be fully enforceable.[20]

1-2

[9] (Pub. Resources Code § 21080.3.1, subds. (d) and (e))
[10] (Pub. Resources Code § 21080.3.1(b))
[11] (Pub. Resources Code § 21080.3.1 (b)).
[12] (Pub. Resources Code § 21080.3.2 (b)).
[13] as provided in Public Resources Code sections 21080.3.1 and 21080.3.2 and concluded pursuant to Public Resources Code section 21080.3.2.
[14] (Pub. Resources Code § 21082.3 (d)).
[15] (Pub. Resources Code § 21080.3.2 (a)).
[16] (Pub. Resources Code § 21082.3 (c)(1)).
[17] (Pub. Resources Code § 21082.3 (a) and (b)).
[18] pursuant to Public Resources Code section 21080.3.2
[19] pursuant to Public Resources Code section 21082.3, subdivision (b), paragraph 2,
[20] (Pub. Resources Code § 21082.3 (a)).

2

- Required Consideration of Feasible Mitigation: If mitigation measures recommended by the staff of the lead agency as a result of the consultation process are not included in the environmental document or if there are no agreed upon mitigation measures at the conclusion of consultation, or if consultation does not occur, and if substantial evidence demonstrates that a project will cause a significant effect to a tribal cultural resource, the lead agency shall consider feasible mitigation.[21]

- Examples of Mitigation Measures That, If Feasible, May Be Considered to Avoid or Minimize Significant Adverse Impacts to Tribal Cultural Resources:
  - Avoidance and preservation of the resources in place, including, but not limited to:
    - Planning and construction to avoid the resources and protect the cultural and natural context.
    - Planning greenspace, parks, or other open space, to incorporate the resources with culturally appropriate protection and management criteria.
  - Treating the resource with culturally appropriate dignity, taking into account the tribal cultural values and meaning of the resource, including, but not limited to, the following:
    - Protecting the cultural character and integrity of the resource.
    - Protecting the traditional use of the resource.
    - Protecting the confidentiality of the resource.
  - Permanent conservation easements or other interests in real property, with culturally appropriate management criteria for the purposes of preserving or utilizing the resources or places.
  - Protecting the resource.[22]
  - Please note that a federally recognized California Native American tribe or a nonfederally recognized California Native American tribe that is on the contact list maintained by the NAHC to protect a California prehistoric, archaeological, cultural, spiritual, or ceremonial place may acquire and hold conservation easements if the conservation easement is voluntarily conveyed.[23] 1-2 cont.
  - Please note that it is the policy of the state that Native American remains and associated grave artifacts shall be repatriated.[24]

- The lack of surface evidence of archaeological resources (including tribal cultural resources) does not preclude their subsurface existence.
  - Lead agencies should include in their mitigation and monitoring reporting program plan provisions for the identification and evaluation of inadvertently discovered archaeological resources.[25] In areas of identified archaeological sensitivity, a certified archaeologist and a culturally affiliated Native American with knowledge of cultural resources should monitor all ground-disturbing activities.
  - Lead agencies should include in their mitigation and monitoring reporting program plans provisions for the disposition of recovered cultural items that are not burial associated in consultation with culturally affiliated Native Americans.
  - Lead agencies should include in their mitigation and monitoring reporting program plans provisions for the treatment and disposition of inadvertently discovered Native American human remains. Health and Safety Code section 7050.5, Public Resources Code section 5097.98, and Cal. Code Regs., tit. 14, section 15064.5, subdivisions (d) and (e) (CEQA Guidelines section 15064.5, subds. (d) and (e)) address the processes to be followed in the event of an inadvertent discovery of any Native American human remains and associated grave goods in a location other than a dedicated cemetery.

☒ **Documentation of Cultural Resources Assessment**

1. *The Cultural Resources section 3.4.1 does not provide specific information on the cultural assessments performed for this project. While traditional/cultural resources are mentioned, there is no documentation of where that information originated.*
2. *Cultural assessments for this project should include MPA/MLPA documents and consultation with local tribes. The following recommendations are typically for land-based resources.*

NAHC Recommendations for Cultural Resources Assessments

To adequately assess the existence and significance of tribal cultural resources and plan for avoidance, preservation in place, or barring both, mitigation of project-related impacts to tribal cultural resources, the NAHC recommends the following actions: 1-3

- Contact the NAHC for:
  - A Sacred Lands File search. Remember that tribes do not always record their sacred sites in the Sacred Lands File, nor are they required to do so. A Sacred Lands File search is not a substitute for consultation with tribes that are traditionally and culturally affiliated with the geographic area of the project's APE.
  - A Native American Tribal Contact List of appropriate tribes for consultation concerning the project site and to assist in planning for avoidance, preservation in place, or, failing both, mitigation measures.
    - The request form can be found at http://nahc.ca.gov/resources/forms/.

- Contact the appropriate regional California Historical Research Information System (CHRIS) Center (http://ohp.parks.ca.gov/?page_id=1068) for an archaeological records search. The records search will determine:

[21] pursuant to Public Resources Code section 21084.3 (b). (Pub. Resources Code § 21082.3 (e)).
[22] (Pub. Resource Code § 21084.3 (b)).
[23] (Civ. Code § 815.3 (c)).
[24] (Pub. Resources Code § 5097.991).
[25] per Cal. Code Regs., tit. 14, section 15064.5(f) (CEQA Guidelines section 15064.5(f)).

3

- If part or the entire APE has been previously surveyed for cultural resources.
- If any known cultural resources have been already been recorded on or adjacent to the APE.
- If the probability is low, moderate, or high that cultural resources are located in the APE.
- If a survey is required to determine whether previously unrecorded cultural resources are present.

- If an archaeological inventory survey is required, the final stage is the preparation of a professional report detailing the findings and recommendations of the records search and field survey.
  - The final report containing site forms, site significance, and mitigation measures should be submitted immediately to the planning department. All information regarding site locations, Native American human remains, and associated funerary objects should be in a separate confidential addendum and not be made available for public disclosure.
  - The final written report should be submitted within 3 months after work has been completed to the appropriate regional CHRIS center.

1-3 cont.

☐ **Problematic Wording**

☒ **Best Practices**

Agencies should be aware that AB 52 does not preclude agencies from initiating tribal consultation with tribes that are traditionally and culturally affiliated with their jurisdictions before the timeframes provided in AB 52.

For that reason, we urge you to continue to request Native American Tribal Contact Lists and "Sacred Lands File searches from the NAHC. The request forms can be found online at: http://nahc.ca.gov/resources/forms/

- The NAHC's PowerPoint presentation titled, "Tribal Consultation Under AB 52: Requirements and Best Practices" may be found online at: http://nahc.ca.gov/wp-content/uploads/2015/10/AB52TribalConsultation_CalEPAPDF.pdf

1-4

☒ **Additional Recommendations**

The Lobster Advisory Committee (LAC) lacks representation of California Native American tribes. I would recommend that addition to the stakeholders represented on the LAC if a representative from a tribe would be interested in serving.

1-5

Sincerely,

Gayle Totton
Associate Governmental Program Analyst
Gayle.totton@nahc.ca.gov

cc: State Clearinghouse

4

Letter 1 Response	Native American Heritage Commission Gayle Totton February 8, 2016

Thank you for taking the time to submit comments on the proposed project. Responses are provided below.

Comment 1-1

The comment states that there is no information in the document regarding the completion of mandated contact or consultation with California Native American Tribes for this project. The comment includes the requirements of AB 52.

Response to Comment 1-1

The following revisions have been made to Section 3.5, Cultural Resource and Chapter 4, References, of the Draft IS/ND to document the contact with California Native American Tribes that was conducted for the project. Materials related to tribal consultation conducted by CDFW for the project have been included in Appendix B to the Draft IS/ND.

Section 3.5, Cultural Resources has been revised as follows:

ENVIRONMENTAL ISSUES	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
V. Cultural Resources. Would the project:				
a) Cause a substantial adverse change in the significance of a historical resource as defined in Section 15064.5?	☐	☐	☒	☐
b) Cause a substantial adverse change in the significance of an archaeological resource pursuant to Section 15064.5?	☐	☐	☒	☐
c) Directly or indirectly destroy a unique paleontological resource or site or unique geologic feature?	☐	☐	☐	☒
d) Disturb any human remains, including those interred outside of formal cemeteries?	☐	☐	☐	☒
e) Cause a substantial adverse change in the significance of a tribal cultural resource as defined in Public Resources Code 21074?	☐	☐	☐	☒

Section 3.5.1, Environmental Setting has been revised as follows:

Native American Outreach and Consultation

The California Natural Resources Agency (CNRA), of which CDFW is a member, adopted its Tribal Consultation Policy in 2012. The policy requires effective consultation between departments of CNRA and California tribes (CNRA 2012). In October 2014, CDFW adopted its own Tribal Communication and Consultation Policy. In accordance with these policies, in 2013 and 2015, CDFW sent notices to request input on the California Spiny Lobster FMP and/or government-to-government consultation to all federally recognized tribes whose ancestral lands are proximate to the project area (Appendix B).

In 2015, the Legislature passed AB 52 and the Governor signed it into law. The statute amended CEQA to establish tribal consultation procedures for evaluation of potential effects to tribal cultural resources. To initiate the AB 52 consultation process, tribes must submit a written request to a lead agency to be informed through formal notification of proposed projects in the geographic area that is traditionally and culturally affiliated with the tribe (PRC Section 21080.3.1[b]). All tribes proximate to the project area that have submitted to CDFW a written request for such notification were included in CDFW's two prior consultation notices. Therefore, no additional notification or consultation is required pursuant to Public Resources Code 21080.3.1.

Section 3.5.2, Discussion has been revised as follows:

e) Cause a substantial adverse change in the significance of a tribal cultural resource as defined in Public Resources Code 21074?

No Impact. CDFW has conducted outreach to California tribes in accordance with the 2012 CNRA Tribal Consultation Policy, the 2014 CDFW Tribal Communication and Consultation Policy, and AB 52. Letters to tribal representatives were sent on October 10, 2013 and October 19, 2015 to invite tribal input on the FMP and proposed amendments to the commercial and recreational fishing regulations. No tribal cultural resources have been identified in the project area, recognizing the project area consists of the marine environment off the state's coast. Because CDFW previously notified all tribes proximate to the project area, offered to consult with them regarding the proposed action, and received no responses, CDFW has complied with both its own consultation requirements and those of AB 52. The FMP and regulatory amendments would have no impact on tribal cultural resources, because activities associated with reasonably foreseeable compliance responses would occur in marine waters off the California coast and would not alter the ocean floor.

Chapter 4, References has been revised as follows:

California Department of Fish and Wildlife. 2014 (October 2). *Tribal Communication and Consultation Policy*. Sacramento, CA.

California Natural Resources Agency. 2012 (November 20). *California Natural Resources Agency Adoption of Final Tribal Consultation Policy*. Sacramento, CA.

CNRA. *See* California Natural Resources Agency.

No changes to the project are required, and the conclusions regarding significance of cultural resources contained in the Draft IS/ND are not altered.

Comment 1-2

The comment states that Section 3.5.1 and part (b) does not document that mitigation measures were developed in consultation with traditionally and culturally affiliated Native American tribes pursuant to Public Resources Code 21080.3.2(a). The comment further states that the cultural resources section does not address Tribal take and access to sites. The comment describes requirements for development mitigation with input from tribes that request consultation.

Response to Comment 1-2

See response to Comment 1-1, above.

Comment 1-3

The comment states that the cultural resource section does not provide specific information on cultural assessments performed for the project, and there is no documentation as to where the cultural resource information originated. The comment further states that cultural assessments for the projects should include

MPA/MLPA documents and consultation with tribes. The comment includes NAHC recommendations for cultural resource assessments.

Response to Comment 1-3

Assessment of cultural resources was based on previous environmental documents and plans prepared by the Minerals Management Service (MMS) and CDFW. As noted on pages 3-19 and 3-20 of the Draft IS/ND, the referenced source of information provided in Section 3.5.1 is MMS 2001, as cited in CDFW 2002. Pages 4-1 and 4-2 of the Draft IS/ND provide the following references, which correspond to the information cited in Section 3.5.1:

> California Department of Fish and Wildlife. 2002 (August). *Nearshore Fishery Management Plan.* Available: https://www.wildlife.ca.gov/Conservation/Marine/NFMP. Accessed November 2015
>
> Minerals Management Service. 2001. Draft EIR OCS Oil and Gas Leasing Program: 2002-2007 October 2001. Vol I & II cited in CDFW 2002.

Also see response to Comment 1-1, above. In addition, CDFW conducted record searches for offshore marine cultural resources at regional centers of the California Historical Resources Information System, and a Sacred Lands File Search was conducted by the NAHC for the South Coast Marine Protected Areas Project Environmental Impact Report (EIR), which is within the same area of potential effect as the FMP and regulatory amendments. The Draft IS/ND has been revised to reference this document.

Section 3.5.1, Environmental Setting has been revised as follows:

> Cultural resources include prehistoric and historic archaeological sites, districts, and objects; historic structures, buildings, districts, and objects; and locations of important historic events, or sites of traditional/cultural importance. Cultural resources are primarily found on land, but submerged resources such as shipwrecks and prehistoric and historic sites and artifacts are known to occur in the coastal waters of California. The Bureau of Ocean Energy Management (BOEM) formerly the Minerals Management Service (MMS) conducted baseline archaeological studies that cover the entire Pacific Region, including the Archaeological Resource Study from Morro Bay to the U.S.-Mexico border, which encompassed the project area (MMS 2001, cited in CDFW 2002). The baseline study for southern California documented 1,681 known prehistoric archaeological sites between Morro Bay and the Mexico border. A total of 4,443 prehistoric archaeological sites were documented along the Pacific coast, and it is likely that there are thousands of additional undocumented sites (MMS 2001, cited in CDFW 2002). Record searches for offshore marine cultural resources were also conducted at regional centers of the California Historical Resources Information System, and a Sacred Lands File Search was conducted by the NAHC for the *South Coast Marine Protected Areas Project EIR*, which is within the same area of potential effect as the project area. No submerged sacred lands were identified (California Fish and Game Commission 2010).

Chapter 4, References has been revised as follows:

> California Fish and Game Commission. 2010 (December). South Coast Marine Protected Areas Project Final Environmental Impact Report. Prepared by URS. Santa Barbara, CA.

No changes to the project are required, and the conclusions regarding significance contained in the Draft IS/ND are not altered.

Comment 1-4

The comment states that agencies should be aware that AB 52 does not preclude initiation of tribal consultation with tribes that are traditionally and culturally affiliated with their jurisdictions before the timeframes provided in AB 52. The comment further states that agencies are urged to continue to request Native American Tribal Contact Lists and Sacred Lands File searches from NAHC.

Response to Comment 1-4

See responses to Comment 1-1 and Comment 1-3, above. For the Spiny Lobster FMP, CDFW has conducted tribal consultation in accordance with the CNRA Tribal Consultation Policy (CNRA 2012) and the CDFW Tribal Communication and Consultation Policy (CDFW 2014), and will continue to request Native American Tribal Contact Lists and Sacred Lands File searches from NAHC for other planning programs. No changes to the project are required, and the conclusions regarding significance of cultural resources contained in the Draft IS/ND are not altered.

Comment 1-5

The comment states that the Lobster Advisory Committee (LAC) lacks representation of California Native American tribes, and recommends having a tribal representative serve on the LAC.

Response to Comment 1-5

As described on page 2-2 of the Draft IS/ND, and in accordance with the requirements of the Marine Life Management Act (MLMA), an extensive public scoping process was conducted by CDFW to develop the proposed Spiny Lobster FMP and implementing regulations. CDFW sought interested individuals and subsequently convened the LAC that represented a broad range of stakeholder interests. Nine LAC meetings occurred between June 2012 and September 2013. All meetings were open to the public, and public input was encouraged. Meeting announcements were posted on the CDFW website, and the public was encouraged to sign up for the Spiny Lobster FMP news email service. In addition, as part of the public outreach for the FMP process, letters were sent to tribal representatives in 2013 and 2015, requesting input and participation in the FMP process, in accordance with the CNRA Tribal Consultation Policy (CNRA 2012) and the CDFW Tribal Communication and Consultation Policy (CDFW 2014). No responses from tribal representatives were received by CDFW. The Draft IS/ND was also circulated for a 45-day public review period to further solicit input on the FMP and environmental review document. CDFW will continue to reach out to tribal representatives to request input and participation in this and other FMP processes.

Som, Marina@Wildlife

Letter 2

From: william barnett <wbarnett@icloud.com>
Sent: Friday, January 29, 2016 10:39 AM
To: Som, Marina@Wildlife
Subject: Lobster Feedback: Disallow take of Females

What is the 'downside' to NOT taking female lobster?
Wherever we can distinguish the sex of an animal (Deer, Pheasant, Turkey, etc) we limit or completely outlaw the take of the female of the species. Female lobster can easily be identified, so denying he take of females would seem to have substantial precedent.
While the catch would decline for a few years, this act would substantially increase the overall catch for decades to come. Similar laws were enacted for the east coast fishery and the amount of lobster harvested hit record levels years later.
One can argue that the population is healthy and that this step is unnecessary. However, if this truly would yield record levels of lobsters being harvested for decades and decades to come, why not invest now? The decline in catch for a short number of years would be far outweighed by the increase in catch going forward in perpetuity after the short decline.
This can be proven mathematically, where X is the current catch. If enacted and females are not allowed to be taken, then (X- .5X)7 would be the catch levels for the period assuming 50% of the population is female and 7 years is how long it takes a lobster to become legal size. If females were not allowed to be taken, that amount would be far less than X times the increase in catch due to more lobster due to more females breeding in perpetuity... 2-1
That is VERY rough, but the point is hopefully made. Disallowing the take of females would increase the population after some short term 'pain'. If your goal is to make the lobster population as healthy as possible, this would seem to be a prudent investment the results of which can be seen on the east coast as they continue to harvest record levels after implementing this type of rule.
Why is lobster the only species, where one can determine the sex easily, that no accommodation is made for the take of females?

Willie Barnett
619-770-8588

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Letter 2 Response	William Barnett January 29, 2016

Thank you for taking the time to submit comments on the proposed project. Responses are provided below.

Comment 2-1

The comment recommends prohibiting the take of female lobsters to ensure the lobster population is healthy in perpetuity.

Response to Comment 2-1

The FMP outlines a "harvest control rule" (HCR) which is a management framework that links indicators of stock status with possible management actions. One of the management actions listed is implementation of a sex-selective fishery. As described on page 2-11 of the Draft IS/ND, a sex-selective restriction allowing the harvesting of male lobsters (and consequently not allowing the harvesting of female lobsters) could be implemented for the California spiny lobster fishery if the need arises. Prohibiting the take of berried females (i.e., female lobsters carrying fertilized eggs) is another sex-selective provision that could be considered. The revised, draft FMP[1] for California spiny lobster is currently being reviewed by the Commission, and is available for public review and comment at https://www.wildlife.ca.gov/Conservation/Marine/Lobster-FMP. The comment does not raise environmental issues or concerns regarding the adequacy, accuracy, or completeness of the environmental document. No changes to the project are required, and the conclusions regarding significance of biological resources contained in the Draft IS/ND are not altered.

[1] California Department of Fish and Wildlife. 2016 (January 10). Draft California Spiny Lobster Fishery Management Plan. Available: https://www.wildlife.ca.gov/Conservation/Marine/Lobster-FMP.

Som, Marina@Wildlife

Letter 3

From: KenKurtis@aol.com
Sent: Sunday, January 31, 2016 10:24 PM
To: Som, Marina@Wildlife
Subject: Draft negative declaration (and other DF&W postings)

Hi Marina,

Perfect name BTW for someone associated with the ocean . . .

:-)

I know you guys post at times to Diver.net/BBS. You should also be posting these things to ScubaBoard.com in the SoCal and NorCal forums. Here are the links:

SoCal - http://www.scubaboard.com/community/forums/socal.88/
NorCal - http://www.scubaboard.com/community/forums/norcal.87/

These boards are very widely read and will get the message out to a much wider audience. (I have no connection to ScubaBoard other than that I post there, mostly in "Accidents & Incidents".)

3-1

Let me know if you have any questions.

- Ken

Ken Kurtis
Owner, Reef Seekers Dive Co.
P.O. Box 634
Beverly Hills, CA 90213
(310) 652-4990
www.reefseekers.com

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Letter 3 Response	Reef Seekers Dive Co. Ken Kurtis January 31, 2016

Thank you for taking the time to submit comments on the proposed project. Responses are provided below.

Comment 3-1

The commenter recommends that information be posted on ScubaBoard.com in the SoCal and NorCal forums to provide project-related information to a wider audience.

Response to Comment 3-1

Comment noted. The comment does not raise environmental issues or concerns regarding the adequacy, accuracy, or completeness of the environmental document.

Letter 4

March 6, 2016

Attn: Marina Som

California Department of Fish and Wildlife

3883 Ruffin Road

San Diego, CA 92123

As a commercial buyer of California spiny lobster for over 20 years, I would like to comment on the Proposed FMP Measures/Regulatory Amendments.

First and foremost, I am disappointed that commercial buyers with market input have been excluded in the FMP development process within the LAC. We are ignored even though we are relevant stakeholders in the fishery. Economics plays a significant role in fishing behavior and its environmental impacts. Market dynamics affect the price of lobsters and the economic well-being of those in the commercial sector. It is unfortunate that economic analysis is not given proper consideration in crafting management strategies that are consistent with the goals of the FMP.

Commercial fishing representatives in the LAC do not represent the buyers or commercial market interests. 4-1

That being the case, I will focus on how the Proposed FMP Measures/Regulatory Amendments can be fine-tuned to benefit both the fishermen and needs of the market.

I am glad that there is unanimous consensus in the LAC that the current commercial trapping effort is too rigorous and excessive. Imposing a trap limit is long overdue. Excessive trapping effort also led to excessive handling of undersized lobsters (shorts). I would speculate that their survival rate upon being released back into the water is not that good thus negatively impacting SPR. While not everyone agreed what the number of traps per vessel should be, the 300 trap limit is a good starting point that can be refined further as needed. 4-2

The current season was implemented long ago when the commercial fishery was primarily for the cooked frozen domestic market. It is now almost exclusively for the export live market with China being the dominant customer. Prices paid to fishermen reflect what the overseas market is willing to pay at various times during the season. Calibrating the season to cater to the needs of the market is good economics to increase efficiency and hence profitability.

Changing the timing and length of the lobster season as a control measure should be done in conjunction with input from the market that the buyers represent to achieve optimal sustainable yield (OSY). 4-3

I have long advocated that the opener of the commercial season should be delayed till the beginning of November especially during warm water years. At the very least, at sea sampling should be conducted to determine that the lobsters are biologically ready for the market. Being export driven, lobsters that are soft shelled or late in their molt cycle have very low survival rate in shipping. During warm water years when they are generally weak at the opener, shipping mortality rate can go as high as 20 to 30 percent. This is a huge loss for exporters.

October is also a bad month for opening the commercial fishery since overall market demand is weak. There is also too much product in the market with the opening of the Mexican lobster fishery barely two weeks earlier. Weak lobsters and low price is not a good starting point for the commercial fishery. Why not delay the opener by a month so the lobsters are of better quality with significantly lower shipping mortality? There is roughly a $4 per lb. difference in price between October and November. It is a significant economic loss to the fishery considering that a large percentage of the landings occur during the opener. 4-3 cont.

It makes no economic sense to harvest the lobsters when the price is at its lowest knowing that the same lobsters would be worth a lot more a month later.

Another issue that I would like to address is having an upper size limit (maximum legal size) as part of the proposed regulatory measures that "would protect larger lobsters, which could increase egg production and SPR."

While increasing the minimum size would not be good from a market standpoint which prefer smaller sized lobsters, establishing a maximum size is very much in tune with the market. During the current season most buyers have spilt pricing for smaller sized lobsters under 3 lbs. and those over. Those over 3 lbs. are priced about $5 lower (or more) depending on market. There is virtually no commercial demand for lobsters over 6 lbs. They have to be sold at a huge loss if a buyer can be found. Larger sized lobsters have the effect of pulling down the average price of lobsters. Best prices are offered for those under 2 lbs.

It should be noted that there are regional differences in the size of lobster being caught. The southern region and those caught in shallow waters along the coast generally yield smaller sizes, and the northern region especially those at the islands tend to yield larger sizes. Larger sized lobsters are also an unintended consequence of MPAs established under the MLPA. We are now witnessing the full effects of spillovers of larger sized lobsters spawned by the creation of the MPAs. 4-4

Since MLPA created spillover of larger sized lobsters in the MPAs, MLMA should remedy the situation through the FMP by implementing an upper limit to mitigate the undesirable effects it have on the market. Upper size limits should not apply to recreational fishers that value the larger sizes with their bag limits.

Sincerely,

A. Talib Wahab, President

Avicena Network, Inc.

Letter 4 Response	Avicena Network Inc. A. Talib Wahab March 6, 2016

Thank you for taking the time to submit comments on the proposed project. Responses are provided below.

Comment 4-1

The commenter expresses concern that commercial buyers have not been included in the FMP processes. The comment further states that commercial fishing representatives on the LAC do not represent the buyers or commercial market interests, and that economic analysis was not given proper consideration in developing management strategies that are consistent with the goals of the FMP.

Response to Comment 4-1

Comment noted. As discussed above in the response to Comment 1-5, CDFW conducted an extensive public scoping process to inform the development of the proposed Spiny Lobster FMP and implementing regulations. CDFW sought interested individuals and subsequently convened the LAC that represented a broad range of stakeholder interests. The LAC consisted of representatives from the marine science community, the recreational fishing sector, commercial fishing sector, the non-consumptive recreational sector, the environmental community, and the federal government. Constituents, interested individuals and organizations, and members of the general public were also encouraged to provide input during the LAC process during public meetings that occurred from June 2012 and September 2013. The LAC provided guidance on FMP objectives as well as management recommendations that addressed key issues put forth by members of the public.

The FMP was introduced to the California Fish and Game Commission (Commission) at its December 9, 2015 meeting. At that time, the formal public review process began and public comment on the FMP is encouraged and considered by the Commission up until the FMP adoption hearing on April 13, 2016. In addition, the Draft IS/ND was released for a 45-day review period to receive public input and comments on the potential environmental effects of the proposed FMP and regulatory amendments; these comments will also be considered by the Commission.

An economic analysis of the recreational and commercial spiny lobster fisheries was conducted for the Spiny Lobster FMP and is included as Appendix VI of the FMP. As noted on page 2-1 of the Draft IS/ND, the spiny lobster supports a valuable commercial fishery and a significant recreational fishery. The proposed project actions are adoption of the *Spiny Lobster Fishery Management Plan* (FMP or proposed plan) to promote a sustainable and orderly fishery. As further stated on pages 2-2 and 2-3 of the Draft IS/ND, the objectives of the FMP are to develop a framework for management that will be responsive to environmental and socioeconomic changes, and recognize the importance of the California spiny lobster resource to the economy and culture of California.

The economy and socioeconomic changes are key considerations of the FMP and long-term management of the spiny lobster fishery. These objectives will continue to be balanced with long-term sustainability of the species. The health and sustainability of the spiny lobster fishery will have a beneficial economic effect in the long-term.

Comment 4-2

The commenter expresses support for setting a commercial trap limit.

Response to Comment 4-2

As noted on page 2-9 of the Draft IS/ND, although a trap limit of 300 is currently being proposed, a trap limit range of 200 to 500 traps is being evaluated in the Draft IS/ND to accommodate any potential future changes to the trap limit as contemplated in the HCR. Any recommended future change to the trap limit

would be based on ecological considerations and consultation with constituents and subject to adoption by the Commission.

Comment 4-3

The comment states that changing the length and starting time of the spiny lobster season should be done with input from the market to achieve optimal sustainable yield. The comment further states that calibrating the season to cater to the needs of the market by delaying the season opening would increase efficiency and profitability.

Response to Comment 4-3

The FMP outlines an HCR which is a management framework that links indicators of stock status with possible management actions. One of the management actions listed is a change to the duration of the commercial and/or sport lobster season. As stated on page 2-10 of the Draft IS/ND, seasonal closures reduce fishing mortality by reducing the number of days that fishing is allowed each year. Closed seasons can protect stocks during important life events, such as spawning and molting. The current closed season in California protects reproduction, and any extension of current seasonal closures is unlikely to provide substantial protection for reproductive behaviors or activities. However, if the SPR-based threshold reference point is exceeded, fishing season length could be shortened, either by delaying the opening date or by closing the season early. As described in the HCR, consultation with constituents is a key step in CDFW's response to an HCR threshold being reached and in the development of recommendations to the Commission.

Comment 4-4

The commenter expresses concern over increasing the minimum size for lobsters, but expresses support for establishing a maximum size. The commenter further states that larger lobsters are an unintended consequence of MPAs and that they have an undesirable effect on the overall market price of lobsters.

Response to Comment 4-4

The FMP outlines an HCR which is a management framework that links indicators of stock status with possible management actions. One of the management actions listed is a change to the minimum size limit or establishing a maximum size limit. As noted on page 2-10 of the Draft IS/ND, if the SPR-based threshold reference point is exceeded, the minimum legal size could be increased to a size that ensures a target SPR within a specified time frame.

In accordance with the MLMA, management decisions must take into account social, economic, and other factors in addition to the science to ensure that the fishery is viable for all participants. A change to the legal size limit is not being proposed at this time, and if it is implemented in the future, it would be deemed necessary for the long-term sustainability of the fishery. The spiny lobster fishery will continue to be adaptively managed under the FMP to balanced economic interests and long-term sustainability of the species. The health and sustainability of the spiny lobster fishery will have a beneficial economic effect in the long-term.

Letter 5

CENTER *for* BIOLOGICAL DIVERSITY

Sent via email

California Department of Fish and Wildlife
3883 Ruffin Road
San Diego, CA 92123
Attn: Marina Som
Marina.Som@wildlife.ca.gov

March 7, 2016

Re: Notice of Intent to Adopt a Negative Declaration or the Spiny Lobster Fishery Management Plan and Proposed Regulatory Amendments pursuant to the California Environmental Quality Act (CEQA) Guidelines

Dear Ms. Som:

The Center for Biological Diversity (the "Center") submits the following comments concerning the Initial Study and Proposed Negative Declaration ("Negative Declaration") prepared for the California Fish and Game Commission ("Commission") for the Spiny Lobster Fishery Management Plan and Proposed Regulatory Amendments (the "Plan"). The Center is a non-profit environmental organization dedicated to the protection of wild animals, plants, and their habitats through science, policy, and environmental law. The Center has over 45,000 members, nearly a quarter of which live in California. Center members have recreational, scientific, and educational interests in the marine life affected by the Plan, and are particularly interested in preventing whales from being entangled in pots and traps in California.

The Plan sets out a framework for management of the recreational and commercial spiny lobster fishery and includes improvements to the status quo that will increase accountability, monitoring, and flexible management. That said, authorization of this fishery without mitigation to prevent whale entanglements will result in significant environmental impacts to endangered species. Therefore we urge you not to approve the Plan without preparing an Environmental Impact Report ("EIR") addressing all of the Project's potentially significant environmental impacts. 5-1

Under the requirements of the Marine Life Management Act ("MLMA"), the contents of the Plan form the basis for all fishery management decisions. The commercial fishery within ocean waters off California ranges from Point Conception in Santa Barbara County south to the U.S.-Mexico border and the recreational fishery ranges from central San Luis Obispo County south the border. The MLMA requires each fishery management

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Oceans Program • 1411 K St. NW, Suite 1300 • Washington, DC 20005

plan to include information on the amount and type of bycatch and in the case of unacceptable amounts or types of bycatch, include conservation and management measures that minimize bycatch and its mortality. F.G.C. § 7085. Because neither the Negative Declaration nor the Plan adequately describes or minimizes the fishery's impact on protected whales, we urge the Commission to prepare an EIR. 5-1 cont.

Discussion

I. Legal Background

The Legislature enacted the California Environmental Quality Act ("CEQA") to "[e]nsure that the long-term protection of the environment shall be the guiding criterion in public decisions." *No Oil, Inc. v. City of Los Angeles*, 13 Cal. 3d 68, 74 (1974). The Supreme Court has repeatedly held that CEQA must be interpreted to "afford the fullest possible protection to the environment." *Wildlife Alive v. Chickering*, 18 Cal. 3d 190, 206 (1976) (quotation omitted). CEQA also serves "to demonstrate to an apprehensive citizenry that the agency has, in fact, analyzed and considered the ecological implications of its action." *Laurel Heights Improvement Ass'n v. Regents of Univ. of Cal.*, 47 Cal. 3d 376, 392 (1988). If CEQA is "scrupulously followed," the public will know the basis for the agency's action and "being duly informed, can respond accordingly to action with which it disagrees." *Id.* Accordingly, CEQA "protects not only the environment but also informed self-government." *Id.*

CEQA applies to all "discretionary projects proposed to be carried out or approved by public agencies." Pub. Res. Code § 21080(a). Before taking any action, a public agency must conduct a "preliminary review" to determine whether the action is a "project" subject to CEQA. *See Muzzy Ranch Co. v. Solano County Airport Land Use Comm'n*, 41 Cal. 4th 372, 380 (2007). A "project" is "the whole of an action" directly undertaken, supported, or authorized by a public agency "which may cause either a direct physical change in the environment, or a reasonably foreseeable indirect physical change in the environment." Pub. Res. Code § 21065; CEQA Guidelines § 15378(a). Under CEQA, "the term 'project' refers to the underlying activity and not the governmental approval process." *California Unions for Reliable Energy v. Mojave Desert Air Quality Mgmt. Dist.*, 178 Cal. App. 4th 1225, 1241 (2009) (*quoting Orinda Ass'n v. Bd. of Supervisors*, 182 Cal. App. 3d 1145, 1171-72 (1986)). The definition of "project" is "given a broad interpretation in order to maximize protection of the environment." *Lighthouse Field Beach Rescue v. City of Santa Cruz*, 131 Cal. App. 4th 1170, 1180 (2005) (internal quotation omitted). 5-2

CEQA requires an EIR where, as here, there is substantial evidence in the record to support a fair argument that the management and authorization of the spiny lobster fishery according to the Plan may have a significant effect on the environment. Pub. Res. Code §§ 21100, 21151; CEQA Guidelines § 15064(a)(1), (f)(1); *Communities for a Better Env't v. South Coast Air Quality Mgmt. Dist.*, 48 Cal. 4th 310, 319 (2010); *No Oil, Inc.*, 13 Cal. 3d at 82. This "fair argument" test "establishes a low threshold for initial preparation of an EIR, which reflects a preference for resolving doubts in favor of

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environmental review." *Architectural Heritage Assn. v. County of Monterey*, 122 Cal. App. 4th 1095 (2004).

By contrast, a negative declaration is appropriate only when there is no substantial evidence in light of the whole record before the public agency that the project may have a significant effect on the environment. Pub. Res. Code §§ 21064.5, 21080(c); CEQA Guidelines §§ 15006(h), 15064(f)(2), 15070(b), 15369.5. If evidence demonstrating a significant impact exists, an EIR must be prepared, even if the lead agency also can point to substantial evidence in the record supporting its determination that no significant effect will occur. *Architectural Heritage*, 122 Cal. App. 4th at 1109-10. The lead agency may not dismiss evidence because it believes that there is contrary evidence that is more credible. *Pocket Protectors v. City of Sacramento*, 124 Cal. App. 4th 903, 935 (2005). 5-2 cont.

The project requires an EIR if the cumulative impact may be significant and if the project's incremental effect, though individually limited, is cumulatively considerable. CEQA Guidelines § 15064(h)(1). When the project is viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable future projects, if the impact is significant than the individual project's incremental effect is "cumulative considerable." *Id.*

II. The Commission Fails to Consider Cumulative Impacts to Threatened and Endangered Whales

As discussed above, CEQA guidelines require that the EIR consider the cumulative impact of California fisheries on endangered whales. This is especially important because the majority of reported whale entanglements cannot be assigned to a particular fishery. Because it is clear that significant impacts to threatened and endangered species could result from the Plan's management of the spiny lobster fishery, the Commission must prepare an EIR.

The Negative Declaration does not provide a sufficient analysis of potential impacts to threatened and endangered species that will result from the changes in the Plan. The Plan proposes a trap limit of 300 traps per operator permit, which is the median number of traps that fishermen operate currently.[1] Under the Plan, however, the maximum soak time will be increased from 4 days to 7 days, nearly doubling whales' potential exposure to traps. In addition, a longer soak time increases the risk of lost traps due to fishermen being able to travel farther from the set and not being able to return to pull traps in bad weather. 5-3

While the Negative Declaration lists endangered and threatened marine mammals that may occur within the waters of the project (Guadalupe fur seal, southern sea otter, humpback whale, sei whale, North Pacific right whale, fin whale, blue whale, orca (killer whale), and sperm whale), it does not adequately analyze the risk of entanglement cumulatively among fisheries off California or adopt mitigation measures for this fishery.

[1] Plan at 2-3.

3

The potential for California fisheries to result in significant impacts to endangered whales is shown by reported fishing gear interactions in 2015 that were higher than ever before. In 2015, two endangered fin whales were reported entangled off Dana Point in unknown gear.[2] The first entangled blue whale in California was sighted off Los Angeles in 2015, in gear suspect to be from a deep-set trap fishery. The potential for unreported interactions is most concerning in the case of the highly endangered Pacific right whale, a California fully protected species, of which only about 30 exist; any mortality incidental to commercial fisheries would be considered significant.[3] In spite of the increase in reported entanglements, reported interactions vastly underestimate impacts to whales because most interactions go unreported.[4]

Even for populations that are relatively abundant compared to the right whales, such as endangered humpback whales, fisheries interactions off of California are having a significant effect. Assessment of the impact of fishery interactions on whales can be evaluated by comparing mortality and serious injury estimates to the potential biological removal level for each stock ("PBR"). PBR is defined as the "maximum number of animals . . . that may be removed from a marine mammal stock while allowing that stock to reach or maintain its optimum sustainable population."[5] For humpbacks in California, Oregon and Washington, for example, the PBR is 22.[6] In 2015, there were 33 reports of entangled humpbacks in California.[7] In the lobster fishery alone, one humpback was reported seriously injured in the period 2007-2011 and one entangled in 2015.[8] 5-3 cont.

Of the 33 reported entanglements in 2015, an unknown number of them caused serious injury, i.e. the entanglement was more likely than not to cause mortality. The MLMA, however, requires that fishery management plans prevent entanglements and minimize the mortality of entanglements that do occur.[9] Therefore it is important that the Plan include measures to prevent entanglements and make sure that entanglements are less severe. For the purposes of evaluating fisheries' impacts, the National Marine Fisheries Service ("NMFS") considers even successfully disentangled animals to be "seriously injured" if the entanglement was more likely than not to result in mortality.[10]

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[2] Exhibit A.
[3] NMFS, Alaska Marine Mammal Stock Assessments, 2014, at 222, NOAA Technical Memorandum NMFS-AFSC-30,1doi:10.7289/V5NS0RTS.
[4] Over 50 percent of humpbacks photographed on the West Coast showed evidence of previous entanglements, based on the presence of scars. Saez, L., D. Lawson, M. DeAngelis, S. Wilkin, E. Petras, C. Fahy. Marine mammal entanglements along the United States west coast: A reference guide for gear identification. IWC/M13/Forinfo06.
[5] 16 U.S.C. § 1362(20).
[6] NMFS, U.S. PACIFIC MARINE MAMMAL STOCK ASSESSMENTS: 2014, NOAA-TM-NMFS-SWFSC-549, doi:10.7289/V5/TM-SWFSC-549, at 190-91.
[7] Exhibit A.
[8] *Id.*; see also NMFS, U.S. PACIFIC MARINE MAMMAL STOCK ASSESSMENTS: 2014, NOAA-TM-NMFS-SWFSC-549, doi:10.7289/V5/TM-SWFSC-549.
[9] F.G.C. § 7085.
[10] NMFS Instruction 02-238-01, Guidelines for Distinguishing Serious from Non-Serious Injury of Marine Mammals Pursuant to the Marine Mammal Protection Act, at 7, available at: http://www.nmfs.noaa.gov/directives/.

4

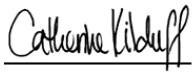
Measures in the Plan that could mitigate the problem of lobster fishing gear entangling whales include: setting a minimum distance between traps, so as to allow safe passage of whales and boat traffic; using "weak lines" that allow whales to break free of wraps; and instituting a program for retrieving lost gear. To help identify entangling gear, the Plan could require using lines marked with identifying color patterns or buoy numbers, which could greatly reduce the number of entanglements that are not identified to a specific fishery.

To mitigate endangered species interactions in federal fixed gear fisheries, NMFS has required creating electronic monitoring and logbook reporting measures for fishers to document effort and lost gear; developing a database to track fishing effort, locations, and lost fixed gear; analyzing data on lost gear to evaluate the magnitude of gear loss and factors that may influence loss (specific areas, times of year, etc.); and analyzing fish-gear fishing effort and locations to support overlap analysis with large whale migrations or aggregations.[11] All of these measures should be standard practices in California fisheries known to entangle endangered whales, including the spiny lobster fishery. 5-4

III. Conclusion

Approving the Plan that provides a framework for managing the spiny lobster fishery on the basis of the Negative Declaration violates CEQA because it does not analyze the cumulative impact of California fisheries on endangered whales. Reported fishing gear entanglements rose significantly in 2014 and 2015. These reports show a significant impact on populations of endangered humpback whales. For some endangered whales, such as the Pacific right whale, any interaction with commercial fisheries would have a population-level effect. Thus, both the risk of bycatch and bycatch mortality must be minimized. We urge the Commission to complete an EIR for the Plan and include mitigation measures. 5-5

Sincerely,



Catherine W. Kilduff, Staff Attorney
Center for Biological Diversity
1411 K St. NW Ste 1300
Washington, DC 20005
202-780-8862
ckilduff@biologicaldiversity.org

[11] NFMS, Dec. 7, 2012. Endangered Species Act (ESA) Section 7(a)(2) Biological Opinion and Section 7(a)(2) "Not Likely to Adversely Affect" Determination Continuing Operation of the Pacific Coast Groundfish Fishery, PCTS Number: NWR-2012-876.

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Exhibit A

NMFS, "Summary Record of Large Whale Entanglements Reported on the U.S. West Coast in 2015"

6

Summary Record of Large Whale Entanglements Reported on the U.S West Coast in 2015

In 2015, the State of California convened an informal working group to address the issue of whale entanglements in the California Dungeness crab fishery, in response to recent increases in reports of entangled whales and public awareness about the issue. The working group consists of commercial and recreational fishermen, non-governmental organizations, California Department of Fish and Wildlife, and NOAA Fisheries (NMFS). As the primary agency responsible for monitoring marine mammal populations, NMFS has committed to providing the best available scientific information and expertise regarding whale entanglements to the working group, including updates of entanglement data collected by NMFS for consideration by the working group as they move forward. The following data summary is intended to directly support working group efforts, along with meeting the interest of other stakeholders and media tracking the issue. The data reported on here represent a summary of information that is reported to NMFS, and is not intended to represent any further evaluation or determination regarding the serious injury or mortality of any entanglement event. Please review the Marine Mammal Stock Assessment Reports for those determinations.

The attached spreadsheet contains the record of whales reported as entangled to the NMFS West Coast Marine Mammal Stranding Program in 2015 based upon a thorough review of all reports and information gathered by the Stranding Program. This includes whales entangled in some type of gear, both fishing and non-fishing. Reports are opportunistic and from a variety of sources, including State and Federal government representatives, commercial vessel operators, and the public. NMFS West Coast Regional Office staff reviews and evaluates reports of entanglements for accuracy. NMFS also coordinates, and often participates, in on-the-water disentanglement efforts, when deemed safe to attempt by a trained disentanglement team. The accurate documentation of the entanglement, through narrative, photographs, video, post-disentanglement effort debriefs, and conversations with the reporting party, all aid in documentation of the incident, which are all included in the evaluation conducted by NMFS West Coast Regional office staff. Increasing the level of information and detail provided by reporting parties has been a major focus of the Stranding Program, as NMFS is working to improve the ability to accurately identify sources of entanglement.

In 2015, 62 distinct occurrences of entangled whales along the coasts of California, Oregon, and Washington were reported; of which NMFS staff confirmed 49 reports to be of an actual entangled whale (Table 1). These 62 occurrences do not include those reports that are determined to be a resighting of an individual previously reported through evaluation of the information and documentation provided. The total number of entanglements reported along the U.S. west coast (62) is the highest annual total since NMFS began keeping records beginning in 1982. Humpback whales were the most commonly identified whale that was reported in 2015. The blue whale that was reported entangled represents the first documented entanglement of a blue whale along the U.S. west coast. Of the 62 total reports, 58 were initially sighted in California, 3 were in Washington, and 1 was in Oregon. It is important to remember that entangled whales are not necessarily observed where the entanglement occurred.

Table 1. Entangled whales in 2015		
Species	**reported**	**confirmed**
Humpback	35	31
Gray	12	9
Fin	2	2
Blue	1	1
Killer Whale[1]	1	1
Unidentified	11	5
Total	62	49

In 2015, entanglements were reported every month throughout the year (Table 2). From February through November, at least 5 reports were documented each month except April, and September marked the month where the most entanglement reports were received (11). Humpback whale entanglements were reported during every month except April and December, with a relatively consistent number of reports each month from May through October.

Table 2. Timing of all reports by month				
Month	**Humpback**	**Gray**	**Other**	**Total**
Jan	2	0	0	2
Feb	2	2	1 Fin	5
Mar	1	4	1 Unid.	6
Apr	0	0	1 Killer Whale	1
May	4	1	3 Unid.	8
Jun	5	0	0	5
Jul	5	1	0	6
Aug	2	1	2 Unid.	5
Sep	6	2	1 Blue; 2 Unid.	11
Oct	6	0	1 Fin	7
Nov	2	0	3 Unid.	5
Dec	0	1	0	1

In 2015, NMFS confirmed five different fishery/gear types as the origin of entanglements (Table 3). The Dungeness crab fishery was the most commonly identified origin of entangling gear (11), with 9 of these entanglements known to have involved gear from California. In addition to the commercial fishery, one humpback whale was entangled in California recreational crab gear. Confirmed gillnet gear entanglements included set gillnet and Washington tribal gillnet. One gillnet entanglement was suspected to be large mesh drift gillnet based on the documentation provided. Entanglements where the origins of gear were confirmed involved humpback whales (12), gray whales (4) and killer whales (1).

[1] Killer whales (*Orcinus orca*) are classified members of the dolphin family (*Delphinidae*). The entangled killer whale was identified as a transient killer whale.

Table 3. Confirmed origin of entanglements	
Dungeness crab CA	8
Dungeness crab CA rec	1
Dungeness crab OR	2
Gillnet	5
Spiny Lobster	1

In 2015, the disentanglement network was very active in responding to entanglement reports along the U.S. west coast. Their involvement greatly increases the ability to accurately document the nature of the entanglement on the animal, as well as initiate interventions to remove gear. Table 4 documents the known outcomes for entangled whales reported in 2015. Of the 62 reports, the fate of 52 whales reported as entangled is unknown. Two individuals were fully disentangled by responders, along with two additional partial disentanglements. Four animals are believed to have freed themselves or otherwise shed the gear following the initial report, and two whales were reported as dead with gear present on them.

Table 4. Outcomes for entangled whales	
disentangled	2
partial disentanglement	2
self-release	4
dead	2
unknown	52

Other notes

The blue whale entanglement is suspected to have originated from a “deep-set trap fishery” based on the documentation provided and consultation with California fishery managers. In May, one humpback whale was documented entangled in what is suspected to be pelagic longline gear. Also of note, in September, a dead leatherback sea turtle was reported entangled in line in coastal waters offshore San Francisco Bay. The origin of the entanglement could not be determined from the documentation that was provided.

1st Observation Date	Common Name	State	County	City	Location	Found dead?	Confirmed entanglement	Fishery Type	Fishery certainty	Gear Type	Gear Set Location	Rescue effort initiated?	Disentangled?
1/8/2015	HUMPBACK WHALE	CA	MONTEREY	MOSS LANDING	5 nm off M	N	C	UNK	U	UNK	UNK	Y	N
1/19/2015	HUMPBACK WHALE	CA	MONTEREY	MOSS LANDING		N	C	Dungeness	C	POT	UNK	Y	N
2/2/2015	GRAY WHALE	CA	Los Angeles	PALOS VERDES	2 miles we	N	C	Gillnet	C	NET	UNK	N	N
2/7/2015	FIN WHALE	CA	ORANGE	DANA POINT	2.5 nm we	N	C	UNK	U	UNK	UNK	N	N
2/16/2015	HUMPBACK WHALE	CA	MONTEREY	MOSS LANDING		N	C	UNK	U	UNK	UNK	Y	N
2/17/2015	HUMPBACK WHALE	CA	MONTEREY	MOSS LANDING	where gear	N	C	Dungeness	C	POT	Moss landi	Y	N
2/26/2015	GRAY WHALE	CA	SANTA BARBARA	SANTA BARBARA	0.5 nm nor	N	C	UNK	U	UNK	UNK	N	N
3/1/2015	UNIDENTIFIED WHALE	CA	VENTURA	PORT HUENEME		Y	C	UNK	U	UNK	UNK	N	NA
3/7/2015	GRAY WHALE	CA	ORANGE	San Clemente	1 mile off S	N	C	UNK	U	UNK	UNK	Y	N
3/11/2015	GRAY WHALE	CA	SAN LUIS OBISPO	San Simeon	off san sim	N	C	Dungeness	C	POT	Same as re	N	N
3/16/2015	GRAY WHALE	CA	ORANGE	DANA POINT		N	C	UNK	U	UNK	UNK	Y	P
3/19/2015	GRAY WHALE	WA		Marrowstone Island	Marrowsto	N	U	UNK	U	UNK	UNK	N	N
3/26/2015	HUMPBACK WHALE	CA	SANTA CRUZ	Santa Cruz	2 mile outs	N	C	UNK	U	UNK	UNK	N	N
4/17/2015	KILLER WHALE	CA	MENDOCINO	McKerricher State Park	McKerricho	Y	C	Dungeness	C	POT	UNK	N	NA
5/3/2015	UNIDENTIFIED WHALE	CA	MONTEREY	Cypress	off Cypress	N	U	UNK	U	UNK	UNK	N	N
5/9/2015	UNIDENTIFIED WHALE	CA	MENDOCINO	Ft Bragg	1 mile awa	N	C	UNK	U	UNK	UNK	N	N
5/14/2015	HUMPBACK WHALE	CA	MONTEREY	MOSS LANDING		N	C	Dungeness	C	POT	UNK	N	SR
5/16/2015	HUMPBACK WHALE	CA	SANTA BARBARA	SANTA BARBARA	12 miles of	N	C	Dungeness	C	POT	Set off Poir	Y	N
5/21/2015	GRAY WHALE	OR		Brookings	.25 nm sou	N	C	UNK	U	UNK	UNK	N	N
5/24/2015	HUMPBACK WHALE	CA	MONTEREY	MOSS LANDING		N	U	UNK	U	UNK	UNK	N	N
5/28/2015	UNIDENTIFIED WHALE	CA	SANTA BARBARA	Ventura	10 miles w	N	U	Gillnet	S	NET	UNK	Y	N
5/28/2015	HUMPBACK WHALE	CA	ORANGE	DANA POINT		N	C	Longline	S	HK/LN	UNK	N	N
6/9/2015	HUMPBACK WHALE	CA	MONTEREY	Pt Pinos area		N	C	Dungeness	C	POT	Lost trap o	Y	SR
6/12/2015	HUMPBACK WHALE	CA	SANTA CRUZ	Sea Cliff State Beach	1/2 mile of	N	U	UNK	U	UNK	UNK	N	N
6/21/2015	HUMPBACK WHALE	CA	SANTA CRUZ	Santa Cruz	1 mile sout	N	C	UNK	U	UNK	UNK	N	N
6/22/2015	HUMPBACK WHALE	CA	SANTA CRUZ	Capitola Beach	sighted off	N	U	UNK	U	UNK	UNK	N	N
6/25/2015	HUMPBACK WHALE	CA	MONTEREY			N	C	Dungeness	C	POT	Near Santa	Y	SR
7/3/2015	HUMPBACK WHALE	CA	MONTEREY			N	C	Dungeness	C	POT	Point Mear	Y	N
7/7/2015	HUMPBACK WHALE	WA		La Push	8 miles off	N	C	UNK	U	NET	UNK	N (althoug	N
7/12/2015	HUMPBACK WHALE	CA	MENDOCINO	FORT BRAGG	14 MIELS D	N	C	Crab	U	UNK	UNK	N	N
7/13/2015	HUMPBACK WHALE	CA	MENDOCINO	FORT BRAGG	NOYO HAR	N	C	UNK	U	UNK	UNK	N	N
7/19/2015	HUMPBACK WHALE	CA	MONTEREY	MOSS LANDING	3 MILES FR	N	C	Crab	U	UNK	UNK	Y	N
7/30/2015	GRAY WHALE	CA	ORANGE	HUNTINGTON BEACH	JUST OFF H	N	C	White sea	C	NET	Same as re	N	SR
8/10/2015	HUMPBACK WHALE	CA	MONTEREY			N	C	UNK	U	POT	UNK	Y	N
8/15/2015	GRAY WHALE	WA		Neah Bay	inside Neal	N	C	Set Gillnet	C	NET	same as re	Y	P
8/25/2015	UNIDENTIFIED WHALE	CA	Los Angeles	CATALINA	9NM SOUT	N	C	UNK	U	UNK	UNK	N	N
8/26/2015	HUMPBACK WHALE	CA	VENTURA	ANACAPA	HALF MILE	N	C	UNK	U	UNK	UNK	N	N
8/27/2015	UNIDENTIFIED WHALE	CA	SANTA BARBARA	GOLETA	OFF DRAKE	N	C	UNK	U	UNK	UNK	Y	N
9/4/2015	BLUE WHALE	CA	Los Angeles	Los Angeles	7.5 NM SO	N	C	Deep set tr	S	POT	UNK	Y	N
9/8/2015	GRAY WHALE	CA	SANTA BARBARA		RINCON BE	N	U	UNK	U	UNK	UNK	N	N
9/10/2015	HUMPBACK WHALE	CA	ORANGE	DANA POINT	209 BANK	N	C	UNK	U	UNK	UNK	N	N
9/12/2015	UNIDENTIFIED WHALE	CA	Los Angeles	SAN PEDRO	2 nm south	N	U	UNK	U	UNK	UNK	N	N
9/14/2015	HUMPBACK WHALE	CA	MONTEREY	MOSS LANDING	5 NM OUT	N	C	UNK	U	UNK	UNK	N	N
9/25/2015	HUMPBACK WHALE	CA	Los Angeles		CATALINA	N	C	UNK	U	UNK	UNK	N	N
9/26/2015	GRAY WHALE	CA	ORANGE	SAN CLEMENTE	12 MILES C	N	U	UNK	U	UNK	UNK	N	N
9/26/2015	HUMPBACK WHALE	CA	ORANGE	SAN CLEMENTE ISLAND	9/26 repor	N	C	UNK	U	UNK	UNK	N	N
9/27/2015	HUMPBACK WHALE	CA	VENTURA		6 MILES SC	N	C	Gillnet	S	NET	UNK	N	N
9/29/2015	HUMPBACK WHALE	CA	ORANGE	NEWPORT	1/2 WAY B	N	C	Dungeness	C	POT	UNK	N	N
9/30/2015	UNIDENTIFIED WHALE	CA	SAN DIEGO	POINT LOMA	~15 MILES	N	U	UNK	U	UNK	UNK	N	N
10/9/2015	FIN WHALE	CA	ORANGE		2 MILES OF	N	C	UNK	U	UNK	UNK	Y	N
10/17/2015	HUMPBACK WHALE	CA	Los Angeles	SAN PEDRO	JUST OUTS	N	C	Gillnet con	S	NET	UNK	Y	N
10/17/2015	HUMPBACK WHALE	CA	ORANGE	Newport	exact locat	N	U	UNK	U	UNK	UNK	N	N
10/23/2015	HUMPBACK WHALE	CA	MONTEREY	MOSS LANDING		N	C	UNK	U	UNK	UNK	N	N
10/25/2015	HUMPBACK WHALE	CA	SAN DIEGO	TORREY PINES	5 NM OFFS	N	C	Lobster	C	POT	UNK	Y	Y
10/28/2015	HUMPBACK WHALE	CA	SANTA BARBARA	CARPINTERIA	4 MILES OF	N	C	Dungeness	C	POT	UNK	Y	Y
10/31/2015	HUMPBACK WHALE	CA	ORANGE	NEWPORT	4.9 MILES (	N	C	Gillnet	C	NET	UNK	N	N
11/7/2015	HUMPBACK WHALE	CA	SAN DIEGO	San Diego	off the coa	N	C	UNK	U	UNK	UNK	Y	N
11/7/2015	UNIDENTIFIED WHALE	CA	Marin	FARALLON ISLANDS	just west o	N	C	UNK	U	UNK	UNK	N	N
11/8/2015	HUMPBACK WHALE	CA	MONTEREY			N	C	UNK	U	UNK	UNK	N	N
11/21/2015	UNIDENTIFIED WHALE	CA	Santa Barbara		4 nm north	N	U	UNK	U	UNK	UNK	N	N
11/27/2015	UNIDENTIFIED WHALE	CA			no informa	N	U	UNK	U	UNK	UNK	N	N
12/21/2015	GRAY WHALE	CA	SAN DIEGO	CAMP PENDLETON	off Camp P	N	C	UNK	U	UNK	UNK	N	N

Letter 5 Response	Center for Biological Diversity Catherine W. Kilduff March 7, 2016

Thank you for taking the time to submit comments on the proposed project. Responses are provided below.

Comment 5-1

The commenter states that the authorization of the spiny lobster fishery without mitigation to prevent whale entanglements will result in significant environmental impacts to endangered species. The commenter also states that Fish and Game Code (FGC) Section 7085 requires each FMP to include information on the amount and type of bycatch, and in the case of unacceptable amounts or types of bycatch, include conservation and management measures to minimize bycatch and its mortality. The commenter further states that neither the Draft IS/ND nor the FMP and proposed regulatory amendments adequately describes or minimizes the fishery's impact on protected whales, and urges the Commission to prepare an EIR.

Response to Comment 5-1

As the lead agency responsible for adopting the FMP and the regulations related thereto, the Commission, with support from CDFW, has determined that the ND adequately addresses all the environmental impacts of the proposed project. As described in Sections 2.1 and 2.4 of the Draft IS/ND, the spiny lobster fishery is an existing fishery managed by the State of California for more than 100 years. Further, in accordance with the requirements of the MLMA, bycatch and marine mammal gear interactions were evaluated in Section 2.3 of the draft FMP (CDFW 2016). This evaluation includes a discussion of the whale entanglement issue and notes that NMFS continues to classify this fishery as Category III (i.e., having "a remote likelihood of, or no known incidental mortality and serious injury of marine mammals") (Section 2.3.3 on page 12 of the FMP). In addition, the history of conservation and management measures affecting the fishery are described in Section 2.4 of the draft FMP, as referenced in the Draft IS/ND.

The proposed project actions are the adoption of the FMP and related regulations to promote a sustainable and orderly spiny lobster fishery. As noted above, the project involves an existing fishery and does not involve expansion of fishing activity beyond the existing baseline conditions. Because the FMP and proposed regulatory amendments would reduce over time the number of traps deployed, the risk of marine mammal entanglement would not increase and may decrease in the long term. The potential to reduce trap deployment over time is driven by the proposed 300-trap limit per commercial lobster operator permit (compared to the current lack of a maximum trap limit), the maintenance of the current number of commercial lobster operator permits, and the fact that some permits are non-transferrable, which would reduce the total number of permit holders through attrition. Consequently, this may result in a beneficial effect over time, and with the most conservative interpretation, a less-than-significant risk for marine mammal species. This assessment is presented in Section 3.4.2 of the Draft IS/ND and pages 26-27 of Appendix A to the Draft IS/ND.

The potential effects of the proposed project actions were compared to the environmental baseline conditions of the existing spiny lobster fishery noted in the above sections of the Draft IS/ND and FMP. Table 2-3 of the Draft IS/ND provides a summary of reasonably foreseeable compliance responses from implementation of the proposed FMP and proposed regulatory amendments. It was determined that changing the commercial trap limit and provisions for the recovery/retrieval of lost or abandoned traps would avoid an increase in the fishery's impact in regard to bycatch and marine mammal interactions and potentially decrease the risks of marine mammal interactions. No significant impacts were determined from the analyses conducted during the preparation of the Draft IS/ND.

Comment 5-2

The comment cites case laws and statues to support the proposition that an EIR should be prepared for the project. The comment further states that a ND is only appropriate when there is no substantial evidence in

light of the whole record before the public agency that the project may have a significant effect on the environment; and, if evidence demonstrating a significant impact exists, an EIR must be prepared, even if the lead agency also can point to substantial evidence in the record supporting its determination that no significant effect will occur. The comment also states that the project requires an EIR if the cumulative impacts may be significant and if the project's incremental effect, though individually limited, is cumulatively considerable.

Response to Comment 5-2

Comment 5-2 represents a summary of the commenter's understanding of the legal underpinnings of CEQA's "fair argument" standard and a lead agency's decision whether to prepare a ND or EIR. The comment provides background information for Comment 5-3 below, and does not directly address the contents of the Draft IS/ND. The comment is noted and no further response is needed.

Comment 5-3

The commenter argues that the proposed FMP and regulations may contribute to a significant cumulative impact on marine mammals through fishing gear entanglement for three reasons: (1) whale entanglements with fishing gear increased in 2015 to the highest level ever recorded by the National Marine Fisheries Service (NMFS), which the commenter contends is new information and may point to a cumulatively significant effect, (2) the majority of the entanglements cannot be assigned to a specific type of fishery, so the risk of entanglement with lobster fishing gear is not known (and by implication, may be increasing), and (3) marine mammal exposure to lobster fishing gear is claimed to be increased as a result of the proposed provision to lengthen the period between required trap checking/servicing events (i.e., "soak time") from 4 to 7 days. The commenter also provides information on the locations, species, and gear types of recent entanglement events, and notes that the MLMA requires that FMPs minimize entanglements.

Response to Comment 5-3

Regarding the commenter's first argument, although the 2015 NMFS (NMFS 2015) report provided by the commenter presents results of NMFS's large whale entanglement monitoring for the full calendar year, the increase in the rate of entanglement is not new information in the Draft IS/ND. As described on page 27 of Appendix A to the Draft IS/ND, an increase in whale entanglements had been noted in 2014 and 2015 by the National Oceanic and Atmospheric Administration (NOAA). At the time the Draft IS/ND was prepared, data were available through June 2015, taken from a November 2015 NOAA entanglement fact sheet for California (cited as NOAA 2015d in Appendix A). The higher rate of entanglement continued for the remainder of the calendar year, according to the commenter-cited 2015 NMFS report. The 2015 NMFS report adds new data for the months of July through December 2015, but the data do not change the Draft IS/ND's already noted understanding of increased whale entanglements during 2015. New information added to an ND that merely clarifies, amplifies, or make insignificant modifications to an ND does not require recirculation of the CEQA document, nor requires the preparation of an EIR (CEQA Guidelines Section 15073.5). Therefore, the higher rate of whale entanglement does not constitute substantial new information that was not known when the Draft IS/ND was completed.

Regarding the commenter's second contention, for a fair argument to arise that a cumulative impact may occur, two circumstances must exist, both supported by substantial evidence – first, the overall problem is significant and, second, a considerable contribution to the problem may occur as a result of the proposed project. The increase in whale entanglement off the California coast is an important concern to the Commission, CDFW, and other agencies involved in marine mammal protection. The Draft IS/ND noted this phenomenon in Appendix A. The Commission recognizes that a cumulatively significant, adverse environmental condition of increased whale entanglement has been occurring in 2014 and 2015 and is supported by factual evidence. The reasons behind the increase in entanglements are not, however, well understood. The commenter implies that the uncertainty regarding the source of entangled materials noted in NMFS data is evidence that more commercial lobster gear entanglements may be occurring. The absence of data constitutes unsubstantiated narrative or opinion.

Further, the commenter's Exhibit A, "Summary Record of Large Whale Entanglement Reported on the U.S. West Coast in 2015" (NMFS 2015) does not support their assertions. Rather, the Summary Record demonstrates that a great deal of mitigation efforts are underway in the face of a large amount of scientific uncertainty. NMFS is the primary agency responsible for monitoring marine mammal populations and, through its Marine mammal Stranding Program, coordinates and often participates in on-the-water disentanglement efforts; the State of California, through the CDFW, convened a working group to address the issue of whale entanglements in the California Dungeness crab fishery and to develop short- and long-term options for reducing the risk of whale entanglements in Dungeness crab fishing gear (refer to response to Comment 5-4 below). While the results of this working group may have applicability to other trap fisheries, it is important to note that the Summary Record (Exhibit A) identifies one entanglement incident in 2015 that was attributable to the California spiny lobster fishery. In that case a rescue effort was initiated and the gear was successfully disentangled.

Regarding the commenter's third argument, as discussed in the response to Comment 5-1 above, neither the FMP nor the proposed regulations involve the authorization of the spiny lobster fishery. The spiny lobster fishery is an existing fishery, operating for more than a century, which is managed by CDFW pursuant to regulations adopted by the Commission. The proposed project would implement a formalized management framework that would be the basis for informed management decision-making to achieve a sustainable fishery considering the entire ecosystem, which would not result in a substantial adverse change in the physical conditions that exist in the proposed project area (refer to response to Comment 5-1).

As noted by the commenter, the proposed regulatory amendments includes a limit of 300 traps, which is the current estimated median of traps operated per fisherman. Existing regulations do not include a limit on the number of traps, so some commercial lobster operator permitees deploy a substantially greater number of trap gear. The proposed trap limit would result in a reduction in the overall number of traps used for the fishery. As permit holders with nontransferable permits exit the fishery, it may result in a near-term and long-term reduction. This trap limit represents an important step towards better management and a more orderly fishery. The provisions are expected to lessen the potential for future impacts to whales.

The commenter contends that the proposal to extend "soak time" between trap servicing events results in increased time for fishing gear to be in the water, and therefore, a claimed increase in risk of whale entanglement; however, this contention reflects a misunderstanding of the FMP and regulations. The proposed increase in the trap service requirement "soak time" from 4 to 7 days does not increase whales' potential exposure to traps; rather, it only extends the allowable time between service checks of the traps. During the lobster season, fishermen typically leave their traps in the water continuously. Traps are checked, emptied, and immediately returned to the water. Information reported on commercial logbooks indicates that many fishermen currently service their traps at shorter intervals than the current maximum allowed 4 days with 15 percent servicing traps after one night, 23 percent after two nights, 26 percent after three nights, and 36 percent after four nights. The increase in maximum allowed time between trap servicing events does not change the time a trap is deployed; rather, it is intended to improve the safety of fishermen by allowing flexibility for when boats travel to the traps, so they can wait for adequate weather conditions.

Under another provision of the new trap limit, every lobster trap must be marked with a CDFW-issued trap tag and each permit holder will receive 300 tags at the beginning of each season. As a result, there will be increased incentive to place traps only in locations where risk of loss due to high wave energy is low, because trap tags are not easily replaced during the season. Reducing the potential for lost traps would also decrease the risk of interaction between whales and lost fishing gear.

Comment 5-4

The commenter provides recommendations to mitigate the problem of whale entanglement with lobster fishing gear which include: setting a minimum distance between traps to allow the safe passage of whales and boat traffic, using "weak lines" that allows whales to break free of wraps, instituting a program for retrieving lost gear, using lines marked with identifying color patterns or buoy numbers. The commenter also notes measures implemented by NMFS to mitigate endangered species interaction in federal fixed-gear fisheries that should be standard practices in California fisheries known to entangle whales. These include:

creating electronic monitoring and logbook reporting measures to document effort and lost gear; developing a database to track fishing effort, locations, and lost fixed gear; analyzing data on lost gear to evaluate the magnitude of gear loss and factors that may influence loss; analyzing fishing effort and locations to support overlap analysis with large whale migration or aggregations.

Response to Comment 5-4

As discussed above, CDFW recognizes the growing problem of marine mammal interactions with fishing gear in California and is approaching the problem first by working with the Dungeness Crab Fishing Gear Working Group (Working Group). The Working Group consists of commercial and recreational fishermen, representatives from environmental organizations, and representatives from federal and state agencies; and was convened by CDFW in September 2015 to develop short- and long-term strategies to reduce the risk of whale entanglements in Dungeness crab fishing gear.

The Commission appreciates the recommendations for other actions to protect whales that could be included in spiny lobster fishery management regulations. Sufficient data does not yet exist regarding the effectiveness of the suggestions. The California Spiny Lobster FMP does not preclude proposal of new regulations in the future, such as specifications for trap spacing, use of "weak lines," and instituting a lost gear retrieval program, if these measures are found in ongoing research to be effective in reducing entanglements.

CDFW is also working towards electronic logs for all fisheries. Currently, a Commercial Passenger Fishing Vessel (CPFV) voluntary electronic log is in place and one is in development for the lobster fishery, as noted in Section 5.1.1 of the FMP. Until electronic reporting is fully in place, CDFW is proposing improvements to the commercial lobster paper log (proposed amendment to Section 122(e) of Title 14 of the CCR) that will include the requirement to record the geographic coordinates for a string or group of traps. This change in the daily lobster log would modernize the location reporting requirement and improve CDFW's spatial understanding of fishing practices. Another proposed addition is the total number of traps currently deployed, which is to be updated each day of fishing. Better spatial information on fishing practices will also be useful for informing gear recovery programs, identifying potential conflicts within the marine environment, and for informing the issue of marine mammal gear interactions.

In addition, as noted in previous responses, CDFW is proposing several regulatory changes to the commercial fishing regulations found in Title 14 of the CCR, which would minimize the potential for marine mammal entanglement with lobster fishing gear. Proposed regulatory amendments to Title 14 CCR include new Section 122.1 that will implement a new trap limit program, effective October 2017, to specify 300 traps per lobster operator permit, establish lobster trap tags, and new buoy marking requirements. The establishment of a trap limit program will create a more orderly commercial fishery as well as provide improved understanding of the amount gear used in the fishery. The lobster trap tags and new buoy marking requirements will help to identify gear specific to the spiny lobster fishery.

A mandatory gear loss reporting affidavit to be submitted at the end of each season will also be included as part of the proposed regulatory amendments (new Subsection 122.2(f)) as well as new provisions for the recovery and retrieval of lost or abandoned gear (new Subsection 122.2(h)). The proposed regulatory changes will serve to help reduce the potential impact of lost or abandoned fishing gear on living marine resources and may help inform future lost gear recovery programs.

Under the proposed plan, the Commission may adopt conservation and management measures within the HCR tool box. While the conservation and management measures are possible responses to the status of reference points for the lobster stock, some of these measures, such as district closures, might also have benefits for avoiding interaction with marine mammals. Both CDFW and the Commission have authority to implement these or any other measures thought to be necessary during emergencies as noted in Section 6.2.1 of the FMP.

Additional details on the proposed amendments to Title 14 of the CCR are found in the Initial Statement of Reasons for the California Spiny Lobster Fishery Management Plan Implementing Regulations available at http://www.fgc.ca.gov.

Comment 5-5

The comment reiterates that approving the project on the basis of the ND violates CEQA because it does not analyze cumulative impacts of California fisheries on endangered whales. The commenter notes that recent reports on fishing gear entanglement show a significant impact on populations of endangered humpback whales, and potential for population-level effects for the endangered Pacific right whale. The commenter urges the Commission to complete an EIR for the project and include mitigation measures to address the risk of bycatch and bycatch mortality from fishing gear entanglement.

Response to Comment 5-5

See responses to Comment 5-1 through 5-4, above.

Letter 6

From: Christopher Miller [mailto:newmoonboat@gmail.com]
Sent: Monday, March 07, 2016 1:30 PM
To: Som, Marina@Wildlife
Cc: Richard Parrish; Ray Hilborn; Bruce Steele; Mastrup, Sonke@Wildlife; Ashcraft, Susan@FGC; Yong Chen; Mason, Tom@Wildlife; Mireles, Carlos@Wildlife; Jeremy Prince; c_culver@lifesci.ucsb.edu; Carrie Pomeroy; Mark Page; Stephen Schroeter; Armando Vega; Chris Hoeflinger; Kalvass, Peter@Wildlife; Brian Trautwein; Foster, Sharon; Jono Wilson; Ana Maria parma; Shuman, Craig@Wildlife; Lia Protopapadakis; Donna Schroeder; Gail Osherenko; Christopher Costello; Roland Takayama (steelshot@cox.net); McFarland, Rosalyn@Wildlife; Puccinelli, Robert@Wildlife
Subject: California Spiny Lobster FMP Negative declaration

Dear Marina,

Thank you for giving me the chance to review your negative declaration of the lobster FMP for the California Environmental Quality Act.

This project has impacts that are individually limited, but cumulatively considerable when you include an evaluation of the current status of the California Fish and Wild life's capacity to implement the harvest control rule.

When you look at the basic core of the harvest control rule being an out come of a policy of adaptive management that is science based the major flaw is there is no analysis of the cost of implementing the control rule if you don't want problems. 6-1

Science is really a science career for some one who believes in improving fishery management. For this FMP to be real and create no negative impacts hiding in its segments, you need to plan the economy of monitoring and investigating a trigger getting pulled.

To be pro-active that should be new CFW staff and more field time for investigating how to prevent problems.

Then you have can think about a pro-active form of management where there is a dynamic culture. There is a quite a lot unified science emerging that evaluates the social ecology of improving management. 6-2

Here in California we have a wide variety case studies of collaborations between managers and fishermen that support the coastal management act as a primary source of law to maintain community access to fresh seafood and its food culture.

None of them seem to work to good when they run out of money. In several of our meetings with managers in this process the cost or the structural capacity to dedicate funds are given as reasons to maintain austerity in management programs. 6-3

But what about areas where large gains can be had for small amounts of regular funding. The cable model is an example of that. It is really based in Dr. Parrish and his intellectual interest in the complexity of a model that can adapt to spatial stock assessment.

1

Dr. Parrish foundation is funding from the Coastal Commissions Policy of directing fiber optic cable companies to mitigate fishermen with a marine tenure based system of a fisheries improvement fund. I think this is the best argument you can make for the Lobster Advisory Committee independently making the same recommendation for trap limits we made to the Fish and Game Commission about twenty years ago. 6-3 cont.

Many times the cost of management and science can be a crutch you lean on. By conditioning yourself to react to problems you impede your ability to adapt.

In fact they can make more problems as reactionaries. A good example in this document is where sensitivity of a control rule reference point is changed based on the peer review.

Since the control rule is really a biological and economic model of fishery revenue with in counties composed of landing ports. The whole system would benefit from a basic holistic goal of collaborations that considers the quality of life value being applied in joint fishery and management behavior over time being enhanced. 6-4

Why not start monitoring now by forming three study regions. Santa Barbara Channel, San Pedro Channel and The Gulf of Catalina social ecology research regions.

If we use common sense we will also make opening up a diplomatic relationship between the La Paz Fisheries Center and our Marine Region a political economy of coordination. This needs a special focus that is missing in your current plan. This is the real time California Current Ecosystem. 6-5

Intergenerational equity is an environmental goal for precaution that we can now build on with methods that are designed to be funded by renewable resources as an integrated philosophy of cost recovery for management that builds a management improvement education method that generates a pro-active field method.

As an example I site the control rule out comes of a trigger being pulled. Three of the responses suggest we monitor and three more say you investigate.
It is clear that the fisheries are societies that must practice solidarity in supporting policies that generate management strategy evaluations for pro-active management procedures.

That may not be a consensus design. That might be a merit based design.

We have to figure out how to fund this to implement it so it will actually allow us to adapt.

We could use a social ecology framework and add cost recovery for management into a new section of the FMP. 6-6

I suggest it is called social business planning with fleet dynamics evaluations.

When you present ideas as examples of case studies of improved management they work best when collaboration takes place as adaptive learning. Adaptive learning requires continued education.

That has infrastructure for field work that also can look at the fishery a community groups in ports.

There may be a real system of management trade offs based in our MPA's spawning potential ratio and it may be the fishermen will develop their own monitoring enterprise through a vessel of opportunity policy.

There are institutional and structural design issues to creating the capacity to use the harvest control rule for the Marine Life Management Acts fishery objectives. I would like you to take a look at an example of a harvest rate by region that was generated Dr. Richard Parrish.

2

This data shows that we may have already hit a trigger. If you look at the areas where guys fish up to 600 traps regularly and have the fastest growth of the recreational hoop net fishery you will see they have the lowest harvest rate.

Then you factor in that the harvest is a race to the fish where we force a competition of our fishery with the Baja Mexico fishery you have to ask why we would do that?

On top of that you have the value of the fishery by month show that the quicker the harvest the lower that value.

The glut on the market is multiplied by the Spiny Lobster Natural History. The season starts around the time they molt and are weak.

As a career fisherman I can say there is no better validation of this data by Dr. Parrish than the amount of effort used to limit it discussion in the stakeholder process as a pre-requisite to informed consent on the control rule.

Apparently this was done by the facilitated process appointed representatives and the use of a direct democracy survey by the CFW was the appropriate check and balance.

6-6 cont.

For the Commercial fishery;

It would be best for all concerned if we considered alternatives to reduce trapping effort by splitting the 300 trap limit into 100 trap blocks for transfer.
So you could have a truly science based program of pro-active capacity and high resolution fleet dynamics evaluations.

This should be conditional to a monitoring and investigation economy fund being voted in for implementation.

If we had equity in ocean monitoring literacy fishermen would immediately recognize their transferable permits value is really based in the ability to dedicate funding to management strategy evaluations.

6-7

Thanks for your time,

Chris Miller
Lobster Fisherman

3

Letter 6 Response	Christopher Miller March 7, 2016

Thank you for taking the time to submit comments on the proposed project. Responses are provided below.

Comment 6-1

The commenter states that implementation of the HCR would be cumulatively considerable. The comment further states that there is no analysis of the cost of monitoring and proactively implementing the HCR.

Response to Comment 6-1

Potential cumulative effects of implementation of the FMP and proposed regulatory amendments are addressed in Section 3.18, Mandatory Findings of Significance.

Effects analyzed under CEQA must be related to a physical change in the environment (State CEQA Guidelines Code of California Regulations Section 15358[b]). Economic and social effects are not considered environmental effects under CEQA. These effects need to be considered only if they would lead to an adverse change in the physical environment. In addition, as stated on page 2-7 of the Draft IS/ND, the HCR is discretionary and not every triggering event would necessarily lead to an immediate regulatory response. Additional evaluation is needed before taking action to determine if external factors (i.e., new regulations, market dynamics, or environmental changes) have caused or contributed to the reference point(s) being exceeded. This process would include consultations with the fishing communities and other stakeholders.

Comment 6-2

The commenter states that CDFW should add new staff and additional time for field monitoring to provide proactive management of the fishery.

Response to Comment 6-2

The comment does not raise environmental issues or concerns regarding the adequacy, accuracy, or completeness of the environmental document. Effects analyzed under CEQA must be related to a physical change in the environment (State CEQA Guidelines Code of California Regulations Section 15358[b]).

Section 6.1.4 of the draft FMP discusses the administrative costs associated with implementation of the FMP, including management, enforcement, and research. The implementation program envisioned by the FMP for the management and monitoring of this fishery will require a minimum of three CDFW staff dedicated exclusively to spiny lobster. These include one environmental scientist on staff, one new environmental scientist, and one new scientific aid to conduct regular and on-going research and management as well as conduct investigations when HCR reference points are crossed.

Comment 6-3

The commenter discusses the lack of funding for management of the fishery and references Dr. Parrish's model as an example. The comment further states that the LAC made the same recommendation for trap limits as fishermen made to the Commission 20 years ago.

Response to Comment 6-3

See response to Comment 6-2, above.

Comment 6-4

The commenter expresses concern that the HCR reference point can be changed by peer review. The commenter further states that there should be a holistic and collaborative approach to management of the fishery.

Response to Comment 6-4

See response to Comment 6-2, above. CDFW is committed to incorporating the best scientific information into fishery management decisions. It is important for the scientific underpinnings of the draft FMP to have undergone independent review prior to submission to the Commission. The Final Report of the Scientific Review Committee as well as CDFW's edits to the draft FMP in response to peer review recommendations are included in the draft FMP as Appendix VII and VIII, respectively.

Comment 6-5

The commenter recommends forming three study regions: Santa Barbara Channel, San Pedro Channel, and the Gulf of Catalina to facilitate monitoring of the fishery and to open diplomatic relations between the Marine Region and the La Paz Fisheries Center.

Response to Comment 6-5

See response to Comment 6-2, above.

Comment 6-6

The commenter express concern that implementation of the HCR is reactionary and that there is not adequate funding. The commenter recommends the addition of a social ecology framework section be added to the FMP including cost recovery for management. The commenter further recommends review of the harvest rate by region that was generated by Dr. Richard Parrish and states that this data indicates an HCR trigger has already been met.

Response to Comment 6-6

See response to Comment 6-2, above. As stated on page 2-2 of the Draft IS/ND, the overarching goal of the FMP is to conduct a comprehensive review of the California spiny lobster fishery and define a management framework that establishes the basis for informed management decision-making to achieve a sustainable fishery considering the entire ecosystem. The HCR is a type of adaptive management framework that identifies potential conservation problems and prescribes appropriate management responses. Section 4.3 of the draft FMP notes that the HCR is not guaranteed to capture every possible issue the fishery will face, and like any other management tool, resource managers will need to exercise independent judgment when using the HCR. In addition, CDFW will continue to explore ways to improve the HCR, such as modifying reference points, or methods for their calculation, to more accurately reflect the status of the fishery and meet the MLMA management objectives.

Comment 6-7

The commenter recommends reducing the trapping effort for the commercial fishery by splitting the 300 trap limit into 100 trap blocks for transfer, which would be conditional based on monitoring. The comment further states that if there is equity in ocean monitoring literacy, fishermen would recognize that the value of transferable permits is the ability to dedicate funding to management.

Response to Comment 6-7

See response to Comment 6-2, above. As stated on page 2-9 of the Draft IS/ND, of the respondents who supported the trap limit, 48 percent wanted a trap limit of 300 or less and 34 percent wanted a trap limit of 350-400. Based on the responses to the surveys, CDFW proposes that each licensed fisherman would be allowed to possess a maximum of two lobster operator permits, and each permit would allow fishermen to receive 300 trap tags issued by CDFW. Although a trap limit of 300 is currently being proposed per lobster operator permit, a trap limit range of 200 to 500 traps was evaluated in the draft IS/ND to accommodate any potential future changes to the trap limit as contemplated in the HCR. Any recommended future change to the trap limit would be based on ecological considerations and consultation with constituents and subject to adoption by the Commission.

CORRECTIONS AND CLARIFICATIONS ON THE DRAFT IS/ND

In addition to the changes to the Draft IS/ND made in response to comments as listed above, a number of minor corrections and clarifications were made to the Draft IS/ND to correct editorial errors in the document. These changes do not change the conclusions presented in the Draft IS/ND. Table 2 lists the page and paragraph numbers of these changes.

Table 2 Corrections and Clarifications on the Draft IS/ND

Page Number	Section	Correction/Clarification
1-1	Section 1.1, paragraph 1	Deleted "California Fish and Game Code"
2-2	Section 2.2, paragraph 1	Revised to clarify # of MPAs in the project area.
2-4	Section 2.4.1, paragraph 1	Deleted comma.
2-4	Section 2.4.2, paragraph 1	Deleted comma.
2-4	Exhibit 2-1	Corrected date cited in exhibit source.
2-4	Section 2.4.2, paragraph 3	Deleted "report cards".
2-8	Table 2-2	Added source information.
2-9	4th Bullet	Capitalized "District"
2-12	Section 2.5.2, 2nd Bullet	Correction to FGC cited.
2-12	Section 2.5.3, paragraph 3	Added comma.
2-17	Table 2-3	Added period.
2-18	Section 2.7, paragraph 2	Deleted "opinions".
3-4	3.1.2, Aesthetics, Question d)	Deleted "not".
3-7	3.2.2, Agricultural and Forestry Resources, Question f)	Deleted two commas.
3-13	3.3.2, Air Quality, Question a)	Deleted repetitive text.
3-17	3.4.2 Biological Resources, Question c)	Deleted two commas.
3-18	3.4.2 Biological Resources, Question d)	Deleted comma.
3-23	3.6.2 Geology and Soils, Questions a(ii) through (iv)	Fixed punctuation.
3-26	3.7.1 Greenhouse Gas Emissions, paragraph 2	Deleted comma.
3-29	3.8.2 Hazards and Hazardous Materials, Question c)	Fixed punctuation.
3-29	3.8.2 Hazards and Hazardous Materials, Question e)	Added comma.
3-29	3.8.2 Hazards and Hazardous Materials, Question f)	Deleted "above".
3-30	3.8.2 Hazards and Hazardous Materials, Question g)	Fixed incomplete sentence.
3-33	3.9.2 Hydrology and Water Quality, Question a)	Added missing word and deleted comma.
3-34	3.9.2 Hydrology and Water	Various editorial edits.

Table 2 Corrections and Clarifications on the Draft IS/ND

Page Number	Section	Correction/Clarification
	Quality, Question b) through d)	
3-35	3.9.2 Hydrology and Water Quality, Question f)	Deleted period and replace with comma.
3-35	3.9.2 Hydrology and Water Quality, Question i)	Added "and" and "that would expose people or vessels to a significant risk of loss, injury, or death involving flooding as a result of a levee or dam failure."
3-37	3.10.2 Land Use and Planning, Question b)	Deleted comma.
3-38	3.11.2 Mineral Resources, Question a)	Various editorial edits.
3-40	3.12.1 Noise, paragraph 1	Deleted semicolon.
3-40	3.12.2 Noise, Question a)	Deleted "and".
3-40	3.12.2 Noise, Questions c) and d)	Deleted comma and semicolon.
3-42	3.13.1 Population and Housing, paragraph 1	Deleted "in 2014 was".
3-47	3.15.2 Recreation, Question b)	Deleted comma.
3-49	3.16.2 Transportation and Traffic, Questions a) and b)	Added parentheses and deleted comma.
3-50	3.16.2 Transportation and Traffic, Question e)	Various editorial edits.
3-52	3.17.2 Utilities and Service Systems, Question b)	Added "question".
3-52	3.17.2 Utilities and Service Systems, Question e)	Added "question" and added comma.
4-1	4 References	Corrected date of Draft FMP to reflect the draft version evaluated by the Draft IS/ND.

REFERENCES

California Natural Resources Agency. 2012 (November 20). *California Natural Resources Agency Adoption of Final Tribal Consultation Policy.* Sacramento, CA.

CNRA. *See* California Natural Resources Agency.

National Marine Fisheries Service. 2015. *Summary Record of Large Whale Entanglements Reported on the U.S. West Coast in 2015*.

NMFS. *See* National Marine Fisheries Service.

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INTENT TO ADOPT A NEGATIVE DECLARATION

The California Fish and Game Commission (Commission) intends to adopt this Negative Declaration (ND) pursuant to the California Environmental Quality Act of 1970 (Section 15000 et. seq., Title 14, California Code of Regulations) for the Spiny Lobster Fishery Management Plan (FMP) and Proposed Regulatory Amendments for the California spiny lobster (*Panulirus interruptus*) fisheries.

The project would serve as the framework for managing the recreational (sport) and commercial fisheries for the California spiny lobster. The commercial fishery subject to the FMP is located in coastal and offshore waters in California and extends from Point Conception in Santa Barbara County, south to the U.S.-Mexico border. The recreational fishery subject to the FMP is also located within the coastal waters of California, ranging from central San Luis Obispo County south to the U.S.-Mexico border.

The 45-day period for public review and comment on the proposed ND began January 21, 2016 and concluded on March 7, 2016. Comments on the proposed Negative Declaration were received at:

California Department of Fish and Wildlife
3883 Ruffin Road
San Diego, CA 92123
Attn: Marina Som
Marina.Som@wildlife.ca.gov

A copy of the Initial Study and proposed ND and supporting documents has been available for review at the California Department of Fish and Wildlife (CDFW) offices at the following locations:

1416 9th Street, 12th Floor
Sacramento, CA 95814

4665 Lampson Avenue, Suite C
Los Alamitos, CA 90720

3883 Ruffin Road
San Diego, CA 92123

1933 Cliff Drive, Suite 9
Santa Barbara, CA 93109

The Initial Study and ND can also be viewed online at:
https://www.wildlife.ca.gov/Conservation/Marine/Lobster-FMP.

For further information regarding the proposed FMP, regulatory amendments, Initial Study, and ND, please contact Tom Mason, Senior Environmental Scientist, at (562) 342-7107 or Tom.Mason@wildlife.ca.gov.

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ACRONYMS AND ABBREVIATIONS

AB	Assembly Bill
AMS	Applied Marine Sciences
ARB	California Air Resources Board
BAAQMD	Bay Area Air Quality Management District
BOEM	Bureau of Ocean Energy Management
CAA	Clean Air Act
CAAA	Clean Air Act Amendments of 1990
CAAQS	California Air Quality Standards
CAPs	Clean Air Plans
CCAA	California Clean Air Act of 1988
CCR	California Code of Regulations
CDFW	California Department of Fish and Wildlife
CEQA	California Environmental Quality Act
CFR	Code of Federal Regulations
CO_2	carbon dioxide
Commission	California Fish and Game Commission
CPUE	catch per unit effort
DTSC	California Department of Toxic Substances Control
FGC	California Fish and Game Code
FMP	Fishery Management Plan
FMP or proposed plan	Spiny Lobster Fishery Management Plan
GHGs	greenhouse gases
GO ID	Get Outside identification number
IPCC	Intergovernmental Panel on Climate Change
IS/Proposed ND	Initial Study/Proposed Negative Declaration
LAC	Lobster Advisory Committee

MBUAPCD	Monterey Bay Unified Air Pollution Control District
MLMA	Marine Life Management Act
MLPA	Marine Life Protection Act
MMPA	Marine Mammal Protection Act
MMS	Minerals Management Service
MPA	Marine Protected Area
mt	metric tons
MT CO_2e	metric tons per carbon dioxide equivalent
MT/year	metric tons per year
NAAQS	National Ambient Air Quality Standards
NAAQS	National Ambient Air Quality Standards
NO_X	nitrous oxides
PM_{10}	respirable particulates
$PM_{2.5}$	fine particulates
ROG	reactive organic gases
RWQCB	Region Water Quality Control Board
SB	Senate Bill
SBCAPCD	Santa Barbara County Air Pollution Control District
SCAQMD	South Coast Air Quality Management District
SCB	Southern California Bight
SDAPCD	San Diego County Air Pollution Control District
SLOAPCD	San Luis Obispo County Air Pollution Control District
SPR	Spawning Potential Ratio
SWRCB	Sacramento Water Resources Control Board
TAC	Total Allowable Catch
USEPA	U.S. Environmental Protection Agency
VCAPCD	Ventura County Air Pollution Control District
WRCC	Western Regional Climate Center

1 INTRODUCTION

1.1 INTRODUCTION

This Initial Study/Proposed Negative Declaration (IS/Proposed ND) has been prepared for the California Fish and Game Commission (Commission) to evaluate potential environmental effects resulting from implementation of the Fishery Management Plan (FMP) and proposed regulatory amendments for the California spiny lobster (*Panulirus interruptus*) in waters off the coast of California. The FMP would serve as the framework for managing the recreational (sport) and commercial fisheries for California spiny lobster upon adoption by the California Fish and Game Commission (Commission) (California Fish and Game Code [FGC] Section 7078). The regulatory amendments would implement the FMP under statutorily prescribed frameworks (~~California Fish and Game Code~~ [FGC~~]~~ Sections 7072, 7075, and 7080-7088).

1.2 PROJECT LOCATION

Endemic to the North American west coast, the California spiny lobster range is from Monterey County, California, to the tip of Baja California, with a small isolated population in the northwestern corner of the Gulf of California (Exhibit 1-1). The project area is limited to the central portion of the California spiny lobster's range within the jurisdiction of the California Department of Fish and Wildlife (CDFW) (Exhibit 1-2). The commercial fishery subject to the FMP in California is located within ocean waters extending from Point Conception in Santa Barbara County, south to the U.S.-Mexico border. The California recreational fishery is also within coastal waters, from central San Luis Obispo County south to the U.S.-Mexico border. The CDFW Marine Districts that are within the FMP project area are shown in Exhibit 1-2.

1.3 PURPOSE OF THIS DOCUMENT

Under the California Environmental Quality Act (CEQA), the Commission is the lead agency with primary responsibility for approval of the proposed project. As the public trust agency with direct management responsibility over the fishery, CDFW has prepared the draft FMP and supported the regulatory amendment process, as well as assisted in the preparation of an analysis that complies with CEQA.

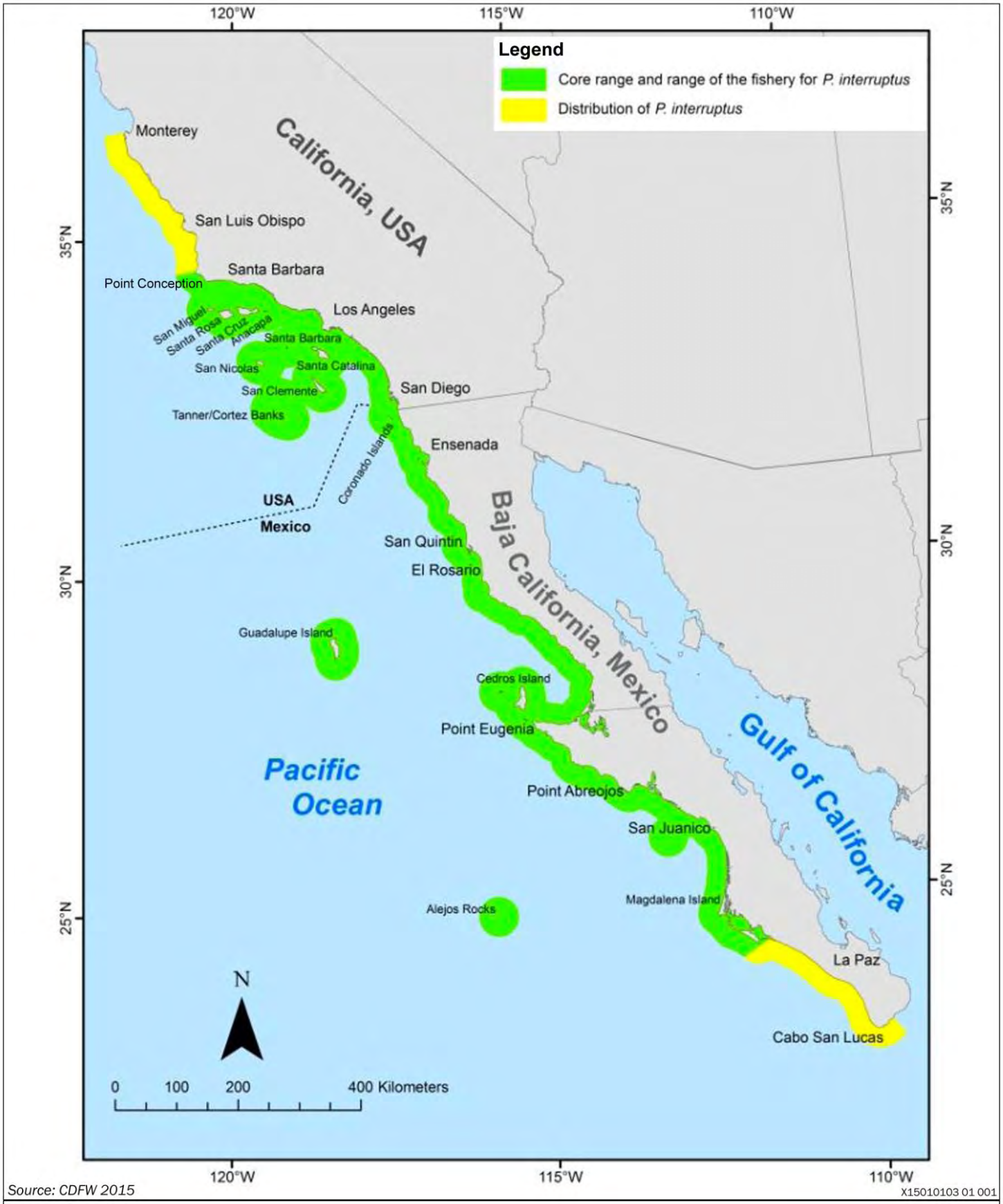
The purpose of this document is to present to decision-makers and the public an analysis of the potential environmental consequences of implementing the proposed FMP and regulatory amendments. This IS/Proposed ND discloses the conclusions of the environmental analysis; it is being made available to the public for review and comment for a 45-day public review period from January 21, 2016 to March 7, 2016.

If you wish to send written comments by postal mail or e-mail, the postal mail must be postmarked or email must be dated no later than March 7, 2016. Please address written comments to:

California Department of Fish and Wildlife
3883 Ruffin Road
San Diego, CA 92123
Attn: Marina Som

E-mail comments should be addressed to: Marina.Som@wildlife.ca.gov.

If you have questions regarding the IS/Proposed ND, please call Tom Mason at (562) 342-7107.



Source: CDFW 2015

X15010103 01 001

Exhibit 1-1 **California Spiny Lobster Range**

Exhibit 1-2 **Marine Districts within Project Area**

After comments are received from the public and reviewing agencies, the Commission must consider those comments in addition to the environmental conclusions of the IS/Proposed ND. Based on this evaluation, the Commission may, then either: (1) adopt the ND and approve the proposed FMP, or a modification of the proposed FMP, along with the attendant regulatory amendments; (2) undertake additional environmental studies before making a decision; or (3) decline to adopt the ND and approve the FMP and associated regulatory amendments. If the FMP and regulatory amendments are adopted, CDFW could proceed with implementation of the FMP.

A copy of the IS/Proposed ND is available for public review at the following CDFW offices:

1416 9th Street, 12th Floor
Sacramento, CA 95814

4665 Lampson Avenue, Suite C
Los Alamitos, CA 90720

3883 Ruffin Road
San Diego, CA 92123

1933 Cliff Drive, Suite 9
Santa Barbara, CA 93109

1.4 PROJECT APPROVALS

The FMP would become effective upon its adoption by the Commission through a public process (FGC Section 7077). The regulations would be approved through a separate Commission rulemaking process, in accordance with the Administrative Procedures Act (Government code section 11340 et seq.). Once the regulations are adopted, they are codified in Title 14 of the California Code of Regulations. Most of the proposed regulatory changes would be effective for the 2017-2018 commercial and recreational California spiny lobster season.

1.5 DOCUMENT ORGANIZATION

This IS/Proposed ND is organized as follows:

Chapter 1: Introduction. This chapter provides an introduction to proposed FMP and regulatory amendments. It describes the organization of this document, as well as issues not requiring detailed analysis.

Chapter 2: Project Description. This chapter describes the background of the proposed FMP and regulatory amendments, identifies their basic objectives, and provides a detailed description of the proposed plan.

Chapter 3: Environmental Checklist. This chapter presents an analysis of a range of environmental issues identified in the CEQA Environmental Checklist and determines if project actions would result in no impact, a less-than-significant impact, a less-than-significant impact with mitigation incorporated, or a potentially significant impact. If any impacts were determined to be potentially significant, an EIR would be required. For this project, however, none of the impacts were determined to be significant.

Chapter 4: References. This chapter lists the references used in preparation of this IS/Proposed ND.

Chapter 5: List of Preparers. This chapter identifies report preparers.

2 PROJECT DESCRIPTION

2.1 PROPOSED PROJECT ACTIONS

The California spiny lobster is an important natural resource that has been managed by the state of California for more than 100 years. The species supports a valuable commercial fishery and a significant recreational fishery. California spiny lobsters also act as important keystone predators within the southern California nearshore ecosystem. The proposed project actions are adoption of the *Spiny Lobster Fishery Management Plan* (FMP or proposed plan), which would include implementation of a harvest control rule, and adoption of regulatory recommendations from the Lobster Advisory Committee (LAC) and CDFW to promote a sustainable and orderly fishery (CDFW 2015a).

2.2 PROJECT BACKGROUND

The Marine Life Management Act (MLMA), which became California law on January 1, 1999, calls for using several tools to meet its statutory objectives.

The MLMA's overriding goal is to ensure the conservation, sustainable use, and restoration of California's marine living resources (FGC Section 7050[b]). This includes the conservation of healthy and diverse marine ecosystems and marine living resources (FGC Section 7050[b]1). To achieve this goal, the MLMA calls for allowing and encouraging only those activities and uses that are sustainable (FGC Section 7050[b]2). Within this overall policy on marine living resources, the MLMA sets the State's policy for marine fisheries (FGC Sections7055 and Section7056). Both commercial and recreational fisheries are to be managed to ensure the long-term economic, recreational, cultural, and social benefits of the fisheries and the marine habitats upon which they depend. With this in mind, the MLMA establishes a marine fishery conservation program to:

- ensure conservation;
- achieve sustainable use of fisheries;
- rebuild depressed stocks;
- prevent overfishing;
- promote habitat protection and, where feasible, restoration; and
- develop information for management decisions.

The MLMA states that FMPs "shall form the primary basis for managing California's sport and commercial marine fisheries" (FGC Section 7072). FMPs are documents that consolidate available information under the statutorily prescribed frameworks (FGC Sections 7072, 7075, and 7080-7088); their contents and any subsequent amendments form the basis for all fishery management decisions. The California Department of Fish and Wildlife (CDFW) is responsible for drafting the FMPs in collaboration with stakeholders and presenting them to the California Fish and Game Commission (Commission) for adoption.

FMPs are used to assemble information, analyses, and management alternatives that allow CDFW to provide a coherent package of information and management measures to the Commission. Under the MLMA, FMPs are required to include the following core elements:

- a description of the fishery;
- fishery science and essential fishery information;
- basic fishery conservation and management measures;
- habitat provisions;
- bycatch and discards;
- overfishing and rebuilding; and
- procedures for review and amendment of an FMP.

FMPs must consider and describe existing conservation and management measures that contribute to the goals of the MLMA. The California spiny lobster fisheries are currently managed with a variety of measures (e.g., size limits, fishing seasons, gear restrictions, and bag limits), and also are subject to Marine Protected Area (MPA) regulations (14 CCR Section 632). The Marine Life Protection Act (MLPA) required CDFW to develop a Marine Life Protection Program, including a Master Plan for a network of MPAs within state waters. Within the project area, there are 78 MPAs and their existence is a key consideration in the proposed Spiny Lobster FMP. Of these 78 MPAs, only seven allow any commercial or recreational fishing of California spiny lobsters. A complete list of MPAs located within the project area is shown in Table 1 of 2015 AMS memorandum (in Appendix A)~~In 2012, the state implemented a network of 50 MPAs along the mainland and around the Channel Islands within the Southern California Bight (SCB) under the MLPA. The SCB is defined as the coast and its immediate offshore areas between Point Conception to the north and the U.S.–Mexico border to the south. Sport and/or commercial lobster fishing are prohibited in 44 of the 50 MPAs. CDFW estimates that 14.6 percent of known mapped lobster habitats in the SCB are contained in the MPAs where the take of California spiny lobster is prohibited (CDFW 2015a)~~.

The management measures and strategies in the FMP are not designed to independently solve every ecosystem-related issue attributed to the California spiny lobster fisheries. Instead, the FMP adaptive management strategies, the MPAs, and existing management measures all have their respective strengths and weaknesses, and are meant to complement each other to further long-term adaptive management and sustainability of the California spiny lobster fisheries.

An extensive public scoping process was used by CDFW to develop the proposed Spiny Lobster FMP and implementing regulations. The Lobster Advisory Committee (LAC) was formed in early 2012 following a call for nominations by CDFW for representatives from various public stakeholder groups. The LAC provided guidance on FMP objectives, as well as management recommendations that addressed key issues put forth by members of the public. The LAC consisted of representatives from the marine science community, the recreational fishing sector, commercial fishing sector, the non-consumptive recreational sector, the environmental community, and the federal government. Nine LAC meetings occurred between June 2012 and September 2013. All meetings were open to the public and public input was encouraged. Meeting announcements were posted on CDFW's website and the public was encouraged to sign up for the Spiny Lobster FMP news email service. Meeting summaries and background documents are available on the CDFW website: https://www.wildlife.ca.gov/Conservation/Marine/Lobster-FMP.

2.3 GOALS AND OBJECTIVES OF THE FMP

The overarching goal of the FMP is to conduct a comprehensive review of the California spiny lobster fishery and define a management framework that establishes the basis for informed management decision-making to achieve a sustainable fishery considering the entire ecosystem. In developing the FMP, CDFW applied the goals and objectives of the MLMA to address the management needs of the fishery.

Fish and Game Code Section 7056 lists objectives for the fishery management system to foster fisheries that can reliably provide the range of benefits Californians seek from marine wildlife (i.e., sustainable fisheries). These features include limiting bycatch, rebuilding depressed fisheries, prioritizing long-term benefits over short-term benefits, making decisions with public input, basing decisions on best readily available scientific information, and adapting to changing circumstances. The goal of the FMP is to formalize a management strategy that can respond effectively to changes in the California spiny lobster fisheries pursuant to the tenets of the MLMA.

The objectives of the FMP are to:

- develop a framework for management that will be responsive to environmental and socioeconomic changes;

- manage the California spiny lobster resource for the long-term benefits of the present and future generations of Californians;
- conserve the health and diversity of marine ecosystems and marine living resources;
- ensure that the California spiny lobster fishery is conducted and managed in a sustainable manner, such that long-term health of the resource is not sacrificed in favor of short-term benefits;
- recognize the importance of the California spiny lobster resource to the economy and culture of California;
- base management decisions on best readily available scientific information;
- involve all interested parties; and
- promote the dissemination of accurate information through the management process.

2.4 EXISTING FISHERY

The existing fisheries include a commercial sector and recreational (or sport) sector. The open seasons for the California spiny lobster fisheries run from early October to mid-March, with the recreational sector starting four days earlier than the commercial fishery (FGC Section 8251; Title 14 California Code of Regulations [CCR] Section 29.90[a]). This results in a 23 to 24-week commercial fishing season and a 23.5 to 24.5-week recreational fishing season, depending on the year. The 2011 CDFW stock assessment (the latest available assessment) indicates that the California spiny lobster stock is stable under the management actions currently in place (Neilson 2011). The seasonal closure (late March-early October) protects the sensitive spawning period of the species. Both of the fishery sectors are described in more detail below.

2.4.1 Commercial Fishery

The commercial California spiny lobster fishery can be characterized by several distinct periods. Commercial landings peaked at an all-time high of 485 metric tons (mt) (1.07 million pounds) during the 1949-1950 fishing season, and declined to a record low of 69 mt (152,000 pounds) during the 1974-1975 fishing season. The reason for this decline was thought to have been the illegal take of sublegal-size adults, and was corrected by the introduction of a requirement for escape ports in lobster traps in 1976, which allowed sublegal-size individuals to exit the traps (Barsky 2001). After 1976, the harvest slowly increased until the 2000-2001 fishing season, when 319 mt (702,000 pounds) were landed. Since 2000, landings have fluctuated within a relatively narrow range, exceeding 300 mt (661,000 pounds) each season.

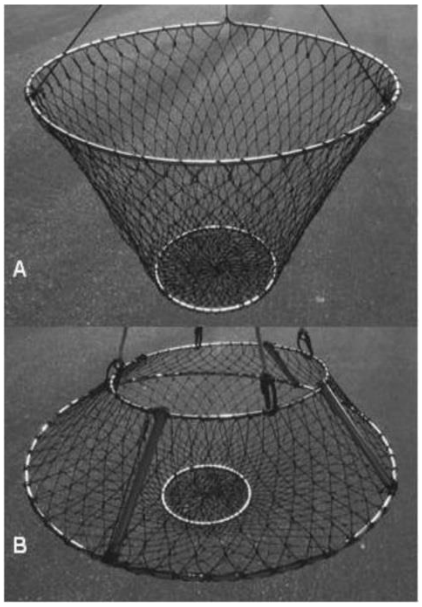
The commercial fishery is a limited-entry fishery, and the number of active participants has remained relatively consistent between 145 to 160 participants since 2000. However, over time, the number of permits would be reduced to 148 through attrition and the non-transferable limitation on certain permits.

To catch California spiny lobsters, commercial fishermen use wire box traps deployed from boats. Traps are the only legal method of take in the commercial fishery. Properly placed and serviced traps do not generally disturb the marine environment (Eno et al. 2001). Traps are usually deployed at a depth of less than 31 meters (100 feet), but some are deployed as deep as 93 meters (300 feet). Currently, commercial fishermen generally operate between 75 and 1,000 traps each season, with a median of 300 traps. California law requires fishermen to service (i.e., pull and clean) each deployed trap at least once every 96 hours, weather conditions permitting (FGC Section 9004).

Commercial landings tend to be distributed evenly between San Diego County, Los Angeles/Orange Counties, and Santa Barbara/Ventura Counties; however, fishing effort is not equally distributed. In general, 80 percent of a season's catch is landed within the first half of the commercial season by mid-January. Commercial fishing effort (i.e., number of trap pulls) has been increasing in recent years despite an overall decrease in the number of active fishermen since the late 1990s. High effort in the commercial fishery may present challenges to sustainability~~,~~ because it results in a high harvest rate.

2.4.2 Recreational Fishery

Recreational lobster fishermen are permitted to catch California spiny lobster either by using baited hoop nets or by hand when diving (SCUBA or skin diving). CDFW allows two types of hoop nets: traditional hoop nets and rigid conical hoop nets (14 CCR Section 29.80) (Exhibit 2-1). The traditional hoop nets (Exhibit 2-1[A]) lie flat on the seafloor and only take their three-dimensional shape when pulled to the surface. Conical hoop nets (Exhibit 2-1[B]) have rigid sides and do not lie flat on the seafloor, and the lobster must climb up and into the net to reach the bait. Most California spiny lobsters captured by the recreational fishery are caught in areas where commercial fishing is prohibited (CDFW 2015a). In the recreational fishery, hoop nets are limited to five per person or ten per boat, and two per person~~,~~ if fishing from a public pier.



Source: CDFW 2015a4

Exhibit 2-1 **Traditional (A) and Conical Hoop Nets (B)**

CDFW has not been able to accurately quantify the sport recreational fishery catch until recent years, when the recreational lobster report card was first put into use in the fall of 2008 season. However, because of low return rates, the report cards have not produced reliable results until the most recent season. Statistical comparison between hoop netters and divers has been particularly problematic. For example, in 2009, only 50.9 percent of all report cards returned were from hoop netters, even though both the CDFW lobster creel survey and the recreational industry representatives indicated that a large majority of the recreational sector fishermen used hoop nets at that time. Lobster report card data from the 2014-2015 fishing season lobster ~~report cards~~ season produced recreational catch estimates of 155.4 mt (342,583 pounds), or about 26 percent of the total catch (i.e., recreational plus commercial catches).

2.4.3 Bycatch

The term, "bycatch," means fish or other marine living resources that are taken in a fishery, but are not the target of the fishery. This includes non-target organisms, whether or not they are discarded, and organisms discarded, because they are of an undesirable species, size, sex, or quality, or because they are required by law not to be retained. The FMP describes that bycatch, regardless of species, is often returned relatively unharmed and alive to the ocean once discovered (CDFW 2015a). Commercial and recreational fishermen are not allowed to retain sublegal-size lobsters under current California law (FGC Section 8252; Title 14 CCR Section 29.90). However, commercial lobster fishermen may retain legal-size rock crab, octopi, and Kellet's whelk until the whelk's annual total allowable catch (TAC) is reached (Title 14 CCR Section 127; FGC Section 8250.5(b)). Recreational lobster hoop netters may also retain incidentally caught, legal-sized species of crabs (Title 14 CCR Section 29.80 (b)).

Seabird and otter bycatch are not common within the California spiny lobster fisheries. However, if bycatch of these species occurs, compliance with the Marine Mammal Protection Act (MMPA), the federal and California Endangered Species Acts, and the Migratory Bird Treaty Act would be required and further monitoring may be necessary (16 USC Sections 1361 *et seq.*; 16 USC Sections 1531 *et seq*.; 16 USC Sections 703 *et seq*.). Any additional measures pursuant to those regulations would be implemented under existing practices.

Research conducted on sea otter entrapment and mortality in fish and shellfish traps suggests that the California spiny lobster fishery would not contribute to otter mortality, if the current geographic extent of the fishery and the current otter range both remain unchanged (USGS 2014). Of the 15 reported instances of trap-related sea otter mortalities during 1974-2007, 14 occurred in either Pacific cod or crab traps (Hatfield et al. 2011). One incidence of a sea otter mortality associated with a lobster trap was recorded in 1987 (Carretta et al. 2014). The majority of California's southern sea otter mortalities on record were the result of shark attacks, boat strikes, mating trauma, diseases, parasites, infections, and biotoxins (CDFW-MWVCRC 2013).

Marine mammal mortality as a result of entanglement in lobster fishing gear is rare in the California spiny lobster fishery. Lobster traps are generally deployed in less than 100 feet of water, a depth range where large marine mammals, such as whales, are not generally found. However, the number of whales observed entangled in trap gear on the California coast increased in recent years (based on the National Marine Fisheries Service stranding database). Since 2000, there have been four recorded incidences of gray whales and one unidentified whale entangled in lobster gear (Carretta et al. 2014; National Marine Fisheries Service stranding database) and one recorded incidence of bottlenose dolphin entanglement in 2008 (Carretta et al. 2014). Mortality as a result of entanglement was confirmed for the unidentified whale.

The National Marine Fisheries Service classifies fisheries based on their level of interaction with marine mammals, and guides when incidental take permits under MMPA are required. Under MMPA, a fishery would require an incidental take permit if it is classified as "Category I" or "Category II" (50 CFR Section 229.2). The California spiny lobster fishery was classified as "Category III" in 2014 (79 FR 77934). Such fisheries "have a remote likelihood of, or no known incidental mortality and serious injury of marine mammals" (50 CFR Section 229.2). The fishery should continue to remain in Category III as long as its annual take of any marine mammals continues to remain less than 1 percent of a given stock's potential biological removal level or, in combination with other mortality sources, is responsible for less than 10 percent of the stock's potential biological removal level (50 CFR Section 229.2).

2.5 CHARACTERISTICS OF THE FMP AND REGULATIONS

2.5.1 Harvest Control Rule

The proposed FMP prescribes a harvest control rule (HCR) for the California spiny lobster fishery. The HCR serves as the foundation for managing the fishery in the future, as well as the primary mechanism to prevent, detect, and recover from overfishing, as required by the MLMA. The rule is a type of adaptive management framework that identifies potential conservation problems and prescribes appropriate management responses. The HCR consists of three components: 1) reference points, 2) a control rule matrix, and 3) a control rule toolbox. These components are discussed below.

REFERENCE POINTS

Reference points are the metrics used to gauge the status of the California spiny lobster stock and commercial fishery. The three California spiny lobster fishery management reference points are: 1) a moving average of catch, 2) a moving average of catch per unit effort (CPUE), and 3) Spawning Potential Ratio (SPR), as shown in Table 2-1 and described in more detail below.

Table 2-1 Reference Points

Reference Point	Threshold	Rationale
Catch	$\frac{\textit{Average Catch for 3 most recent seasons}}{\textit{Average Catch for 10 most recent seasons}} \leq 0.9$	Identifies possible change in stock stability, particularly growth overfishing[1]
CPUE (Catch per Unit Effort)	$\frac{\textit{CPUE for 3 most recent seasons}}{\textit{CPUE for 10 most recent seasons}} \leq 0.9$	Identifies potential adverse changes in the fishery, mainly economic overfishing[2]
SPR (Spawning Potential Ratio)	$SPR_{CURRENT} \leq$ SPR (Average 2000-2008)	Detects biological sustainability, particularly recruitment overfishing[3]

[1] Growth overfishing: Fishing in which yield per recruit is lower than theoretical maximum values due to the harvesting of small and rapidly growing fish (Diekert 2012).

[2] Economic overfishing: Level of fishing effort that exceeds maximum economic yield (Flaaten 2010).

[3] Recruitment overfishing: Level of fishing that creates significant adverse impact to the species diversity, trophic composition, and productivity of an ecosystem (Murawski 2000).

Catch (Total Catch per Season)

Catch trends over time can serve as a proxy for abundance. A significant change in catch is susceptible to multiple interpretations. However, the fact that a significant change in catch appears is a clear indicator that an impact is occurring.

It is important to note that this reference point is primarily designed to detect trends. Catch can fluctuate drastically from year to year due to socioeconomic, environmental, and biological factors. These fluctuations often do not reflect problems that warrant management responses. The multi-year running averages incorporated into the catch threshold serve to identify when a trend is significant enough to warrant management considerations. The average catch of the three most recent seasons is used in the numerator to smooth variability in recent catch values, and is divided by the average catch of the 10 most recent seasons to account for approximately decadal shifts in temperature regime. The catch-based reference point threshold is 0.9 (see Table 2-1).

CDFW originally obtained a catch reference point threshold of 0.8 through consultation with several lobster fishery experts during the LAC process (Dr. Douglas Neilson, Dr. Ray Hilborn, Dr. Matthew Kay, Dr. Hunter Lenihan, Dr. Richard Parrish, and Dr. Jeremy Prince). A catch reference point value above 0.8 indicates that recent catch has been within 20 percent of the average for the last decade. Hilborn (2010) suggests that

yields within 20 percent of a calculated maximum sustainable yield should be sustainable. The threshold was changed to 0.9 following independent scientific peer review of the FMP (CDFW 2015a, Appendix VIII). The threshold value was modified from 0.8 to 0.9 resulting in a more sensitive threshold.

Catch per Unit Effort (CPUE)

CPUE is used by fishery managers in two important ways. First, it serves as a proxy for the abundance of fish in an area. This proxy assumes that there is a relationship, though not necessarily a linear one, between the condition of a stock and the rate at which they are captured under any given unit of effort (e.g., time spent fishing, amount of gear deployed). As with total catch, long-term trends in CPUE can provide insight into changes in the stock, which would influence management decisions.

In addition, CPUE is also very useful for tracking the optimal effort level and detecting economic overfishing. The threshold for the CPUE-based reference point was also originally any value for CPUE current that is equal to or less than 0.8 (see Table 2-1). The threshold for the CPUE-based reference point was also increased to 0.9 in response to independent scientific peer review recommendations to make the threshold more sensitive (see Table 2-1).

Spawning Potential Ratio (SPR)

In addition to yield, harvest rate also affects the ability of a stock to replace itself. Because fishing tends to reduce the number and the size of individuals, it has the potential to diminish the reproductive output of a population. The reproductive output (number of eggs) of a population is often referred to as the spawning potential.

The SPR is usually a ratio of the number of eggs produced by a fished population divided by the number of eggs produced by an unfished population. SPR values range from 1.0 to 0.0. For example, SPR values of 1.0, 0.5, and 0.0 correspond to harvest rates at which a population can produce all, half, or none of the number of eggs produced when the stock is unfished, respectively. At low harvest rates, SPR values are high because many large animals remain in the population.

At higher harvest rates, SPR declines and may ultimately reach zero if no size limit is in place to protect at least some portion of the breeding stock. It is important to note that SPR assumes that an unfished population would produce a relatively constant amount of eggs or maintain a relatively constant spawning stock biomass (Rochet 2000).

SPR can be calculated in several ways. The method currently employed by CDFW uses data from commercial logbooks and commercial landing receipts to calculate the average weight of lobsters caught in a given fishing season CDFW then relates the average weight to a corresponding fishing mortality (F) and calculates an SPR value using the resulting F. This calculation is currently accomplished using the Cable-CDFW Model (CDFW 2015a). The Cable-CDFW Model calculates the SPR as an output based on 46 user-specified inputs, each responsible for the calculation of various biological, economical, and operational characteristics of the fishery.

CONTROL RULE MATRIX

The three reference points selected to monitor and manage the California spiny lobster fishery (Catch, CPUE, and SPR) are incorporated into an HCR Matrix. This matrix provides a “dashboard” approach to assist managers in interpreting the status of Catch, CPUE, and SPR reference points in relation to their respective thresholds (Table 2-2). Based on these interpretations, the matrix provides interpretations for stock health and particular courses of action to address the current condition of the fishery. Depending on the respective trend and status of each measurement (i.e., have any of the reference points thresholds been exceeded?), the matrix identifies various management strategies ranging from easing harvest regulations, to no regulatory action, to further restricting the fishery.

Table 2-2 Harvest Control Rule (HCR) Matrix

Scenario	Reference Point[1]			Interpretation/possible causes	Suggested management response sequence
	CATCH	*CPUE*	*SPR*		
1	↑	↑	↑	Stock productivity and fishery performance stable and/or increasing	a) Monitor reference point trends b) Make no change (if reference points are stable or just above thresholds) c) Ease effort regulations (if reference point trends are increasing)
2	↓	↑	↑	Fishery under-harvested (i.e., fishing effort and harvest rates are low, could be caused by drop in price or other economic factors)	a) Monitor reference point trends b) Make no change (if CPUE/SPR trends stable/just above threshold) c) Ease effort regulations (if explanations for decreasing catch are not biological and CPUE/SPR trends increasing)
3	↑	↓	↑	Catchability down Potential economic overfishing Potential early warning of recruitment overfishing	a) Monitor reference point trends b) No change (if SPR trends are stable/above threshold) c) Effort reduction (if SPR trends declining) d) No change, or ease catch restriction (if catchability is proven to be lower than usual and is causing CPUE decline)
4	↓	↓	↑	Catchability down Potential economic overfishing Potential early warning of recruitment overfishing	a) Monitor reference point trends b) Investigate underlying causes c) Confirm SPR trends and model inputs d) If action is needed, implement one or more of the eight regulatory options in the control rule toolbox as appropriate e) Effort reduction (if SPR trends declining)
5	↑	↑	↓	Stock overfished Recruitment largely provided from Mexican stock	a) Investigate underlying causes b) Confirm SPR trends and model inputs c) If action is needed, implement one or more of the eight regulatory options in the control rule toolbox as appropriate
6	↓	↑	↓	Stock overfished, and Possible catchability increase (effort creep due to technology, etc.)	a) Investigate underlying causes b) Confirm/monitor CPUE (misreporting?) c) Confirm SPR trends and model inputs d) If action is needed, implement one or more of the eight regulatory options in the control rule toolbox as appropriate
7	↑	↓	↓	Stock overfished Overfishing indicated	a) Investigate underlying causes b) Confirm SPR trends and model inputs c) If action is needed, implement one or more of the eight regulatory options in the control rule toolbox as appropriate
8	↓	↓	↓	Stock overfished Overfishing indicated Disease	a) Investigate underlying causes b) Confirm SPR trends and model inputs c) If action is needed, implement one or more of the eight regulatory options in the control rule toolbox as appropriate

[1] Interpretation of different scenarios in which reference points thresholds are exceeded, and recommended management responses. Symbols for each reference point are: ↑ ("safe", does not exceed threshold), and ↓ (exceeds threshold). Note that once $CATCH_{THRESHOLD}$ or $CPUE_{THRESHOLD}$ are exceeded, monitoring CPUE and Catch trends provides valuable information that managers can use to "fine tune" the fishery or to detect overfishing early (i.e., before the stock becomes overfished).

Source: CDFW 2015a.

The HCR is discretionary and not every triggering event would necessarily lead to an immediate regulatory response. Additional evaluation is needed before taking action to determine if external factors (i.e., new regulations, market dynamics, or environmental changes) have caused or contributed to the reference point(s) being exceeded. This process would include consultations with the fishing communities and other stakeholders. For example, if the triggering of the catch-based reference point coincides with a new effort-based regulation, the first task would be to determine if the triggering event is caused by the new regulation. If it is determined that the triggering event is caused by the new regulation and not biological processes, no further management action would be necessary. In the event that management actions are warranted, the HCR calls for the implementation of one or more of the eight regulatory options provided in the control rule toolbox (discussed below).

CONTROL RULE TOOLBOX

The FMP prescribes a control rule toolbox of eight regulatory conservation and management measures that are available to the Fish and Game Commission when reference point thresholds are triggered. The specific actions in the toolbox are:

- change commercial trap limit,
- change recreational bag limit,
- establish total allowable catch,
- implement ~~d~~District closures,
- change season length,
- change minimum legal size,
- establish maximum legal size, and
- implement sex-selective fishery (i.e., male-only fishery or female-specific size restriction).

Each of the eight regulatory options in the control rule toolbox carries specific benefits and limitations that managers would need to carefully evaluate, including impacts to constituents, level of regulatory change, and duration of regulatory change (i.e., how long it would remain in place). CDFW would consult with the fishing communities and other stakeholders to better inform any management recommendation to the Commission on the proper regulatory response. Each of the regulatory options is discussed in more detail below.

Change Commercial Trap Limit

The commercial California spiny lobster fishery is not currently regulated by a trap limit. However, a recent rise in fishing effort has led to possible economic inefficiency within the fishing sector (CDFW 2015a). Furthermore, an excess of lost traps may create further environmental and social concerns. CDFW has worked closely with its constituents to resolve these issues, and as part of the implementing regulations for this FMP, CDFW proposes a formal trap limit program that allows the Commission to adjust commercial sector fishing effort.

A limit of 300 traps per permit is proposed, based on the 2013 “California Department of Fish and Wildlife Commercial Lobster Survey” conducted by CDFW, which targeted all holders of transferrable and nontransferrable lobster operator permits. Of the 111 permit holders who responded, more than 76 percent agreed that a trap limit is needed. Of the respondents who supported the trap limit, 48 percent wanted a trap limit of 300 or less and 34 percent wanted a trap limit of 350-400. Based on the responses to the surveys, CDFW proposes that each licensed fisherman would be allowed to possess a maximum of two lobster operator permits, and each permit would allow fishermen to receive 300 trap tags issued by CDFW. Traps would be required to be tagged with CDFW issued trap tags. Although a trap limit of 300 is currently being proposed, a trap limit range of 200 to 500 traps is being evaluated in this ND to accommodate any potential future changes to the trap limit as contemplated in the HCR. Any recommended future change to the trap limit would be based on ecological considerations and consultation with constituents and subject to adoption by the Commission.

Change Recreational Bag Limit

An adjustment to the recreational bag limit would serve to control effort in the recreational sector. Adjustment options may consist of daily, weekly, monthly, or annual limits. A bag limit would change the number of lobsters a recreational fisherman can keep. MLMA requires any type of allocation within an FMP to be equitably shared between the recreational and commercial sectors (FGC Section 7072(c)). Any proposed change to the recreational bag limit is allocative by nature, and should be considered in conjunction with possible adjustments for the commercial sector.

Total Allowable Catch

A Total Allowable Catch (TAC) or a TAC/Individual Transferrable Quota management framework can prevent a stock from being overfished. However, management challenges in quota fisheries include, but are not limited to, allocation of catch among fishermen, consolidation of capacity when quota is transferable, accounting for natural fluctuations in stock size that may render the TAC too restrictive or aggressive from year to year, and access to the fishery if/when quota shares increase in price.

Approaches for determining a TAC for California include, but are not limited to: (a) accurately estimate the biomass of the stock, and then determine what fraction of the stock the fishery is allowed to harvest; (b) determine a conservative catch level (i.e., one that is historically low/modest) that is clearly sustainable and set that as the TAC; or (c) identify a target CPUE and adjust the TAC through time until CPUE falls to within some range of the target value. Equitable distribution of the TAC between the commercial and recreational sectors would be necessary (FGC Section 7072(c)). If a quota system is adopted, allocation between and within sectors (commercial and recreational) would need to be considered.

District Closures

The FMP identifies closure of Fishing Districts (shown in Exhibit 1-2) as a possible management response. Areas closed to fishing tend to experience very low fishing mortality (although some fishing mortality can occur related to spillover and poaching). Population increase inside closed areas can increase the spawning output of the entire stock. However, closing areas off to fishing can also displace fishing effort to other areas, placing more pressure on the unprotected portion of the stock. Existing CDFW records show that most of the recreational take in the state occurs in locations where commercial fishing is prohibited.

A number of Fishing Districts are presently closed to commercial harvest (Exhibit 1-2). Prominent examples include the north side of Catalina Island and Santa Monica Bay. If the status of the SPR-reference points threshold is exceeded and following investigations indicate that action is necessary, these areas could be additionally closed to recreational harvest. Doing so would enhance the spawning output of populations in these areas.

Change in Season Length

Seasonal closures reduce fishing mortality by reducing the number of days that fishing is allowed each year. Closed seasons can protect stocks during important life events, such as spawning. A longer closed season could also improve survival of individuals that would have succumbed to fishing, which in turn increases SPR. The current closed season in California protects reproduction, and any extension of current seasonal closures is unlikely to provide substantial protection for reproductive behaviors or activities. However, if the SPR-based threshold reference point is exceeded, fishing season length could be shortened, either by delaying the opening date or by closing the season early. Most catch occurs during the first part of each season; therefore, reducing the duration of the season would have a disproportionately small effect on overall fishing mortality.

Change Minimum Legal Size

Increasing the minimum legal size would ensure that lobsters would, on average, reproduce more times before they are caught. Furthermore, females would be slightly larger and produce more eggs. Increasing the minimum legal size is an effective way to increase SPR. If the SPR-based threshold reference point is exceeded, the minimum legal size could be increased to a size that ensures a target SPR within a specified

time frame. A reduction in minimum legal size would have the opposite effect, if future conditions suggest that SPR could be reduced.

Establish Maximum Legal Size

If the SPR-based threshold reference point is exceeded, a maximum legal size could be implemented to protect larger spawning females. As the communities inside MPAs mature, they would likely comprise more of these adults with higher fecundity, and a maximum legal size would be expected to protect these important spawning females as they move outside of the boundaries of the MPAs.

Sex-Selective Fishery

A sex-selective restriction allowing the harvesting of male lobsters (and consequently not allowing the harvesting of female lobsters) could be implemented for the California spiny lobster fishery. If the SPR-based threshold reference point is exceeded, changing sex regulation for females could be an efficient means to increase SPR. Prohibiting the take of berried females (i.e., female lobsters carrying fertilized eggs) is another sex-selective provision that could be considered.

2.5.2 Inoperative Statutes

The Fish and Game Code dictates that each FMP and plan amendment shall include a list of any statutes and regulations that shall become inoperative, as to the particular fishery covered by the FMP, upon the Commission's adoption of implementing regulations for that FMP (FGC Section 7088). As such, to implement the control rule toolbox as proposed in the FMP, the following Fish and Game Code sections would be moved to Title 14 CCR and rendered inoperative once they are adopted by the Commission:

1. FGC Section 8251: This section dictates the season length for the commercial California spiny lobster fishery. The HCR prescribed by this FMP incorporates changes to season lengths as a possible management adjustment.

2. FGC Section 8252: This section prescribes the size limit for the commercial sector, which is identical to the recreational sector size limit found in the CCR. The commercial size limit will be moved into Title 14, CCR reflecting the Commission's authority to make adjustment.

3. FGC Section 8254(c): This section states an annual lobster permit fee of $265. The permit fee will change due to implementation of the trap tag program.

4. FGC Section 8258: This section lists the Districts where commercial lobster traps may be used to take CA lobster. The use of commercial traps to take California spiny lobster in certain Districts may change if the District closure option within the harvest control rule toolbox is used.

This FMP would render the following sections of the Fish and Game code inoperative as applied to only the California spiny lobster fisheries once the implementing regulations are in place:

1. FGC Section 7857(e): This section prohibits CDFW from issuing more than one of a single type of permit, including a lobster permit, to a single fisherman. The trap limit program envisioned by the FMP may allow fishermen to stack multiple permits, and thus this section will be rendered inactive for lobster operator permits.

2. FGC Section 7857(j): This section prohibits the transfer of a commercial fishing license, permit, or other entitlement. This section will be made inoperative to be consistent with the objectives of this FMP related to permit transferability and the acquisition of a second permit as part of the proposed trap limit program.

3. FGC Section 8102: This section states the conditions for issuing limited entry permits to a working partner of a permit holder in cases where the permit holder dies, is incapacitated or retires. This section will be made inoperative as it applies to the California spiny lobster fishery to be consistent with the commercial California spiny lobster limited entry fishery permit program and trap limit program as described in the FMP.

4. FGC Section 8103~~4~~: This section states the conditions for transferring limited entry permits upon the death of the permit holder. This section will be made inoperative as it applies to the California spiny lobster fishery to be consistent with the commercial California spiny lobster limited entry fishery permit program and trap limit program as described in the FMP.

5. FGC Section 9004: This section requires commercial fishermen to service any deployed trap every 96 hours. However, proposed regulations will extend this servicing requirement to every 168 hours. As such, this section will be rendered inoperative as applied to the California spiny lobster fishery.

2.5.3 Lobster Advisory Committee Regulatory Recommendations

During the LAC process, described above in Section 2.2, constituent representatives were able to reach consensus on a number of items pertaining to the California spiny lobster fisheries. The LAC has also reached consensus on five objectives to guide future allocation considerations for the lobster fishery:

- Identify current effort levels for each sector and establish controls to prevent unrestricted growth.
- Identify the proportion of overall catch and/or effort from each sector, and if necessary, take corrective action to maintain those proportions if the percent of total catch and/or effort by sector deviates significantly from a pre-determined base period.
- Recognize the current differences between sectors in traditional fishing grounds and time-of-day fished, and seek to maintain those differences.
- If increases or decreases in effort to catch in the fishery are required due to application of the control rule, those changes should seek to maintain equitability and not give an advantage to either sector unless biological triggers require a change to allocation.
- End illegal commercialization of sport-caught lobsters.

In addition to providing input on the development of the FMP, the LAC also formed consensus on several commercial and recreational regulatory amendments that serve to create a more orderly and safe fishery, improve management, clarify regulations, improve enforceability of regulations, and benefit marine resources. The LAC proposals were compiled into a finalized consensus recommendation on September 11, 2013. Representatives from CDFW met separately with the LAC recreational and commercial representatives to clarify and define the details for describing regulation changes that would be enforceable and effective. The LAC proposals along with CDFW's recommendations were submitted to the Commission for its consideration at its April 2015 meeting. At the Commission's June 2015, meeting the Commission directed CDFW to prepare a regulatory package that includes both the LAC and CDFW recommendations described below.

COMMERCIAL TRAP LIMIT

A trap limit of 300 attached to each valid lobster operator permit is being proposed. This trap limit is proposed, in part, to cap and potentially reduce the current effort level. However, the proposal also aims to eventually cap the maximum long-term effort capacity of the commercial fishing fleet at 44,400 traps (148 transferable permits x 300 traps each). Furthermore, licensed commercial fishermen would have the option

to purchase a second transferable permit (as they become available) for a maximum of two permits. This proposed mechanism would give fishermen the flexibility to fish up to 600 traps. The commercial trap limit includes a catastrophic trap tag loss provision through the submission of an affidavit to CDFW describing the circumstances of the loss to allow for the replacement of tags lost during a season. Catastrophic loss as defined by the LAC is the loss of 75 or more tags per lobster operator permit. CDFW would be required to add new fees and forms associated with the trap tag system for administrative requirements.

Even with the ability to hold two permits, some existing fishermen, especially those currently fishing between 600-1,000 traps, may need to extensively modify their fishing practices. However, the interest of these fishermen must be balanced with the risk of ecological impacts related to lost gear, if trap intensity continues to escalate; the externalized economic inefficiency impacting the rest of the commercial fleet; and the desire of other fishermen in favor of fewer traps in the water.

CLARIFY THE POSSESSION AND USE OF SCUBA GEAR FROM COMMERCIAL LOBSTER VESSELS

Existing regulations do not explicitly prohibit SCUBA equipment on commercial lobster vessels, but do prohibit commercial fishermen from using SCUBA equipment “to assist in the take of lobsters” (14 CCR 122[g]). SCUBA gear can be an important tool for recovery of lost traps that might otherwise “ghost fish” or entangle other marine life. It can also be used for disentanglement in instances when trap lines are caught on a vessel’s propeller or on other gear. This proposal would clarify that commercial fishermen may use SCUBA for the purpose of securing traps for retrieval purposes only, retrieving lost gear, or to unfoul a line from a vessel; it would remain illegal to use SCUBA gear for the take of lobster.

JOINT LIABILITY FOR PERMITTEES OPERATING FROM THE SAME VESSEL

Neither the FGC nor the CCR prohibits two or more holders of lobster operator permits from operating from the same vessel on a trip. However, how liabilities are shared between these fishermen in the event of a violation is currently unclear. As such, the LAC proposes that each permittee whose traps are being pulled must be aboard the vessel and all permittees would be jointly responsible in the event of a FGC or CCR violation.

EXTEND THE COMMERCIAL TRAP SERVICE INTERVAL

Federal regulations require fixed gear (includes traps) in federal waters to be serviced at least every 7 days (50 Code of Federal Regulations Section 660.230(b)(3)). The desire to conform to federal regulation and to provide lobster fishermen with more flexibility in servicing their gear led to the proposal for a longer soak time for lobster traps, extending it from 4 to 7 days. This extended service requirement would only apply to lobster traps.

FORMALIZE THE USE OF NOTES IN THE COMMERCIAL FISHERY

Lobster fishermen are allowed to authorize another lobster operator permit holder to pull his or her traps by assigning that permit holder a note. This system was designed to allow one permit holder to pull the traps of another in the event of an emergency, such as sudden illness or vessel breakdown. Formalizing the note system would give CDFW more oversight through the submission of a waiver for CDFW approval to minimize potential abuse. To allow for the retrieval of lost gear, the proposed regulation includes a provision to allow lobster operator permit holders to recover up to six lost traps belonging to another permit holder without a waiver.

ADDITIONAL GRACE PERIOD FOR DEPLOYING AND RETRIEVING COMMERCIAL TRAPS

It is also proposed to extend the grace period for trap deployment before the commercial season opens and the grace period for trap retrieval after the commercial season closes. Commercial fishermen are currently

allowed to deploy traps in the water 6 days before the season opens. They are also given 6 days to remove their traps from the water after the season closes. However, all traps left in the water during the grace periods must be unbaited with doors wired open. Fishermen may not bait the traps until 24 hours prior to the season opening and traps must still be emptied of baits and wired open when season closes.

To decrease the chance of accidents and navigational hazards, the grace period for deploying and retrieving traps would be extended to 9 days. Fishermen are still prohibited from baiting the traps until 24 hours before the season opens, and traps must still be emptied and wired open when the season closes.

DEFINE ABANDONED TRAPS

To define when a trap is considered abandoned, traps would be deemed abandoned if they are not retrieved 14 days after the season ends. In addition, new proposed regulations would allow for retrieval of this lost gear by lobster operator permit holders and CDFW designees from 15 days after the season to September 15.

TAIL CLIPPING/HOLE-PUNCHING OF RETAINED RECREATIONAL LOBSTER

Tail-clipping/hole-punching is practiced in other recreational lobster fisheries. For example, Australia requires the marking of retained recreationally-caught lobsters, where enforcement officers can use clipping or hole-punching to distinguish recreationally-caught lobsters from commercially-caught lobsters. The same can be accomplished in California. This tool is relatively simple to implement and enforce, and can help prevent recreationally caught lobsters from entering the black market. This potential regulatory change would require the hole-punching or the tail-clipping of the central tail fin of all retained lobsters, and prohibit the release of hole-punched or tail-clipped lobsters in the recreational sector. The proposed regulations would also prohibit commercial possession, sale, or offer for sale hole-punched or tail-clipped lobsters, although commercial fishermen would be allowed to keep them for personal use. This proposed change is an optional regulatory amendment.

CHANGING THE OPENING TIME FOR RECREATIONAL SEASON

The midnight opening time for the recreational season has led to confusion within the recreational fishing community. Because of fatalities occurring on opening nights, there were concerns with safety. Furthermore, a midnight opening is more difficult for CDFW to enforce than a day time opening. Because of the safety and enforcement issues associated with a midnight opener, the recreational season opener would be moved to an alternate time. This proposed regulatory change would move the recreational season opener from 12:01 a.m. to 6:00 a.m. on the Saturday preceding the first Wednesday in October. Overall, this reduces the season length by 6 hours.

MARKING RECREATIONAL HOOP NET FLOATS

A rule requiring the marking of all hoop net floats with the operator's unique Get Outside identification number (GO ID) found on their recreational fishing licenses (e.g., individual license numbers, GO ID numbers) is also proposed. This would allow enforcement officers to better identify hoop net operators and lost/abandoned gear. This regulatory change would require hoop netters to mark hoop net floats with their GO ID numbers, and would not result in a change in fishing behavior.

CLARIFYING REGULATORY LANGUAGE ON POSSESSION OF SPEAR GEAR WHILE DIVING FOR LOBSTERS

Current regulation prohibits the possession of "hooked devices" when diving for lobsters. This has led to different interpretations of the language, as well as citations for spear fishermen who were in possession of spear guns while attempting to take lobsters by hand. Clarifications to focus the regulatory language on how lobsters may only be taken by hand when diving is proposed. Merely carrying spearfishing gear while taking

lobsters should be legal, while the use of such gear or any hooked devices to aid in lobster fishing should remain illegal. The proposed regulations would make these clarifying amendments.

CLARIFY REGULATORY LANGUAGE FOR MEASURING OF RECREATIONALLY CAUGHT LOBSTERS

Current recreational regulation states that lobsters shall be measured at the water line and prohibits under-sized lobsters from being brought aboard boats. The proposed change would allow for bringing under-sized lobster aboard a vessel for measurement purposes. All lobsters would be measured immediately and any undersize lobster must be released immediately into the water.

IMPROVE FISHERY DEPENDENT DATA COLLECTION

Regulatory changes would require that lobster logbooks and landing receipts be modified to capture more precise location and landings information to improve essential fishery information needed to more efficiently manage the commercial fishery.

PROHIBIT PERMIT TRANSFERS IN THE EVENT OF PENDING VIOLATIONS

The transfer of a lobster operator permit would be prohibited under the proposed regulations, when there are pending administrative, civil, or criminal processes that could result in suspension or revocation of the permit.

EXTEND THE PERMIT TRANSFER PERIOD FOR AN ESTATE

To allow more time for an estate to transfer a transferable lobster operator permit in the event of the death of the permit holder, the death provision transfer period would be changed in the proposed regulations from 1 to 2 years.

REQUIRE APPLICATION FOR PERMIT TRANSFER

An application would be required by the proposed regulations for the transfer of lobster operator permits. Currently, transfers are completed using a notarized document and not a formal CDFW application.

REPORTING OF COMMERCIAL TRAP LOSS

Commercial lobster fishermen would be required under the proposed regulations to report at the end of each fishing season the number and last known location of traps not recovered.

ADDITIONAL NONSUBSTANTIVE CHANGES

Additional regulatory changes are proposed to clean up existing language for consistency, enforceability, and clarity. These proposed changes would not result in substantive changes to current regulations.

2.6 REASONABLY FORESEEABLE COMPLIANCE RESPONSES

The purpose of this IS/Proposed ND is to evaluate potential environmental effects resulting from implementation of the Spiny Lobster FMP and proposed regulatory amendments. Pursuant to CEQA Guidelines Section 15064(d), lead agencies shall consider direct physical changes and reasonably foreseeable indirect physical changes in the environment that may be caused by a project. Adoption of a management plan and regulatory amendments, by itself, does not cause a direct physical change in the environment. Therefore, the potential indirect effects of reasonably foreseeable compliance responses (i.e., the actions reasonably expected to occur in response to implementation of the plan and proposed regulatory

actions) are evaluated in this IS to the extent feasible, when those responses may result in changes to the physical environment.

While the types and examples of foreseeable compliance responses can be reasonably predicted, the specific location, intensity, and setting of these actions cannot. As a result, the IS discusses broadly defined types of environmental impacts, rather than specific locations or site-specific environmental characteristics associated with the potential impacts. The impacts identified in the IS would apply generally within the project area. Many of the foreseeable compliance responses do not alter the physical environment, as defined in the CEQA Guidelines Section 15360. Other responses would lead to actions that may affect the marine environment of the project area. The following features from the FMP and regulatory amendments would not result in a direct or indirect effect to the environment, because they do not involve activities that alter physical conditions of the marine environment. Therefore, these are not evaluated further in this IS:

- implementing regulations that describe the definitions used in the FMP, process and timing, the harvest control rule SPR, CPUE, and Catch threshold levels, and making certain FGC sections inoperable;
- requiring hoop net operators to mark hoop net floats with GO-ID numbers;
- changing the estate transfer period from 1 year to 2 years after the death of a transferable lobster operator permit holder;
- adding a catastrophic trap tag loss provision for in-season trap tag replacement. Catastrophic loss is defined as the loss of 75 or more tags per permit;
- implementing a waiver requirement for permit holders to service another fisherman's traps;
- adding fees and forms associated with the trap tag program;
- clarifying methods of take for lobster, and when lobsters are required to be measured and undersized lobsters released;
- extending the lobster operator permit death provision transfer period from 1 to 2 years;
- prohibiting the transfer of a lobster operator permit until all pending violation(s) have been resolved;
- requiring an application for the transfer of lobster operator permits; and
- any regulatory amendments clarifying or modifying language of current regulations not resulting in a substantive change in the intent of the regulations.

Table 2-3 provides a list of FMP management tools and regulatory amendments with examples of reasonably foreseeable compliance responses that could be associated with the proposed regulatory changes. Reasonably foreseeable direct or indirect effects to the physical environment of the FMP management tools and regulatory amendments in Table 2-3 are discussed in Chapter 3. The California spiny lobster fishery would be adaptively managed within the framework of the FMP and regulatory amendments and all future compliance responses cannot be reasonably known at this time. Therefore, Table 2-3 includes examples of the types of compliance responses that could be expected to occur, to provide context for the environmental analysis in Chapter 3. Table 2-3 is not meant to be an exhaustive list of compliance responses that have the potential to occur through implementation of the FMP and regulatory amendments. It is important to note that CDFW is directed to use the best readily available science to meet the ecosystem and fishery objectives of the MLMA when developing any future applications of the FMP management tools in Table 2-3.

Table 2-3 Proposed FMP Measures/Regulatory Amendments and Examples of Reasonably Foreseeable Compliance Responses

FMP Management Tools	Examples of Compliance Responses
Changing the commercial trap limit	◢ Would place a limit on the total number of traps used in the fishery, which would be beneficial to benthic habitats and potentially reduce overall bycatch and marine mammal interactions.
Changing the recreational bag limit[1]	◢ Could lead to an increase or decrease in fishing effort and total catch, depending upon the bag limit being increased or decreased.
Setting a Total Allowable Catch	◢ Could result in a change to total catch relative to current catch and more or less pressure on the lobster population and marine environment.
District Closures	◢ Could result in fishing effort shifts (i.e., increased pressure) from a closed District to remaining open areas and additional travel by some fishermen.
Changing the season length[1]	◢ Could result in either an increase or decrease in recreational and commercial fishing effort and total catch.
Changing minimum legal size	◢ Could increase recreational and commercial fishing effort because it would initially take longer for fishermen to catch legal sized lobsters. Initially it would result in overall reduction in catch for both the commercial and recreational fisheries until the lobster population caught up to the new size limit. If minimum size were decreased, it would likely not have as much an impact on effort, but this could lead to decreases in spawning output.
Establishing a maximum legal size	◢ Would protect larger lobsters, which could increase egg production and SPR.
Establishing a sex selective fishery (i.e., male-only fishery or female-specific size restriction)[1]	◢ Would reduce total catch in the fishery and could lead to increased recreational and commercial fishing effort, because it would take more time to reach a limit of legal lobsters of the appropriate sex.
Regulatory Amendments	**Examples of Compliance Responses**
Requiring traps to be serviced at least every 7 days (currently 4 days)	◢ Potentially less frequent servicing/tending to traps could result in increased bycatch, and increased gear loss, which could increase effects on benthic habitats and marine mammal gear interactions.
Adding a provision to allow permit holders to recover up to 6 lost traps belonging to other permit holders	◢ Would allow the recovery of lost traps by other permit holders, which could reduce ghost fishing effects, and possibly reduce marine mammal interactions and benefit benthic habitats.
Reporting of commercial trap loss	◢ Would provide CDFW with additional essential fishery information needed to inform management decisions and could benefit trap recovery efforts.
Defining abandoned traps. Traps considered abandoned if not retrieved 14 days after the season ends. Fifteen days after the commercial season ends lobster operator permit holders and CDFW designees may recover an unlimited number of abandoned lobster traps	◢ Would aid lost fishing gear recovery projects by allowing the recovery of lost traps by other permit holders and CDFW designees. The recovery of lost traps would reduce ghost fishing, possibly reduce gear interactions with marine mammals and benefit benthic habitats.
Extending the period (from 6 to 9 days) for deploying and retrieving traps before and after the season	◢ Would allow for safer trap deployment and retrieval which could result in less gear loss. May result in lobster traps and associated gear being in the ocean for up to 3 additional days pre and post season.
Clarifying SCUBA gear possession on commercial vessels	◢ Could result in less gear loss, because it would allow fishermen to recover gear at the time of loss.
Improving fishery dependent data collection	◢ Would support the long-term sustainable management of the lobster fishery. ◢ Could result in earlier detection of issues and a subsequent improvement in adaptive management response time to resolve these issues.

Table 2-3 Proposed FMP Measures/Regulatory Amendments and Examples of Reasonably Foreseeable Compliance Responses	
Setting the trap limit to 300 traps per permit with the ability to purchase a second permit for a maximum 600 traps	◢ Would reduce the total number of traps in the water at one time and possibly reduce the chances for entanglement by marine species. ◢ Could reduce the total amount of fishing effort, because fishermen would be limited to 300 traps per permit. ◢ Could reduce vessel travel time for those that currently fish more than 300 traps. ◢ Could result in less abandoned traps, because it provides incentive for fishermen to recover their traps and equipment due to a limited number of trap tags issued each season.
Changing recreational season opener from 12:01 am to 6:00 a.m.	◢ Could reduce harm caused to the marine environment and improve safety by removing the midnight season opener. This may reduce accidents, damage to the marine environment, and loss of equipment because fishing effort would be spread out over daylight hours and no longer all focused at midnight.
Potentially requiring hole-punching or fin-clipping of retained lobsters in the sport fishery	◢ Could reduce the illegal sale of sport-caught lobster, which would benefit the lobster resource.

[1]Features that could increase recreational lobster activity.

2.7 FUTURE FMP AMENDMENTS

If new, relevant information becomes available, an FMP amendment based on that information may be appropriate. Any amendment that would affect an existing regulation or requires new regulations would be accompanied by a regulatory amendment proposal for the Commission. Amendment of the regulations would require a rulemaking process.

CDFW may propose an FMP amendment on its own initiative and discretion. In this case, CDFW would solicit ~~opinions~~ input from the public and the Commission. The public would have at least 30 days to review any proposed amendments prior to the hearing. CDFW may submit the proposal to the Commission after 30 days, or it may hold further public meetings before submission (see also FGC Section 7077). Interested parties may also propose plan provisions or amendments to either CDFW or the Commission.

An FMP amendment can be focused on a particular portion of the document; an amendment process should not automatically trigger the amendment of the entire FMP. However, an amendment on one portion of the FMP should not contradict another part.

Future amendments to the regulations or to the FMP would be subject to CEQA review in a manner consistent with the statute and guidelines. An additional CEQA document would only be needed, if substantial changes requiring major revisions arise or new information of substantial importance becomes available, in accordance with CEQA Guidelines Sections 15162 – 15164.

3 ENVIRONMENTAL CHECKLIST

This environmental checklist has been prepared to evaluate whether implementation of the Spiny Lobster Fishery Management Plan (FMP) and proposed regulatory amendments would result in significant or potentially significant effects on the environment. The checklist and explanatory discussion compose the Initial Study for the project that supports the adoption of the proposed Negative Declaration (ND) by the lead agency, California Fish and Game Commission (Commission).

ENVIRONMENTAL FACTORS POTENTIALLY AFFECTED:

The environmental factors checked below would be potentially affected by this project, involving at least one impact that is a "Potentially Significant Impact" as indicated by the checklist on the following pages.

☐ Aesthetics	☐ Agriculture and Forest Resources	☐ Air Quality
☐ Biological Resources	☐ Cultural Resources	☐ Geology / Soils
☐ Greenhouse Gas Emissions	☐ Hazards & Hazardous Materials	☐ Hydrology / Water Quality
☐ Land Use / Planning	☐ Mineral Resources	☐ Noise
☐ Population / Housing	☐ Public Services	☐ Recreation
☐ Transportation / Traffic	☐ Utilities / Service Systems	☐ Mandatory Findings of Significance
	☒ None	☐ None with Mitigation

The environmental analysis in the Initial Study indicates that the project would not result in any significant or potentially significant effects on the environment.

DETERMINATION (To be completed by the Lead Agency)

On the basis of this initial evaluation:

☒ I find that the project could not have a significant effect on the environment, and a **NEGATIVE DECLARATION** will be prepared.

☐ I find that although the project COULD have a significant effect on the environment, there **WILL NOT** be a significant effect in this case because revisions in the project have been made by or agreed to by the project proponent. A **MITIGATED NEGATIVE DECLARATION** will be prepared.

☐ I find that the project **MAY** have a significant effect on the environment, and an **ENVIRONMENTAL IMPACT REPORT** is required.

☐ I find that the project **MAY** have a "potentially significant impact" or "potentially significant unless mitigated" impact on the environment, but at least one effect 1) has been adequately analyzed in an earlier document pursuant to applicable legal standards, and 2) has been addressed by mitigation measures based on the earlier analysis as described on attached sheets. An **ENVIRONMENTAL IMPACT REPORT** is required, but it must analyze only the effects that remain to be addressed.

☐ I find that although the project could have a significant effect on the environment, because all potentially significant effects (a) have been analyzed adequately in an earlier **EIR** or **NEGATIVE DECLARATION** pursuant to applicable standards, and (b) have been avoided or mitigated pursuant to that earlier **EIR** or **NEGATIVE DECLARATION**, including revisions or mitigation measures that are imposed upon the project, nothing further is required.

Signature	Date
Mike Yaun	Acting Executive Director California Fish and Game Commission

3.1 AESTHETICS

ENVIRONMENTAL ISSUES	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
I. Aesthetics. Would the project:				
a) Have a substantial adverse effect on a scenic vista?	☐	☐	☒	☐
b) Substantially damage scenic resources, including, but not limited to, trees, rock outcroppings, and historic buildings within a state scenic highway?	☐	☐	☒	☐
c) Substantially degrade the existing visual character or quality of the site and its surroundings?	☐	☐	☒	☐
d) Create a new source of substantial light or glare which would adversely affect day or nighttime views in the area?	☐	☐	☒	☐

3.1.1 Environmental Setting

The project area consists of the coastline of the Pacific Ocean and the open ocean extending approximately 20 miles offshore from San Luis Obispo County, California, south to the U.S.–Mexico border and the Channel Islands. Aesthetic resources include numerous views of coastal and marine features from the coastline and from vessels. For divers within the project area, the aesthetic setting also includes the underwater environment.

This project area is characterized by open ocean and scattered rocky ocean outcrops. Views of the adjacent coastline include sandy beaches, bluffs, coastal terraces, and areas of coastline development. Views of the project area from the coastline include expansive views of the open ocean and very distant views of the Channel Islands on the horizon. Views from the vessels on the ocean surface include the open ocean, foreground views of the Channel Islands, and distant views of the beaches and coastline development along the coast of California.

The Channel Islands are largely undeveloped and have topography ranging from flat beaches and rolling hills to steep outcroppings. Santa Catalina Island is the most developed of the islands within the project area and views of the island include rugged topography with commercial and residential development. Views of the island also include marinas and various recreational and commercial watercraft. Underwater views include varied sea floor topography and aesthetically important marine resources, such as kelp forests, sea caves, and marine life.

State Route (SR) 1, Interstate 5, and/or U.S. Highway 101, which are all eligible as a state scenic highways, follow the coastline adjacent to the project area for much of the distance between San Luis Obispo County and the U.S.—Mexico border (California Department of Transportation 2011). There are many scenic vistas along the coastline and these scenic highways offering expansive views of the Pacific Ocean and the project area.

3.1.2 Discussion

a) Have a substantial adverse effect on a scenic vista?

Less than Significant. The project area is visible from several highways that are eligible as state scenic highways and a number of scenic vistas along the coast and from the Channel Islands. During the open season for the California spiny lobster fishery, there are views of commercial and recreational vessels on the open water as well as buoys for submerged traps. Commercial fishermen and recreational hoop-netters deploy submerged traps into the ocean, and divers submerge themselves to capture lobsters. These activities occur underwater, and all activities are seasonal and do not leave behind permanent structures. Implementation of the FMP and regulatory amendments may cause slight changes in the number and/or location of vessels and/or buoys on the water on any given day or may result in the concentration of fishing to shift from one District to another within the overall project area. However, none of the proposed changes would increase the overall level of fishing activity within the project area and views from a scenic vista would not be degraded. Therefore, the FMP and regulatory amendments would not have a substantial adverse effect on scenic vistas. This impact would be less than significant.

b) Substantially damage scenic resources, including, but not limited to, trees, rock outcroppings, and historic buildings within a scenic highway or roadway?

Less than Significant. Because the project area is within a marine environment, there are no trees or historic buildings associated with a scenic highway located within the project area. There are some rocky ocean outcrops within the project area; however, commercial and recreational fishing activity takes place within the open water of the project area and no new structures are proposed as part of the FMP and regulatory amendments. The FMP and regulatory amendments could cause shifts of fishing activity within the overall project area, but the proposed amendments would not change the type or level of fishing activities in a manner or magnitude that would substantially affect views within the project area. Therefore, this impact would be less than significant.

c) Substantially degrade the existing visual character or quality of the site and its surroundings?

Less than Significant. The visual character of the project area would include the open ocean along the coast of California and the underwater environment visible to divers. The FMP and regulatory amendments could cause shifts in the amount of fishing at a given location within the overall project area, but not an increase in the overall amount of fishing. These shifts would be seasonal and would only result in slight changes in visible fishing activity within the area. The visual character of the open ocean would not change noticeably. There would be a decrease in the number of commercial lobster traps in the water over time, which would result in fewer intrusions by fishing gear into natural underwater views. In addition, the existing fisheries are not currently known to substantially degrade the existing scenery of the coastline or underwater environment, and the FMP and regulatory amendments would not result in substantial changes to the existing fisheries. Therefore, this impact would be less than significant.

d) Create a new source of substantial light or glare which would adversely affect day or nighttime views in the area?

Less than Significant. Commercial lobster fishing is prohibited at night. Recreational fishing vessels may be on the water at night and would use limited vessel lighting for safety and navigation. However, none of the regulatory amendments would ~~not~~ cause an overall increase in recreational fishing. In addition, any specific-day increase in recreational fishing effort that may occur would primarily take place during daytime hours. Therefore, the FMP and regulatory amendments would have a less-than-significant impact on light and glare.

3.2 AGRICULTURE AND FOREST RESOURCES

ENVIRONMENTAL ISSUES	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
II. Agriculture and Forest Resources.				
In determining whether impacts to agricultural resources are significant environmental effects, lead agencies may refer to the California Agricultural Land Evaluation and Site Assessment Model (1997, as updated) prepared by the California Department of Conservation as an optional model to use in assessing impacts on agriculture and farmland. In determining whether impacts to forest resources, including timberland, are significant environmental effects, lead agencies may refer to information compiled by the California Department of Forestry and Fire Protection regarding the state's inventory of forest land, including the Forest and Range Assessment Project and the Forest Legacy Assessment project; and forest carbon measurement methodology provided in Forest Protocols adopted by the California Air Resources Board.				
Would the project:				
a) Convert Prime Farmland, Unique Farmland, or Farmland of Statewide Importance (Farmland), as shown on the maps prepared pursuant to the Farmland Mapping and Monitoring Program of the California Resources Agency, to non-agricultural use?	☐	☐	☐	☒
b) Conflict with existing zoning for agricultural use or a Williamson Act contract?	☐	☐	☐	☒
c) Conflict with existing zoning for, or cause rezoning of, forest land (as defined in Public Resources Code section 12220(g)), timberland (as defined by Public Resources Code section 4526), or timberland zoned Timberland Production (as defined by Government Code section 51104(g))?	☐	☐	☐	☒
d) Result in the loss of forest land or conversion of forest land to non-forest use?	☐	☐	☐	☒
e) Involve other changes in the existing environment, which, due to their location or nature, could result in conversion of Farmland to non-agricultural use or conversion of forest land to non-forest use?	☐	☐	☐	☒
f) Conflict with existing or planned aquaculture operations or uses?	☐	☐	☒	☐

3.2.1 Environmental Setting

The California Department of Conservation considers Prime Farmland and Farmland of Statewide Importance to be defined as land that: "Has been used for irrigated agricultural production at some time during the four years before the Important Farmland Map date. Irrigated land use is determined by Farmland

Mapping and Monitoring Program staff by analyzing current aerial photos, local comment letters, and related GIS data, supplemented with field verification" (California Department of Conservation 2015). The project area consists of an open ocean and underwater marine environment, so it does not contain any terrestrial farmlands.

As defined in the Public Resources Code (PRC, various sections), there is no timberland-zoned land or other timberland-related or forest-related land in the project area, because it is an open ocean and underwater marine environment.

Aquaculture, or mariculture in the marine environment, is the production of marine and freshwater organisms under controlled conditions or within the natural environment. In California, this includes shellfish for human consumption and finfish for stock enhancement (e.g., white seabass hatchery program).

Some types of aquaculture in California are practiced in the open ocean and in bays where products such as mussels, clams, and white seabass are grown. Other aquaculture occurs in artificial earthen ponds, tanks or raceways that are the primary source of farm-raised catfish, tilapia, bass, shrimp, crawfish, baitfish, and ornamental fish and plants (National Association of Aquaculture 2015).

According to the list of aquaculture registrants (CDFW 2015b), there are registered aquaculture companies/organizations within the range of the project area, including Santa Barbara County, San Luis Obispo County, San Diego County, Riverside County, Ventura County, and Orange County. These companies produce organisms varying from freshwater to marine species of fish, shellfish, and crustaceans. There are currently five aquaculture facilities within the project area. Facilities for freshwater species are typically inland and those that cultivate marine species are near or within the marine environment on both public and private land.

3.2.2 Discussion

a) Convert Prime Farmland, Unique Farmland, or Farmland of Statewide Importance (Farmland), as shown on the maps prepared pursuant to the Farmland Mapping and Monitoring Program of the California Resources Agency, to non-agricultural use?

b) Conflict with existing zoning for agricultural use or a Williamson Act contract?

No Impact. The project area is a marine environment, so it does not contain any Prime Farmland, Unique Farmland, or Farmland of Statewide Importance, as mapped by the California Resources Agency, because the project area is an open ocean and underwater marine environment. Currently, there is no effect on terrestrial agriculture from the fisheries and the project would not cause changes that would result in direct or indirect conversion of these types of farmland. Additionally, because there is no terrestrial Farmland in or near the project area, there is no potential for conflict with zoning for agricultural use or a Williamson Act contract. Therefore, there would be no impact.

c) Conflict with existing zoning for, or cause rezoning of, forest land (as defined in Public Resources Code [PRC] section 12220(g)), timberland (as defined by PRC section 4526), or timberland zoned Timberland Production (as defined by Government Code section 51104(g))?

d) Result in the loss of forest land or conversion of forest land to non-forest use?

No Impact. The project area is a marine environment, so it does not contain any forest land (as defined by PRC), timberland, or zoned Timberland Production (as defined by Government Code). Currently, there is no

effect on forest land or other related resources from the fisheries and the project would not cause changes that would result in direct or indirect conversion of or conflict with zoning related to forestland types of land uses. Therefore, there is no impact.

e) Involve other changes in the existing environment, which, due to their location or nature, could result in conversion of Farmland to non-agricultural use or conversion of forest land to non-forest use?

No Impact. The FMP and regulatory amendments only involve changes to the existing management of the commercial and recreational California spiny lobster fisheries in waters of the state. Currently, the California spiny lobster fishery has no connection to Important Farmland or forest land uses in surrounding terrestrial areas, and the FMP and regulatory amendments would not result in any changes or conversions to of either Important Farmland or forest land uses to other land uses. In addition, as described above in Section 3.2.2 for questions “a” and “b,” there would also be no substantial effect to existing aquaculture facilities and/or resources. Therefore, there would be no impact.

f) Conflict with existing or planned aquaculture operations or uses?

Less than Significant. Five aquaculture facilities are currently located within the project area; however, no potential conflict with these existing facilities or any planned aquaculture operations or uses would result from implementation of the FMP and regulatory amendments. It is anticipated that over time~~,~~ the number of commercial lobster traps in the water would decrease~~,~~ because of implementation of the proposed regulatory amendments. The management measures in the FMP and proposed regulatory amendments would not alter existing fishing practices or intensities within the project area in such a way as to affect existing aquaculture facilities. This impact would be less than significant.

3.3 AIR QUALITY

ENVIRONMENTAL ISSUES	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
III. Air Quality.				
Where available, the significance criteria established by the applicable air quality management or air pollution control district may be relied on to make the following determinations.				
Would the project:				
a) Conflict with or obstruct implementation of the applicable air quality plan?	☐	☐	☒	☐
b) Violate any air quality standard or contribute substantially to an existing or projected air quality violation?	☐	☐	☒	☐
c) Result in a cumulatively considerable net increase of any criteria pollutant for which the project region is non-attainment under an applicable federal or state ambient air quality standard (including releasing emissions which exceed quantitative thresholds for ozone precursors)?	☐	☐	☒	☐
d) Expose sensitive receptors to substantial pollutant concentrations?	☐	☐	☒	☐
e) Create objectionable odors affecting a substantial number of people?	☐	☐	☒	☐

3.3.1 Environmental Setting

The proposed plan and regulatory amendments would affect lobster fishing activities at docking locations and off-shore along the southern coast of California from Monterey County to San Diego County, although nearly all fishing activity occurs south of Santa Barbara County. This stretch of coastline includes the following counties: Monterey, San Luis Obispo, Santa Barbara, Ventura, Los Angeles, Orange, and San Diego; and the following air districts: Monterey Bay Unified Air Pollution Control District (MBUAPCD), San Luis Obispo County Air Pollution Control District (SLOAPCD), Santa Barbara County Air Pollution Control District (SBCAPCD), Ventura County Air Pollution Control District (VCAPCD), South Coast Air Quality Management District (SCAQMD), and San Diego County Air Pollution Control District (SDAPCD). These areas are located in the North Central Coast, South Central Coast, South Coast, and San Diego air basins. The ambient concentrations of air pollutant emissions are determined by the amount of emissions released by the sources of air pollutants and the atmosphere's ability to transport and dilute such emissions. Natural factors that affect transport and dilution include terrain, wind, atmospheric stability, and sunlight. Therefore, existing air quality conditions in the area are determined by such natural factors as topography, meteorology, and climate, in addition to the amount of emissions released by existing air pollutant sources.

Climate and wind patterns along this stretch of coastline would vary with topography and location. Generally, marine winds flow inland from the Pacific Ocean eastward and temperatures along the coastline are mild (WRCC 2015).

Of the many pollutants, ozone and particulate matter (i.e., respirable [PM_{10}] and fine [$PM_{2.5}$] particulates) are of primary concern within the coastal counties, as well as for much of the rest of the State.

Table 3-1 below shows the attainment status of each of the affected counties for the State and Federal ozone (1-hour and 8-hour) and particulate matter standards. These standards are pursuant to the terms of the California Air Quality Standards (CAAQS) and National Ambient Air Quality Standards (NAAQS).

Table 3-1 National and State Air Quality Attainment Statuses at Affected Counties

County	Ozone[a]	PM_{10}	$PM_{2.5}$[b]
National Standard			
Monterey	Attainment	Attainment	Attainment
San Luis Obispo	Nonattainment (Marginal)	Attainment	Attainment
Santa Barbara	Attainment	Attainment	Attainment
Ventura	Nonattainment (Serious)	Attainment	Attainment
Los Angeles[c]	Nonattainment (Extreme)	Attainment	Nonattainment (Moderate)
Orange	Nonattainment (Extreme)	Attainment	Nonattainment (Moderate)
San Diego	Nonattainment (Marginal)	Attainment	Attainment
State Standard			
Monterey	Nonattainment	Attainment	Nonattainment
San Luis Obispo	Nonattainment	Attainment	Nonattainment
Santa Barbara	Nonattainment	Unclassified	Nonattainment
Ventura	Nonattainment	Attainment	Nonattainment
Los Angeles	Nonattainment	Nonattainment	Nonattainment
Orange	Nonattainment	Nonattainment	Nonattainment
San Diego	Nonattainment	Nonattainment	Nonattainment

a. Reflects the national 8-hour standard. The 1-hour standard was revoked on June 15, 2005.
b. Reflects the latest 2012 $PM_{2.5}$ standard.
c. For the South Coast portion only.

Source: ARB 2013a, USEPA 2015

As described in the management toolbox of the FMP, the proposed FMP and regulatory amendments could result in seasonal shifts in vessel transit and transportation activity within discreet areas due to district closures or a change in season length. Potential temporal and spatial shifts in fishing activity could include changes in the timing and location of vessel transit, docking services, and running of on-board generators. Although, the FMP and regulatory amendments have the potential to result in more concentrated fishing activities, they would not involve any construction or ground disturbance activities or result in an overall increase in fishing activity.

In an effort to characterize the existing contribution of emissions from commercial and recreational fishing vessels in general (and not just those engaged in lobster fishing), Table 3-2 below shows the relative contribution of emissions from fishing vessels and recreational boats for each affected air district in 2013. These emissions include vessel activity on all navigable waters in the air districts, including those inland. The California Air Resources Board (ARB) reports these emissions in tons per year and breaks down emissions by source categories. Reported criteria pollutants include reactive organic gases (ROG) and nitrous oxides (NO_X), which are major ozone precursors, as well as PM_{10} and $PM_{2.5}$. Table 3-2 shows that the commercial and recreational fishing sectors accounts for no more than 10 percent of an air district's annual emissions, of which lobster fishing activity would only account for a small subset.

Table 3-2 2013 Emissions Inventory for Affected Air Districts Showing Contribution of Overall Fishing Vessel and Recreational Boat Activity[a] (tons/year)

Emissions Source	ROG	NO_X	PM_{10}	$PM_{2.5}$
MBUAPCD	**49.01**	**74.17**	**43.84**	**11.69**
Fishing Vessels[b]	0.12	1.43	0.06	0.06
Recreational Boats	1.95	0.38	0.12	0.09
All Other Emissions Sources in Air District	46.95	72.36	43.66	11.54
SLOAPCD	**17.58**	**27.69**	**15.01**	**4.67**
Fishing Vessel[b]	0.05	0.56	0.02	0.02
Recreational Boats	1.07	0.21	0.07	0.05
All Other Emissions Sources in Air District	16.47	26.92	14.92	4.59
SBCAPCD	**29.44**	**83.37**	**15.37**	**5.84**
Fishing Vessel[b]	0.08	0.88	0.04	0.04
Recreational Boats	0.41	0.07	0.02	0.02
All Other Emissions Sources in Air District	28.96	82.42	15.31	5.79
VCAPCD	**33.93**	**47.20**	**16.55**	**6.02**
Fishing Vessel[b]	0.06	0.76	0.03	0.03
Recreational Boats	2.28	0.42	0.13	0.10
All Other Emissions Sources in Air District	31.58	46.02	16.38	5.89
SCAQMD	**482.61**	**570.16**	**173.62**	**73.45**
Fishing Vessel[b]	0.33	3.84	0.17	0.15
Recreational Boats	32.30	6.08	1.95	1.47
All Other Emissions Sources in Air District	449.98	560.25	171.50	71.83
SDAPCD	**126.45**	**113.94**	**72.72**	**20.28**
Fishing Vessel[b]	0.14	1.64	0.07	0.07
Recreational Boats	11.72	2.22	0.71	0.54
All Other Emissions Sources in Air District	114.59	110.09	71.95	19.68
Total for All Affected Districts	**739.03**	**916.54**	**337.10**	**121.95**
Fishing Vessels[b]	0.78	9.12	0.39	0.36
Recreational Boats	49.72	9.37	3.00	2.26
All Other Emissions Sources in Air District	688.53	898.05	333.72	119.32

[a] Not limited to lobster fishing.
[b] Includes charter and commercial fishing vessels

MBUAPCD = Monterey Bay Unified Air Pollution Control District
SLOAPCD = San Luis Obispo County Air Pollution Control District
SBCAPCD = Santa Barbara County Air Pollution Control District
VCAPCD = Ventura County Air Pollution Control District
SCAQMD = South Coast Air Quality Management District
SDAPCD = San Diego County Air Pollution Control District
LTS = Less than significant
BMP = Best Management Practices

Source: ARB 2013b

As shown in Table 3-2, criteria pollutants generated by charter and commercial fishing vessels make up a small percentage (less than 2 percent) of a district's annual criteria pollutant emissions. Emissions from recreational boats, however, can make up to 9 percent of total annual criteria pollutant emissions. However, it is unknown what proportion of recreational boats is used for lobster fishing, specifically.

3.3.2 Regulatory Framework

Air quality within the project area is regulated by such agencies such as the U.S. Environmental Protection Agency (USEPA), and ARB at the federal and state levels, respectively, and by local air districts. Air districts attain and maintain air quality conditions in their respective air basins and jurisdictions through a comprehensive program of planning, regulation, enforcement, technical innovation, and promotion of the understanding of air quality issues. Many district clean air strategies include the preparation of plans for the attainment of ambient air quality standards, adoption and enforcement of rules and regulations concerning sources of air pollution, and issuance of permits for stationary sources of air pollution. The air districts also inspect stationary sources of air pollution and responds to citizen complaints, monitors ambient air quality and meteorological conditions, and implements programs and regulations required by the federal Clean Air Act (CAA), the federal Clean Air Act Amendments of 1990 (CAAA), and the California Clean Air Act of 1988 (CCAA).

FEDERAL

At the federal level, USEPA implements the national air quality programs. USEPA's air quality mandates are drawn primarily from the CAA, enacted in 1970. The most recent major amendments were made by Congress in 1990. The CAA, last amended in 1990, requires USEPA to establish the National Ambient Air Quality Standards (NAAQS) (40 CFR part 50). USEPA has established primary and secondary NAAQS for the following criteria air pollutants: ozone, CO, NO_2, SO_2, PM_{10}, $PM_{2.5}$, and lead (ARB 2013). The primary standards protect public health and the secondary standards protect public welfare. The CAA also requires each state to prepare an air quality control plan referred to as a State Implementation Plan (SIP). The federal CAAA added requirements for states with nonattainment areas to revise their SIPs to incorporate additional control measures to reduce air pollution. The SIP is modified periodically to reflect the latest emissions inventories, planning documents, and rules and regulations of the air basins as reported by their jurisdictional agencies. USEPA reviews all state SIPs to determine whether they conform to the mandates of the CAA and its amendments and whether implementing them will achieve air quality goals. If USEPA determines a SIP to be inadequate, a Federal Implementation Plan that imposes additional control measures may be prepared for the nonattainment area. If the state fails to submit an approvable SIP or to implement the plan within the mandated time frame, sanctions may be applied to transportation funding and stationary air pollution sources in the air basins.

STATE

Under the CCAA, passed in 1988, areas not in compliance with the state standards must submit plans to reduce emissions and achieve attainment. These Clean Air Plans (CAPs) are updated periodically and reflect the progress in meeting the air quality standards and to incorporate new information regarding the feasibility of control measures and new emission inventory data. An Air District's record of progress in implementing previous measures must also be reviewed as part of a CAP. CAPs serve to:

- update past strategies in accordance with the requirements of the CCAA to implement "all feasible measures" to reduce any emissions triggering a non-attainment status in an air basin or air district;
- consider the impacts of control measures on any pollutants for which the area is under non-attainment in a single, integrated plan;
- review progress in improving air quality in recent years; and
- establish emission control measures to be adopted or implemented in the near future timeframe.

Commercial Harbor Craft Regulation

On November 15, 2007, ARB approved the Commercial Harbor Craft Regulation to reduce emissions from diesel engines on commercial harbor craft vessels that operate in "Regulated California Waters" (13 CCR Section 2299.5 and 17 CCR Section 93118.5). California regulated waters include all internal waters,

estuarine waters, ports, and coastal waters within 24 nautical miles of the California coast. The regulation is expected to substantially reduce diesel PM and NOx emissions from harbor craft engines by requiring USEPA marine engine standards for all repowered engines and requiring meters to be installed on all commercial fishing vessel engines (both propulsion and auxiliary). Additionally, all vessel owners or operators must maintain records for each vessel engine. The emission reductions associated with this regulation are expected to reduce premature mortality, cancer risk, and other adverse impacts caused by exposure to these pollutants. This regulation also reduces diesel PM and NOx emissions that contribute to statewide exceedances of ambient air quality standards (ARB 2008).

LOCAL

As shown in Table 3-1, all affected counties are in nonattainment of CAAQS standards for ozone and $PM_{2.5}$, with only Los Angeles, Orange, and San Diego Counties in nonattainment for the state PM_{10} standard. Thus, all associated air districts are required to have a plan in place that demonstrates each district's method of reducing emissions to meet exceeded standards.

THRESHOLDS OF SIGNIFICANCE

For the purpose of this analysis, the following thresholds of significance in Table 3-3, taken from the respective air district guidelines, are used to determine if an impact on air quality would be significant. The plan would result in a significant air quality impact if it would cause exceedances of the following thresholds for operational impacts listed in Table 3-3. Thresholds for construction impacts are not included because the proposed FMP and regulatory amendments would not result in any construction or ground disturbance activities.

Table 3-3 Thresholds of Significances for Each Affected Air District for Operational Impacts Only

Air District	NO_X	ROG	PM_{10}	$PM_{2.5}$
MBUAPCD	137 lbs/day[a]	137 lbs/day[b]	NA	82 lbs/day[c]
SLOAPCD	25 lbs/day or 25 tons/year for ROG and NO_X combined		25 lbs/day or 25 tons/year (dust only)	1.25 lbs/day (DPM)
SBCAPCD	25 lbs/day or 25 tons/year for ROG and NO_X combined from motor vehicle trips only		Daily trigger for offsets set in the APCD New Source Review	
VCAPCD	25 lbs/day[d] OR 5 lbs/day[e]	25 lbs/day[d] OR 5 lbs/day[e]	LTS with BMPs	LTS with BMPs
SCAQMD	55 lbs/day	55 lbs/day[b]	150 lbs/day	55 lbs/day
SDAPCD[f]	250 lb/day or 40 tons/year	75 lb/day or 13.7 tons/year	100 lbs/day or 15 tons/year	55 lbs/day or 10 tons/year

a. direct plus indirect
b. Threshold for volatile organic compounds (VOC), a subset of ROG.
c. Only applies to onsite emissions and plan-related exceedances along unpaved roads
d. Applied to areas in the County outside the Ojai Planning Area
e. Applies to the Ojai Planning Area. The Ojai Planning Area includes a portion of the County's coastal areas.
f. SDAPCD has not adopted CEQA thresholds of significance. These thresholds reflect published screening level thresholds for air quality impact analyses for new sources.

Notes: NA = Not Available
DPM = Diesel-generated particulate matter
MBUAPCD = Monterey Bay Unified Air Pollution Control District
SLOAPCD = San Luis Obispo County Air Pollution Control District
SBCAPCD = Santa Barbara County Air Pollution Control District
VCAPCD = Ventura County Air Pollution Control District
SCAQMD = South Coast Air Quality Management District
SDAPCD = San Diego County Air Pollution Control District
LTS = Less than significant
BMP = Best Management Practices

Source: MBUAPCD 2008, SLOAPCD 2009, SBCAPCD 2015, VCAPCD 2003, SCAQMD 2015, SDAPCD 2007

3.3.3 Discussion

a) Conflict with or obstruct implementation of applicable air quality plans?

Less than Significant. The purpose of any air quality plan is to reduce criteria and toxic air pollutants in a particular region. These plans can be established by jurisdictional agencies such as air districts or through a general plan document. Typical air quality plans in given air districts address the feasibility and actions that air districts should take to meet or maintain state and federal clean air standards. As shown in Table 3-1, all air districts affected by the FMP and regulatory amendments are at some level of non-attainment with respect to state and national standards, except for the PM_{10} NAAQS. Air quality plans within general plan document are usually written as goals, actions, and policies that prohibit or limit land use development actions that would worsen air quality. Any project or plan that would result in short-term or long-term increases in air pollutants would be at risk of conflicting with or obstructing applicable air quality plans. Whether or not an actual conflict would occur depends on the specific limitations presented in the air quality plans and would vary by region.

The implementation of the proposed FMP and regulatory amendments would result in establishing a management framework for the fishery; however, it would not directly conflict with or obstruct the implementation of any applicable air quality plans. Theoretically, an increase boating trips or longer travel distances could worsen air quality through increased annual and daily fuel usage and combustion. However, the actual effect of the FMP on total boat trips or trip lengths would not increase overall fishing activity. As ~~shown~~ discussed in Section 2.6 of the Project Description and shown in Table 2-3, ~~discussed in Section 2.6, "Reasonably Foreseeable Compliance Responses,"~~ implementation of the proposed FMP and regulatory amendments has the potential to seasonally affect the location and concentration of vessel activities.

With respect to air quality impacts, these compliance responses could result in spatial and temporal redistribution of overall fishing vessel activity and associated fuel exhaust emissions. While compliance responses with the proposed regulatory amendments listed in Section 2.6 could generally reduce vessel activity, seasonal district closures could result in increased concentrations of vessel activity in open fishing areas, which could lead to higher short-term, localized increases in the concentrations of air pollutants in varying locations, affecting local conditions, but not overall conditions. Additionally, the FMP would not change the total number of annual fishing permits that would allow for increases in overall fishing vessel activity over existing conditions. The effect the FMP has on the movement, concentration, and location of active fishing vessels would be similar to existing conditions, with the only difference being the motivation behind the vessel destinations and schedules (e.g., regulatory vs. market incentives). Also, the FMP and proposed regulatory amendments would not cause an increase in overall fishing vessel activity (i.e., annual ship ton-miles) over existing conditions. In addition, all commercial fishing vessels are required to comply with the State's Commercial Harbor Craft Regulation that regulates emissions from maritime vessels. Thus, subject to this regulation, although the FMP could potentially increase localized concentrations of lobster fishing vessel activity in certain areas, such concentrations would not result in an overall increase in vessel activity. The implementation of the FMP would, therefore, not result in increased emissions of air pollutants or contaminants and, thus, would not conflict with or obstruct implementation of any applicable air quality plans. This impact would be less than significant.

b) Violate any air quality standard or contribute substantially to an existing or projected air quality violation?

Less than Significant. As discussed above in Section 3.3.3, "a", the implementation of the FMP would not result in increased emissions of air pollutants or contaminants over existing conditions and; thus, would not be anticipated to exceed the air quality district thresholds of significance, listed in Table 3-3, for air districts within the project area. Therefore, the FMP would not violate any air quality standard or contribute substantially to an existing or projected air quality violation. This impact would be less than significant.

c) Result in a cumulatively considerable net increase of any criteria pollutant for which the plan region is non-attainment under an applicable federal or state ambient air quality standard (including releasing emissions which exceed quantitative thresholds for ozone precursors)?

Less than Significant. As discussed above in Section 3.3.3, "a", the implementation of the FMP and proposed regulatory amendments would not result in an overall increase of emissions of air pollutants or contaminants over existing conditions. Thus, the project would not result in a cumulatively considerable net increase of any criteria pollutant for which the plan region is in non-attainment under an applicable federal or state ambient air quality standard. This impact would be less than significant.

d) Expose sensitive receptors to substantial pollutant concentrations?

Less than Significant. Most vessel activity and resultant emissions would occur in the open ocean, far from sensitive receptors. Affected marinas and docking areas would likely not be in close proximity to sensitive receptors such as hospitals, childcare centers, schools, and elderly care facilities. Although some residences and waterside parks may be located close to docks, the FMP would not result in substantial increases in emissions over existing conditions, as discussed above in question "a" of this section. Thus, the FMP would not expose sensitive receptors to substantial pollutant concentrations. This impact would be less than significant.

e) Create objectionable odors affecting a substantial number of people?

Less than Significant. Fishing vessels and associated docking areas typically generate odors due to the transport of sea life. Most vessel activity and resultant potential odor generation would occur in the open ocean, far from sensitive receptors. Any potential increases in odors at fishing docks and other locations would be characteristic of existing odors at these locations. Additionally, the level of odors would be similar to existing seasonal patterns in fish catch that could occur at a dock. Fishing docks are also typically located away from high population concentrations, though some residences could be located near docks. Thus, the FMP would not significantly create additional objectionable odors affecting a substantial number of people. This impact would be less than significant.

3.4 BIOLOGICAL RESOURCES

ENVIRONMENTAL ISSUES	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
IV. Biological Resources. Would the project:				
a) Have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special-status species in local or regional plans, policies, or regulations, or by the California Department of Fish and Wildlife or the U.S. Fish and Wildlife Service?	☐	☐	☒	☐
b) Have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, or regulations or by the California Department of Fish and Wildlife or the U.S. Fish and Wildlife Service?	☐	☐	☒	☐
c) Have a substantial adverse effect on federally protected wetlands as defined by Section 404 of the Clean Water Act (including, but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means?	☐	☐	☒	☐
d) Interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites?	☐	☐	☒	☐
e) Conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance?	☐	☐	☐	☒
f) Conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or state habitat conservation plan?	☐	☐	☐	☒

3.4.1 Environmental Setting

This discussion is based on the assessment of potential marine special-status species and habitats included in the Biological Resources Memorandum prepared by Applied Marine Sciences (AMS 2015, Appendix A).

Among the marine habitats evaluated, the assessment identified eelgrass beds as the only potential U.S. Army Corps of Engineers Clean Water Act Section 404 jurisdictional coastal wetland features that could occur within the project area.

The 2015 AMS memorandum identified a list of the potential for occurrence for a number of special-status avian, fish, marine invertebrate, marine mammal, marine reptile species, and plants; these species are identified in full in Appendix A. The identified species are protected or designated as special-status by the following: 1) protected under either the Federal Endangered Species Act or California Endangered Species Act, 2) afforded special protection under the Marine Mammal Protection Act, 3) managed under the

Magnuson-Stevens Act, or 4) otherwise considered species of special concern by National Oceanic and Atmospheric Administration, CDFW, or U.S. Fish and Wildlife Service. The general coastal waters of California located within the project area are used extensively by these species for foraging habitat, nursery areas, or as critical habitat.

In addition, a number of habitats considered to be important to the marine ecosystem including intertidal (rocky shoreline, sandy beaches, estuaries and lagoons, seagrass beds), subtidal regions (soft and hard substrates), and key ecosystems, such as kelp forests and eelgrass beds, are included in the overview of the AMS memorandum and assessment (AMS 2015). The intertidal habitats occur in the area where only recreational fishing could typically take place, while the subtidal regions are where both commercial and recreational fishing activities are more likely to occur (i.e., in deeper waters). All of these provide habitat for ecological competitor species, predator and prey species, and potential habitat for the California spiny lobster.

MARINE PROTECTED AREAS

In 1999, the California legislature passed the MLPA. The MLPA is designed to protect the state's marine life and habitats, marine ecosystems, and marine natural heritage through the establishment of a statewide network of MPAs. MPA locations have been selected specifically so that they, in combination and as distributed along the coastline, can protect the diversity and abundance of California's marine life, habitats, and ecosystems (AMS 2015). Within the project area, there are 78 MPAs and their existence is a key consideration in the proposed Spiny Lobster FMP. Of these 78 MPAs, only seven allow any commercial or recreational fishing of California spiny lobsters. A complete list of MPAs located within the project area is shown in Table 1 of 2015 AMS memorandum (in Appendix A).

METHODOLOGY

Potential impacts on biological resources resulting from implementation of the project (FMP and regulatory amendments) were determined by evaluating a range of reasonably foreseeable compliance action responses as described in Section 2.6, Table 2-3. As discussed in that section, the FMP management tool response actions and their resulting impacts range from examples such as the potential increase or decrease in the season length, recreational bag limit, protection of certain sized lobsters because of size limits, effects of a sex-selective fishery, establishing a Total Allowable Catch and district closures and a wide set of other foreseeable compliance response actions and resulting impacts. These compliance responses were evaluated for potential direct and indirect impacts to the biological resources and habitat characteristics in and around the project area to identify potential impacts to common and sensitive habitats. The potential for the range of compliance response actions to affect common and special-status species, through habitat modification or direct mortality, was also evaluated. Impacts are generally characterized as temporary (seasonal) or permanent.

3.4.2 Discussion

a) Have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special-status species in local or regional plans, policies, or regulations, or by the California Department of Fish and Wildlife or the U.S. Fish and Wildlife Service?

Less than Significant. As described in Section 3.4.1, "Environmental Setting," there are a number of special-status or otherwise protected species that occur in and around the marine environment of the project area. Fishing practices, both commercial and recreational, can have effects on surrounding non-target organisms and habitats through several mechanisms, as discussed in the AMS report (Appendix A). This includes direct mechanisms of impact to habitat on the seafloor and subtidal areas within the various substrates therein from

direct application of commercial traps and recreational hoop nets. Indirect effects, such as bycatch (described in Section 2.4.3 and Appendix A), defined for the purposes of this document as unintended capture of non-target species (e.g., species besides the California spiny lobster), could also occur through various fishing practices. This could include potential entanglement marine species and birds. Although the potential for entanglement exists, the project would ultimately reduce the number of lobster traps being deployed through the proposed trap limit and the existing restricted access program. It is also designed to reduce the number of lost or abandoned traps. These actions would reduce the potential risk of entanglement with lobster gear compared to the levels currently being experienced by the fishery (AMS 2015).

The commercial spiny lobster fishery is a limited entry fishery (i.e., limited number of commercial fishing permits that are issued each season). The provisions in the FMP and proposed regulatory amendments do not change this factor, nor do they allow for more fishing and or use of equipment that could cause either direct or indirect mechanisms of impact. The Harvest Control Rule, "toolbox" (the suite of conservation and management measures), and other adaptive management framework described in Chapter 2, "Project Description," were developed to maintain and, in some cases, enhance the sustainability of the California spiny lobster fishery, while taking into consideration the surrounding ecosystem. Several of the FMP tools and proposed regulatory amendments described in Section 2.5, "Characteristics of the FMP and Regulations," and Section 2.6, "Reasonably Foreseeable Compliance Responses," would result in fewer traps in the water over time, which would decrease the potential for habitat effects, amount of bycatch, and number of marine mammal interactions, yielding a beneficial effect on the overall marine ecosystem. Although the proposed regulatory amendment to extend the period for trap servicing would not measurably increase or decrease the potential for entanglements, as described in Section 2.4.3, "Bycatch," the California spiny lobster fishery is classified as a Category III fishery by the National Marine Fisheries Service and is considered to "have a remote likelihood of, or no known incidental mortality and serious injury of marine mammals." Although the proposal to extend the period for trap servicing could affect this aspect of bycatch, it would not substantially change the frequency of bycatch from existing conditions. Therefore, this impact would be less than significant.

b) Have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, or regulations or by the California Department of Fish and Wildlife or the U.S. Fish and Wildlife Service?

Less than Significant. As described above in Section 3.4.2, "a," the FMP and regulatory amendments have been developed by CDFW in accordance to the goals and objectives of the MLMA. To this end, the project minimizes potential effects to sensitive natural communities and habitats identified through state regulations, most of which are administered by CDFW. Although the existing practices within the fishery currently have minor effects on the marine environment, the FMP and regulatory amendments would yield primarily beneficial effects to the marine environmental and ecosystem compared to existing conditions through its management toolbox, adaptive management approach, and proposed regulatory changes. Therefore, this impact is less than significant.

c) Have a substantial adverse effect on federally protected wetlands as defined by Section 404 of the Clean Water Act (including, but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means?

Less than Significant. As described above in Section 3.4.1, "Environmental Setting," and in Appendix A, some eelgrass beds and other similar transitional habitats within tidally influenced areas, that have the potential to be Clean Water Act Section 404 jurisdictional coastal wetland areas, are present within the project area. Current recreational fishing practices may include the placement of hoop nets in these transitional habitats (AMS 2015). Under the FMP management tools and proposed regulatory changes, this recreational fishing activity would not change substantially or increase in overall amount. Currently, hoop netting typically does not result in removal, fill, or other substantial effects to these transition habitat areas. All other applicable guidelines regarding bycatch and maintenance would be observed with implementation

of the FMP and regulatory amendments; no additional effects to these habitats would result. This impact would be less than significant.

d) Interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites?

Less than Significant. Under existing fishing practices, potential bycatch in hoop nets and commercial traps could have minor effects on movement of native resident or migratory fish and invertebrates by interfering with movement. However, this would be a less-than-significant effect, because the majority of bycatch is released alive and is not a substantial issue with the current fisheries. Under the harvest control rule toolbox conservations and management measures and proposed regulatory changes, the risk of bycatch and marine wildlife gear interactions, including entanglement of migratory whales, would not increase and would potentially decrease as a result of fewer commercial traps and improved management practices for both fisheries, such as the provision to recover abandoned traps. As described above in Section 3.4.2, "a," "b," and "c," substantial impacts to habitats and substrates would not occur from implementation of the FMP and regulatory amendments and, thus, no substantial interference with movement or effect to native fish and wildlife nursery sites would occur. As the FMP takes into account fecundity and reproductive success of the California spiny lobster, a native species, nursery sites within the project area for this endemic species could see beneficial effects from implementation of one or more of the regulatory options in the harvest control toolbox, such as a sex-selective fishery and/or District closures. This impact would be less than significant.

e) Conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance?

f) Conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or state habitat conservation plan?

No Impact. There are no adopted Habitat Conservation Plans or Natural Community Conservation Plans within the project area. The guiding regulation regarding the conservation and management of marine living resources off California in the project area is the MLMA. As such, the Spiny Lobster FMP and proposed regulatory changes have been developed in accordance with the protocols and objectives of the MLMA and do not conflict with any of its provisions. Specifically, as described in Section 2.2, "Project Background," the MLMA calls for "conservation, sustainable use, and restoration of California's marine living resources" (FGC Section 7050[b]). This includes the conservation of healthy and diverse marine ecosystems and marine living resource, including the development of FMPs. In addition, the primary goal of the FMP and regulatory amendments is to maintain a sustainable fishery, in accordance with the MLMA. In addition, the FMP and regulatory amendments have been developed to complement the provisions of the MLPA, for the protection of the marine ecosystem. Because the FMP and regulatory amendments have been developed as a result of and in accordance with the MLMA, there would be no conflict with these or other local policies or ordinances for protecting biological resources; nor would there be conflict with the provisions of any approved habitat conservation plan. Therefore, there would be no impact.

3.5 CULTURAL RESOURCES

ENVIRONMENTAL ISSUES	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
V. Cultural Resources. Would the project:				
a) Cause a substantial adverse change in the significance of a historical resource as defined in Section 15064.5?	☐	☐	☒	☐
b) Cause a substantial adverse change in the significance of an archaeological resource pursuant to Section 15064.5?	☐	☐	☒	☐
c) Directly or indirectly destroy a unique paleontological resource or site or unique geologic feature?	☐	☐	☐	☒
d) Disturb any human remains, including those interred outside of formal cemeteries?	☐	☐	☐	☒
e) Cause a substantial adverse change in the significance of a tribal cultural resource as defined in Public Resources Code 21074?	☐	☐	☐	☒

3.5.1 Environmental Setting

Cultural resources include prehistoric and historic archaeological sites, districts, and objects; historic structures, buildings, districts, and objects; and locations of important historic events, or sites of traditional/cultural importance. Cultural resources are primarily found on land, but submerged resources such as shipwrecks and prehistoric and historic sites and artifacts are known to occur in the coastal waters of California. The Bureau of Ocean Energy Management (BOEM) formerly the Minerals Management Service (MMS) conducted baseline archaeological studies that cover the entire Pacific Region, including the Archaeological Resource Study from Morro Bay to the U.S.-Mexico border, which encompassed the project area (MMS 2001, cited in CDFW 2002). The baseline study for southern California documented 1,681 known prehistoric archaeological sites between Morro Bay and the Mexico border. A total of 4,443 prehistoric archaeological sites were documented along the Pacific coast, and it is likely that there are thousands of additional undocumented sites (MMS 2001, cited in CDFW 2002). Record searches for offshore marine cultural resources were also conducted at regional centers of the California Historical Resources Information System, and a Sacred Lands File Search was conducted by the NAHC for the *South Coast Marine Protected Areas Project EIR*, which is within the same area of potential effect as the project area. No submerged sacred lands were identified (California Fish and Game Commission 2010).

The California State Lands Commission has compiled a database of shipwrecks off the coast of California. The information can be viewed at http://shipwrecks.slc.ca.gov and is incorporated by reference. The baseline study for southern California identified a total of 916 shipwrecks between Morro Bay and the U.S.-Mexico border (MMS 2001 cited in CDFW 2002).

Archaeological evidence from the Channel Islands indicates that prehistoric populations may have settled in the area and traversed coastal areas by water as early as 13,000 years ago (MMS 2001 cited in CDFW 2002). Although sea levels were much lower than today, the Channel Islands still were separated from the mainland by a minimum of 5 miles. The presence of archaeological sites dating to the late Pleistocene/Early Holocene era, approximately 12,000 to 8,000 years Before Present, suggests that maritime travel occurred between the coast of California and the islands, and that aboriginal populations may have exploited littoral and nearshore resources (MMS 2001, cited in CDFW 2002).

The first European exploration of the southern and central California coast occurred in 1542 from vessels under the command of Juan Rodriquez Cabrillo. During the exploration, Cabrillo died and, according to some sources, is buried on one of the offshore Channel Islands (MMS 2001 cited in CDFW 2002). For the next 267 years, until permanent Spanish colonization started in 1769, the area was largely ignored, except for an occasional voyage of exploration and discovery. Vessels of commerce, the Manila Galleons, sailed down the California coast en route to Acapulco, Mexico from Asia (MMS 2001 cited in CDFW 2002).

During the American period (1846 to present), shipping along the California coast increased. Before completion of the Southern Pacific Railroad, coastal communities, most of which lacked natural harbors, constructed piers as a means of accessing maritime trade for shipment of agricultural products. A thriving lumber trade between ports in the Pacific Northwest and the coastal communities developed and continued into the 1920s. In the 20th century, as coastal trade decreased, it was replaced by trans-Pacific trade, commercial fishing, military, petroleum exploration and development, and leisure as sources of widespread maritime activity. The California coast contains the remains of the various vessels that met calamity while engaged in maritime activities. Shipwrecks tend to be concentrated around sites where maritime traffic was concentrated (CDFW 2002).

NATIVE AMERICAN OUTREACH AND CONSULTATION

The California Natural Resources Agency (CNRA), of which CDFW is a member, adopted its Tribal Consultation Policy in 2012. The policy requires effective consultation between departments of CNRA and California tribes (CNRA 2012). In October 2014, CDFW adopted its own Tribal Communication and Consultation Policy. In accordance with these policies, in 2013 and 2015, CDFW sent notices to request input on the California Spiny Lobster FMP and/or government-to-government consultation to all federally recognized tribes whose ancestral lands are proximate to the project area (Appendix B).

In 2015, the Legislature passed AB 52 and the Governor signed it into law. The statute amended CEQA to establish tribal consultation procedures for evaluation of potential effects to tribal cultural resources. To initiate the AB 52 consultation process, tribes must submit a written request to a lead agency to be informed through formal notification of proposed projects in the geographic area that is traditionally and culturally affiliated with the tribe (PRC Section 21080.3.1[b]). All tribes proximate to the project area that have submitted to CDFW a written request for such notification were included in CDFW's two prior consultation notices. Therefore, no additional notification or consultation is required pursuant to Public Resources Code 21080.3.1.

3.5.2 Discussion

a) Cause a substantial adverse change in the significance of a historical resource as defined in Section 15064.5?

Less than Significant. Historical resources include standing buildings (e.g., houses, barns, outbuildings, cabins), intact structures (e.g., dams, bridges, piers), and submerged resources related to historic maritime activities. Although historic piers, docks, or marinas could occur within the project area, the FMP and regulatory amendments would not result in the use of facilities that are not already used for the lobster fishery. In addition, the project would not result in an increase in the overall use of existing facilities beyond current conditions. Furthermore, areas of known shipwrecks are typically avoided, because of the high potential for gear damage or losses. While the possibility of fishing gear encountering a shipwreck or other historic resource cannot be eliminated, it would be essentially the same as current conditions, because the proposed FMP and regulatory amendments would not cause an increase in the overall amount of fishing activity. Therefore, this impact would be less than significant.

b) Cause a substantial adverse change in the significance of an archaeological resource pursuant to Section 15064.5?

Less than Significant. As described in Section 3.5.1, there are recorded archaeological resources within the tidal and submerged water within the project area. However, the FMP and regulatory amendments would not increase the overall amount of fishing activity that could disturb archaeological resources, nor would it change the locations where fishing activities currently occur that could adversely affect the significance of any known archaeological resources within the project area. In addition, regulatory amendments, such as setting a commercial trap limit, would reduce the potential to affect submerged archaeological resources over time by limiting the number of traps making contact with the sea floor, where archaeological resources have the potential to occur. Therefore, this impact would be less than significant.

c) Directly or indirectly destroy a unique paleontological resource or site or unique geologic feature?

No Impact. The FMP and regulatory amendments would not result in an increase in activities that would directly or indirectly destroy paleontological or geologic features. As stated in the response for question "b" above, some regulatory amendments may decrease the potential for the California spiny lobster fisheries to affect the sea floor, which is where paleontological and geologic features have the potential to occur. Therefore, there would be no impact.

d) Disturb any human remains, including those interred outside of formal cemeteries?

No Impact. No known sites of human remains or burials have been identified within the project area. In addition, the FMP and regulatory amendments would not result in excavation or other activities that have the potential to directly or indirectly disturb any known human remains. Therefore, there would be no impact.

e) Cause a substantial adverse change in the significance of a tribal cultural resource as defined in Public Resources Code 21074?

No Impact. CDFW has conducted outreach to California tribes in accordance with the 2012 CNRA Tribal Consultation Policy, the 2014 CDFW Tribal Communication and Consultation Policy, and AB 52. Letters to tribal representatives were sent on October 10, 2013 and October 19, 2015 to invite tribal input on the FMP and proposed amendments to the commercial and recreational fishing regulations. No tribal cultural resources have been identified in the project area, recognizing the project area consists of the marine environment off the state's coast. Because CDFW previously notified all tribes proximate to the project area, offered to consult with them regarding the proposed action, and received no responses, CDFW has complied with both its own consultation requirements and those of AB 52. The FMP and regulatory amendments would have no impact on tribal cultural resources, because activities associated with reasonably foreseeable compliance responses would occur in marine waters off the California coast and would not alter the ocean floor.

3.6 GEOLOGY AND SOILS

ENVIRONMENTAL ISSUES	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
VI. Geology and Soils. Would the project:				
a) Expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving:				
i) Rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist for the area or based on other substantial evidence of a known fault? (Refer to California Geological Survey Special Publication 42.)	☐	☐	☒	☐
ii) Strong seismic ground shaking?	☐	☐	☒	☐
iii) Seismic-related ground failure, including liquefaction?	☐	☐	☒	☐
iv) Landslides?	☐	☐	☒	☐
b) Result in substantial soil erosion or the loss of topsoil?	☐	☐	☐	☒
c) Be located on a geologic unit or soil that is unstable, or that would become unstable as a result of the project, and potentially result in on- or offsite landslide, lateral spreading, subsidence, liquefaction, or collapse?	☐	☐	☐	☒
d) Be located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code (1994, as updated), creating substantial risks to life or property?	☐	☐	☐	☒
e) Have soils incapable of adequately supporting the use of septic tanks or alternative waste water disposal systems where sewers are not available for the disposal of waste water?	☐	☐	☐	☒

3.6.1 Environmental Setting

The Cenozoic geologic history (past 67 million years) of the Pacific coastal margin has been dominated by the interaction of oceanic and continental tectonic plates. Along the southern coast of California, north-northwest movement of the Pacific Plate relative to the North American Plate has resulted in the formation of the San Andreas and subsidiary fault systems (CDFW 2002).

The project area is in a seismically-active area, and numerous faults, several of which are potentially active, transverse the area (California Geological Survey 2010). A “potentially active fault” is defined as a fault that has shown evidence of surface displacement within the past 1.6 million years (i.e., Quaternary Period, which includes the Holocene and Pleistocene epochs), but with no evidence of activity in the last 11,000 years. Portions of the project area are also encompassed in several Alquist-Priolo Earthquake Fault Zones mapped by the California Geological Survey. Seismically active areas along the coast and marine environment, including the project area, are also susceptible to tsunamis. Potential impacts related to tsunamis are discussed below in Section 3.9, “Hydrology and Water Quality.”

The geology of the project area relates to the seafloor, which comprises the shore, continental shelf, continental slope and rise, and deep-sea bottom. Because of the variability of the coastline and offshore topography, the distance that the shelf extends from shore varies from approximately 1 nautical mile to 25 nautical miles. The continental slope extends from approximately 200 meters (m) in depth to an average depth of a few thousand meters. The continental slope can be further divided into upper, middle, and lower slope areas. The upper slope areas are from 200-500 m depth, middle slope between 500-1,200 m depth, and the lower slope between 1,200 and approximately 3,200 m depth (CDFW 2002).

The sea floor has representations of all major types of sediment: sand, mud, silt, hard rock outcrops including pinnacles, cobbles and gravel, and clays. Low-relief rocky ocean outcrops (2 to 3 meters relief) provide unique habitat for a variety of fish and invertebrates (CDFW 2002).

3.6.2 Discussion

a) Expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving:

i) Rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist for the area or based on other substantial evidence of a known fault? (Refer to California Geological Survey Special Publication 42.)

Less than Significant. Portions of the project area are within Alquist-Priolo Earthquake Fault Zones, and several potentially active faults are located within the area. However, the project area is within a marine environment, and implementation of the FMP and regulatory amendments would not include construction of any structures that would directly expose people or structures to rupture of an earthquake fault. It is not anticipated that there would be a direct effect to fishermen regarding substantial adverse effects from rupture of a known earthquake fault from any changes to management of the fisheries from the project. Therefore, this impact would be less than significant.

ii) Strong seismic ground shaking?

Less than Significant. As discussed above in this section~~,~~ under "a(i)," although the project area is in an area with numerous faults, the FMP and regulatory amendments only pertain to the marine environment and would not directly expose or increase existing exposure of people or structures to seismic ground shaking that could occur on land. The potential for the FMP and regulatory amendments to expose people to tsunamis is discussed in Section 3.9, "Hydrology and Water Quality." This impact would be less than significant.

iii) Seismic-related ground failure, including liquefaction?

Less than Significant. As discussed above in this section~~,~~ under question "a(i)," although the project area is in an area with numerous faults, the FMP and regulatory amendments only pertain to the marine environment and would not directly expose people or structures to seismic-related ground failure or liquefaction that could occur on land nor increase existing exposure to seismic-related ground failure, including liquefaction. This impact would be less than significant.

iv) Landslides?

Less than Significant. As discussed above in this section~~,~~ under question "a(i)," the FMP and regulatory amendments only pertain to the marine environment and would not directly expose people or structures to

landslides that could occur on land or increase existing exposure. Although underwater landslides have the potential to occur, the FMP and regulatory amendments would not increase the number of fishing vessels that would be exposed to underwater landslides. This impact would be less than significant.

b) Result in substantial soil erosion or the loss of topsoil?

No Impact. The project area is within a marine environment, and soil erosion and loss of topsoil are land-based occurrences. Therefore, the FMP and regulatory amendments would have no impact on soil erosion or loss of topsoil.

c) Be located on a geologic unit or soil that is unstable, or that would become unstable as a result of the project, and potentially result in on- or offsite landslide, lateral spreading, subsidence, liquefaction, or collapse?

No Impact. The project area is within a marine environment, and unstable soils is a land-based occurrence. Therefore, the FMP and regulatory amendments would have no impact on unstable soils.

d) Be located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code (1994, as updated), creating substantial risks to life or property?

No Impact. The project area is within a marine environment, and expansive soil is a land-based occurrence. Therefore, the FMP and regulatory amendments would have no impact on expansive soils.

e) Have soils incapable of adequately supporting the use of septic tanks or alternative waste water disposal systems where sewers are not available for the disposal of waste water?

No Impact. The project area is within a marine environment, and soils incapable of supporting septic tanks are land-based occurrences. In addition, no septic tanks are proposed as part of the FMP or regulatory amendments. Therefore, the FMP and regulatory amendments would have no impact on soils incapable of supporting septic tanks.

3.7 GREENHOUSE GAS EMISSIONS

ENVIRONMENTAL ISSUES	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
VII. Greenhouse Gas Emissions. Would the project:				
a) Generate greenhouse gas emissions, either directly or indirectly, that may have a significant impact on the environment?	☐	☐	☒	☐
b) Conflict with an applicable plan, policy or regulation adopted for the purpose of reducing the emissions of greenhouse gases?	☐	☐	☒	☐

3.7.1 Environmental Setting

Certain gases in the earth's atmosphere, classified as greenhouse gases (GHGs), play a critical role in determining the earth's surface temperature. GHGs are responsible for "trapping" solar radiation in the earth's atmosphere, a phenomenon known as the greenhouse effect. Prominent GHGs contributing to the greenhouse effect are carbon dioxide (CO_2), methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride.

Recent scientific research indicates that elevated concentration of GHG in the atmosphere and global warming trends are attributed to anthropogenic activities. It is extremely unlikely that global climate change of the past 50 years can be explained without the contribution from human activities (Intergovernmental Panel on Climate Change [IPCC] 2007:86). By adoption of Assembly Bill (AB) 32, the California Global Warming Solutions Act of 2006, and Senate Bill (SB) 97, the State of California has acknowledged that the effects of GHG emissions cause adverse environmental impacts. AB 32 mandates that emissions of GHGs must be capped at 1990 levels by the year 2020 (Health and Safety Code section 38530).

Emissions of GHGs have the potential to adversely affect the environment because such emissions contribute, on a cumulative basis, to global climate change. Although the emissions of one single project, such as this, would not cause global climate change, GHG emissions from multiple projects throughout the world could result in a cumulative impact with respect to global climate change. According to ARB's 2000-2013 GHG Inventory, intrastate water-borne activity accounted for 1.67 million metric tons of CO_2 equivalents, or less than half a percent of the statewide GHG emissions in 2013 (ARB 2015).

Legislation and executive orders on the subject of climate change in California have established a statewide context and a process for developing an enforceable statewide cap on GHG emissions. Given the nature of environmental consequences from GHGs and global climate change, CEQA requires that lead agencies consider evaluating the cumulative impacts of GHGs, even relatively small (on a global basis) additions. Small contributions to this cumulative impact (from which significant effects are occurring and are expected to worsen over time) may be potentially considerable and therefore, significant.

Therefore, the global climate change analysis presented in this section assesses the change in GHG emissions associated with compliance response activities discussed in Section 2.6 that would occur under implementation of the proposed Spiny Lobster FMP.

The affected fishing areas managed by the FMP are under several air district jurisdictions, as discussed under Section 3.3.2 above. Many, but not all of these air districts, have recommended thresholds of significance for GHG-emissions from projects and other activities. Available thresholds are generally based on the emissions reduction targets for the year 2020 mandated by AB 32 and address emissions of CO_2e,

which is a measurement used to account for the fact that different GHGs have different potential to retain infrared radiation in the atmosphere and contribute to the greenhouse effect. This potential, known as the global warming potential of a GHG, is dependent on the lifetime, or persistence, of the gas molecule in the atmosphere.

Within the plan project area, only SCAQMD and SBCAPCD have recommended GHG thresholds (10,000 metric tons per carbon dioxide equivalent [MT CO_2e] per year in both districts). However, their thresholds are only applicable to stationary sources, such as industrial facilities. Outside of the project area, the Bay Area Air Quality Management District (BAAQMD) developed a GHG emissions threshold of 1,100 metric tons per year (MT/year) of CO_2e for land use development projects. Although the proposed project does not consist of land use development, the threshold of 1,100 MT/year of CO_2e is used in this analysis for comparative purposes. This approach is considered to be conservative (i.e., avoiding the risk of understating an impact), because the standard of 1,100 MT/year of CO_2e is more stringent than applying SCAQMD's and SBCAPCD's stationary source threshold of 10,000 MT/year of CO_2e (BAAQMD 2012, SCAQMD 2015, SBCAPCD 2015).

3.7.2 Discussion

a) Generate greenhouse gas emissions, either directly or indirectly, that may have a significant impact on the environment?

Less than Significant. Although the FMP could result in the seasonal shifting of fishing vessel activity either spatially or temporally through potential seasonal District closures, it would not cumulatively increase overall annual fishing vessel activity and nor would it substantially affect associated fuel combustion above the current baseline. The FMP does not change the current permit limit for the commercial fishery. Under existing conditions, commercial fishing activity varies based on the market demand and resource availability for California spiny lobster. Historical changes in total lobster take have shown a propensity to change with market demand, price and resource availability and to a lesser degree on ecological conditions and regulatory changes, as discussed in the Spiny Lobster FMP (CDFW 2015a: Table 2-3, Figure 2-4, and Figure 2-6). The factors that affect commercial lobster fishing activity would affect recreational fishing activity levels in the same way. Thus, this impact would be less than significant.

b) Conflict with an applicable plan, policy or regulation adopted for the purpose of reducing the emissions of greenhouse gases?

Less than Significant. As discussed above in Section 3.7.2, "a", the project would not significantly result in increased GHG emissions from fishing vessel activity. Thus, the FMP would not conflict with any plans, policies, or regulations adopted for the purpose of reducing GHG emissions. This impact would be less than significant.

3.8 HAZARDS AND HAZARDOUS MATERIALS

ENVIRONMENTAL ISSUES	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
VIII. Hazards and Hazardous Materials. Would the project:				
a) Create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials?	☐	☐	☒	☐
b) Create a significant hazard to the public or the environment through reasonably foreseeable upset and/or accident conditions involving the release of hazardous materials into the environment?	☐	☐	☒	☐
c) Emit hazardous emissions or handle hazardous or acutely hazardous materials, substances, or waste within one-quarter mile of an existing or proposed school?	☐	☐	☒	☐
d) Be located on a site which is included on a list of hazardous materials sites compiled pursuant to Government Code Section 65962.5 and, as a result, would it create a significant hazard to the public or the environment?	☐	☐	☒	☐
e) For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project result in a safety hazard for people residing or working in the project area?	☐	☐	☒	☐
f) For a project within the vicinity of a private airstrip, would the project result in a safety hazard for people residing or working in the project area?	☐	☐	☒	☐
g) Impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan?	☐	☐	☒	☐
h) Expose people or structures to a significant risk of loss, injury, or death involving wildland fires, including where wildlands are adjacent to urbanized areas or where residences are intermixed with wildlands?	☐	☐	☐	☒

3.8.1 Environmental Setting

Materials and waste may be considered hazardous if they are poisonous (toxicity), can be ignited by open flame (ignitability), corrode other materials (corrosivity), react violently, or explode or generate vapors when mixed with water (reactivity). The term “hazardous material” is defined in law as any material that, because of quantity, concentration, or physical or chemical characteristics, poses a significant present or potential hazard to human health and safety or to the environment (California Health and Safety Code Chapter 6.95, Section 25501[o]). Federal and state laws require that soils and groundwater having concentrations of contaminants such as lead, gasoline, or industrial solvents that are higher than certain acceptable levels

must be handled and disposed as hazardous waste during excavation, transportation, and disposal. The use of hazardous materials and disposal of hazardous wastes are subject to numerous laws and regulations at all levels of government.

The project area is within the marine environment and past and present uses include commercial and recreational boating, mineral resource extraction (oil and gas), and fishing. Past and present land uses on the islands within the project area include military use, residential, commercial, and industrial uses as well as recreational uses. There are also a number of sewage outfalls along the coast that drain into the project area.

Data on historic and documented releases of hazardous materials in the surrounding area were obtained through internet searches including review of the State Water Resources Control Board (SWRCB) GeoTracker database, the USEPA Envirofacts/Enviromapper website, and the state Cortese list via the California Department of Toxic Substance Control (DTSC) EnviroStor database. According to the EnviroStor database, one federal superfund site, Montrose Chemical in the Palos Verdes Shelf, is within the project area. This site encompasses a deposit of contaminated seafloor sediment that sits on the continental shelf and slope off the coast of the Palos Verdes Peninsula, in Los Angeles County, at water depths ranging roughly from 40 to 200 m or greater. Sediment, ocean water, fish, and other ecological receptors at this location are contaminated because of discharged wastes from the Montrose Chemical Corporation and other industries. The site is actively being remediated and USEPA is currently conducting fish studies, sediment sampling, and water column sampling (DTSC 2015). No underground storage tanks, including leaking underground storage tanks, have been identified within the project area (SWRCB 2015) and no additional hazards were identified within the project area by the Enviromapper website (USEPA 2015).

One public airport, Catalina Airport, and two private airports/airstrips, Santa Cruz Island Airport and Christy Airstrip, are located on the islands within the project area. Several major airports are also located along the coast adjacent to the project area including Santa Barbara Airport, Los Angeles International Airport, and San Diego International Airport. One school, Avalon High School, is located within the project area on Santa Catalina Island.

3.8.2 Discussion

a) Create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials?

Less than Significant. Although commercial and recreational fishing for lobsters do not generate any hazardous wastes, commercial fishermen, sport hoop netters, and sport divers diving from boats would use chemicals such as antifreeze, paint, and oil during the use and maintenance of their vessels. However, the FMP and regulatory amendments would not increase the overall number of commercial or recreational vessels on the water, or the amount of overall time commercial or recreational vessels would be operating. The regulatory amendments would also not increase the type or amount of chemicals used in the lobster fishery and fishing vessels would be required to comply with federal and state regulations related to discharge of hazardous materials into water bodies. Therefore, this impact would be less than significant.

b) Create a significant hazard to the public or the environment through reasonably foreseeable upset and/or accident conditions involving the release of hazardous materials into the environment?

Less than Significant. Fuel used to operate commercial and recreational vessels could be potentially leaked into the environment in the event that a vessel was damaged. However, the FMP and regulatory amendments would not increase the potential for accidents related to commercial or recreational vessels. Several of the regulatory amendments would improve safety, which could reduce the potential for accidents

and subsequent damage to vessels that could leak hazardous wastes into the environment. Therefore, this impact would be less than significant and potentially beneficial.

c) Emit hazardous emissions or handle hazardous or acutely hazardous materials, substances, or waste within one-quarter mile of an existing or proposed school?

Less than Significant. One school, Avalon High School on Santa Catalina Island, is located within the project area. However, as discussed in this section under "a" and "b~~,~~" above, the FMP and regulatory amendments would not increase the risk exposure to the occupants of the school or emissions associated with hazardous materials. Therefore, this impact would be less than significant.

d) Be located on a site which is included on a list of hazardous materials sites compiled pursuant to Government Code §65962.5 and, as a result, would it create a significant hazard to the public or the environment?

Less than Significant. As discussed above in Section 3.8.1, the Palos Verdes Shelf, which contains an active Superfund site, is within the project area. However, the contaminated sediment bed at Palos Verdes Shelf is too deep for direct human contact. In addition, CDFW has restricted fishing activities within several portions of the Palos Verdes Shelf through the enforcement of the commercial catch ban for white croaker (FGC Section 7715(a) and (b) and CCR Title 14, Section 104). In 2013, under the MLPA, CDFW designated two MPAs, the Abalone Cove State Marine Conservation Area and the Point Vicente No-Take State Marine Conservation Area that are also partially within the footprint of the Palos Verdes Shelf. CDFW's MPAs are intended to protect natural habitats and marine life by protecting or limiting removal of wildlife from within their boundaries (USEPA 2014). Because fishing is restricted within some portions of the Superfund site and the site is actively being remediated (including fishing studies being conducted by USEPA to ensure that fish being taken from this area are considered safe), this site would not pose a threat to commercial or recreational lobster fishing. In addition, the FMP and regulatory amendments would not increase the amount of lobster fishing activity in this area. Therefore, this impact would be less than significant.

e) For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project result in a safety hazard for people residing or working in the project area?

Less than Significant. As discussed above in Section 3.8.1, one public and two private airports are located within the project area, and several large airports are adjacent to the project area. Therefore, the project area is within the flight path of several airports. However, commercial and recreational fishing is currently occurring within the project area, and the FMP and regulatory amendments would not cause an overall increase in fishing in the project area. In addition, there would be no changes to the air traffic patterns over the project area and no increase in the exposure of people to a safety hazard. This impact would be less than significant.

f) For a project within the vicinity of a private airstrip, would the project result in a safety hazard for people residing or working in the project area?

Less than Significant. There are two private airstrips within the project area. However, as discussed above under "e" ~~above~~, the FMP and regulatory amendments would not cause an overall increase in fishing in the project area and would not result in any changes to the air traffic patterns that would expose people to a safety hazard. This impact would be less than significant.

g) Impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan?

Less than Significant. The FMP and regulatory amendments would not cause an overall increase in fishing that is currently occurring within the project area. In addition, the FMP and regulatory amendments would not cause an overall increase in the magnitude of fishing vessels in the project area at a given time ~~that would;~~. ~~t~~The project would not modify or interfere with any existing emergency response plan or emergency evacuation plan. Therefore, this impact would be less than significant.

h) Expose people or structures to a significant risk of loss, injury, or death involving wildland fires, including where wildlands are adjacent to urbanized areas or where residences are intermixed with wildlands?

No Impact. The project area is within the marine environment and is not subject to wildfires. In addition, the FMP and regulatory amendments would not result in changes that would increase the potential for igniting fires onboard of fishing vessels. Therefore, there would be no impact.

3.9 HYDROLOGY AND WATER QUALITY

ENVIRONMENTAL ISSUES	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
IX. Hydrology and Water Quality. Would the project:				
a) Violate any water quality standards or waste discharge requirements?	☐	☐	☒	☐
b) Substantially deplete groundwater supplies or interfere substantially with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table level (e.g., the production rate of pre-existing nearby wells would drop to a level that would not support existing land uses or planned uses for which permits have been granted)?	☐	☐	☐	☒
c) Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, in a manner which would result in substantial on- or offsite erosion or siltation?	☐	☐	☐	☒
d) Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, or substantially increase the rate or amount of surface runoff in a manner which would result in on- or offsite flooding?	☐	☐	☐	☒
e) Create or contribute runoff water which would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff?	☐	☐	☒	☐
f) Otherwise substantially degrade water quality?	☐	☐	☒	☐
g) Place housing within a 100-year flood hazard area as mapped on a federal Flood Hazard Boundary or Flood Insurance Rate Map or other flood hazard delineation map?	☐	☐	☐	☒
h) Place within a 100-year flood hazard area structures that would impede or redirect flood flows?	☐	☐	☐	☒
i) Expose people or structures to a significant risk of loss, injury, or death involving flooding, including flooding as a result of the failure of a levee or dam?	☐	☐	☐	☒
j) Result in inundation by seiche, tsunami, or mudflow?	☐	☐	☐	☒

3.9.1 Environmental Setting

Existing activities and artificial structures, such as wastewater outfalls, piers and jetties, maintenance dredging, and beach nourishment, which affect coastal water quality occur throughout the project area. Below is a list of the laws, regulations, and policies designed to protect water quality within the project area:

Federal Law, Regulations, and Policies:

- Federal Water Pollution Control Act of 1972 (Clean Water Act) (33 U.S.C. 1251 et seq.)
- Rivers and Harbors Act of 1899
- Coastal Zone Management Act of 1972 (16 U.S.C. 1451-1464)
- National Marine Sanctuaries Act
- Estuary (Estuarine) Protection Act of 1968 (PL 90-454, as amended; 16 U.S.C. 1221 et seq.)
- National Park Act of August 19, 1916 (Organic Act), (16 U.S.C. 1, et seq.)
- Marine Protection, Research and Sanctuaries Act (33 U.S.C. 1401 et seq.)
- National Wildlife Refuge System Administration Act of 1966 and National Wildlife Refuge System Improvement Act of 1997
- Oil Pollution Act of 1990 (33 U.S.C. 2701-2761)
- Executive Order 11990 – Protection of Wetlands

State Law, Regulations, and Policies:

- Public Trust Doctrine
- Porter-Cologne Water Quality Control Act (Porter-Cologne)
- SWRCB Regulations for CWA Section 316(b)
- California Coastal Act (PRC Sections 30000, et seq.)
- Lempert-Keene-Seastrand Oil Spill Prevention and Response Act of 1990

Statewide Management Plans and Executive Orders:

- Ocean Plan
- Water Quality Control Plan for Control of Temperature in Coastal Interstate Waters and Enclosed Bays and Estuaries of California (Thermal Plan)
- Policy on the Use of Coastal and Estuarine Waters for Power Plant Cooling
- Water Quality Control Plan for Enclosed Bays and Estuaries

A wide range of pollution sources, both land- and water-based, affect water quality in the project area. Treated wastewater discharges associated with urbanized areas can contain both domestic and industrial wastes. Storm runoff from urbanized and non-urbanized areas can contain a variety of pollutants, with agricultural watersheds often contributing loads of pesticides and nutrients to nearshore waters. Land use varies considerably from region to region; Los Angeles County has received the poorest water quality reports for the state (URS 2010).

Five primary factors affect offshore water quality issues within the project area: 1) point source wastewater (regulated industrial and municipal discharges); 2) non-point source discharges (e.g., stormwater discharges); 3) harmful algal blooms; 4) contaminated sediment; and 5) oil spills. These issues are described in more detail below and in Appendix A (AMS 2015).

Point and Non-point Source Pollution: There are specific locations (point sources) where industrial pollution enters coastal waters; discharges from these locations are generally regulated by state or federal agencies, as listed above. The origins of these point sources include municipal wastewater treatment and disposal systems and industrial sites, such as desalination plants, power plants, aquaculture sites, and research marine laboratories. The project area does not contain any known sources of point source pollution.

Non-point Source Pollution: Non-point source pollution is the leading cause of degraded water bodies across the country. Non-point pollution sources include urban runoff, resource extraction (offshore energy extraction, sand mining, drilling and pumping of petroleum products onshore), boats (recreational vessels, commercial vessels and cruise ships), and agriculture. Potential non-point source pollution in the project area include urban runoff, resource extraction, and boats.

Algal Blooms: Certain species of phytoplankton and cyanobacteria pose threats to marine water quality through rapid reproduction or release of toxins. Harmful algal blooms occur naturally in surface waters under conditions of elevated water temperature, high nutrient levels, and reduced water flow and circulation.

Contaminated Sediments: A number of areas along the California coast have contaminated sediments, and have been designated as Superfund sites by the federal government (National Institutes of Health 2015).

Oil and Hazardous Material Spills: California has been the site of numerous accidental oil spills due to heavy oil and hazardous material tanker traffic, marine shipping, the presence of oil platforms located off the Southern California coast, and crude oil and refined produce pipelines running from platforms to onshore sites as well as along the coast.

3.9.2 Discussion

a) Violate any water quality standards or waste discharge requirements?

Less than Significant. A number of contributing factors affect the water quality in the open and intertidal marine environment as described above in Section 3.9.1, "Environmental Setting." Under current fishing practices, there is little to no contribution to the degradation of water quality. There is normally no discharge of pollutants into the environment, except small, accidental releases during routine maintenance of fishing vessels or when equipment is abandoned in the water or nearby areas. Under normal circumstances, there exists the potential for minor disturbances of the sea floor and related seasonal resuspension of sediments exist from deployment of fishing traps from both commercial and, to a lesser extent, recreational hoop nets. This resuspension could result in localized effects, but given the scope and location of the fished areas, the volumes and redistribution of sediment would be minimal, (i.e., not be greater than the size of the traps and other equipment), and would settle quickly. The project~~,~~ would not increase the number of commercial traps and recreational hoop nets currently in use. As discussed in Section 2.6, "Reasonably Foreseeable Compliance Responses," the project may reduce the number of traps used overall in the fishery, thereby, resulting in a beneficial effect reducing potential issues related to accidental discharge associated with fishing operation, equipment abandonment, and resuspension of sediment that would result in the violation of any water quality standard or waste discharge requirement; thus, potentially improving water quality and avoiding violation of any applicable standards. Therefore, this impact would be less than significant.

b) Substantially deplete groundwater supplies or interfere substantially with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table level (e.g., the production rate of pre-existing nearby wells would drop to a level that would not support existing land uses or planned uses for which permits have been granted)?

No Impact. The project is the implementation of a comprehensive management framework and associated regulatory amendments for the California spiny lobster fishery pursuant to the MLMA. The project would only affect fishing activities within the marine environment and would not affect terrestrial resources related to groundwater recharge resources of any existing or planned land uses for which permits have been granted. Furthermore, no construction of any new facilities constructed with impervious surfaces that could substantially deplete groundwater supplies or interfere substantially with groundwater affect terrestrial recharge ~~are~~ is proposed as part of this project; and no increase in the need for or use of groundwater supplies would occur as part of implementation of the project. Therefore, there would be no impact on groundwater levels or demand.

c) Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, in a manner which would result in substantial on- or offsite erosion or siltation?

No Impact. The project is the implementation of a comprehensive management framework and associated regulatory amendments for the California spiny lobster fishery pursuant to the MLMA. The FMP and regulatory amendments would only affect fishing activities within the marine environment. No land use is proposed as part of this project that modify existing drainage patterns of any affect built structures, facilities, or hydrologic features, either directly or indirectly ~~such that drainage patterns could be modified~~. Because drainage would not be modified~~,~~ in such a manner that erosion or siltation would occur~~,~~ (whether on-site within, off-site from, or adjacent to the project area)~~, would not be affected. Therefore~~, there would be no impact.

d) Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, or substantially increase the rate or amount of surface runoff in a manner which would result in on- or offsite flooding?

No Impact. As discussed above in this section under "c.”~~,~~ the project would only affect fishing activities within the marine environment. No changes to land use are proposed as part of this project that would affect structures, alter existing drainage patterns or other hydrologic features that could affect existing patterns of surface runoff or result in on- or off-site flooding from surface runoff. Only recreational and commercial lobster fishing would be affected by the project ~~and,~~; thus, there would be no effects to on- or off-site flooding. Therefore, there would be no impact.

e) Create or contribute runoff water which would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff?

Less than Significant. The FMP and regulatory amendments would only affect fishing activities within the marine environment. No land use change is proposed as part of the project, so there would be no contribution to runoff water that could exceed the capacity of existing or planned stormwater drainage systems. The FMP and regulatory amendments would not result in changes to facilities, impervious surfaces, or other structures or stormwater drainage systems such that runoff volumes, flows, or quality of polluted runoff into stormwater drainage systems would be affected. During rain events, small amounts of rainwater could be discharged directly from existing fishing vessels into the marine environment; however, this would not be an additional source of polluted runoff, compared to current conditions. The FMP and regulatory

amendments would not change overall runoff amounts, flow, or quality. Therefore, this impact would be less than significant.

f) Otherwise substantially degrade water quality?

Less than Significant. As described in the section above under "a," water conditions in the project area would be maintained or improved as a result of implementation of the FMP and regulatory amendments~~.~~, including those related to accidental discharge of pollutants, equipment abandonment, and resuspension of sediment. This impact would be less than significant.

g) Place housing within a 100-year flood hazard area as mapped on a federal Flood Hazard Boundary or Flood Insurance Rate Map or other flood hazard delineation map?

No Impact. As described in Section 1.2, "Project Location," the project area encompasses the California spiny lobster range in open marine waters. No housing would be created as part of the FMP or regulatory amendments; therefore, none would be placed within a 100-year flood hazard area as mapped on a federal Flood Hazard Boundary, Flood Insurance Rate Map, or other flood hazard delineation map. There would be no impact.

h) Place within a 100-year flood hazard area structures that would impede or redirect flood flows?

No Impact. As described in Section 1.2, "Project Location," the project area encompasses the California spiny lobster range in open marine waters. No structures would be built or placed as a result of the FMP or regulatory amendments; therefore, there would be no effect to the 100-year flood hazard area that would impede or redirect or flood flows. There would be no impact.

i) Expose people or structures to a significant risk of loss, injury, or death involving flooding, including flooding as a result of the failure of a levee or dam?

No Impact. The FMP and regulatory amendments would modify fishing activities of lobster fishermen and individual or groups of fishing vessels in the marine environment. No levees or dams are present within the project area that would expose people or vessels to a significant risk of loss, injury, or death involving flooding as a result of a levee or dam failure. Therefore, there would be no impact.

j) Result in inundation by seiche, tsunami, or mudflow?

No Impact. Seiches and mudflows are hazards generated primarily in terrestrial environments that could affect structures and people on land nearby to inland bodies of water and other inland hydrologic features. The FMP and regulatory amendments would only affect fishing activities within the marine environment; and as such, are not subject to either seiches or mudflows. Although rare, the potential exists for tsunamis to occur in the project area, which could affect existing fishing practices if vessels out at sea during such events were caught in its path. However, the FMP and regulatory amendments would not cause an increase in the overall number of fishing vessels in the project area that could be impacted by tsunami activity beyond baseline conditions because vessel numbers and geographic distribution would only shift on an infrequent basis and for short periods of time and the overall number of vessels would not increase. Therefore, there would be no impact.

3.10 LAND USE AND PLANNING

ENVIRONMENTAL ISSUES	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
X. Land Use and Planning. Would the project:				
a) Physically divide an established community?	☐	☐	☐	☒
b) Conflict with any applicable land use plan, policy, or regulation of an agency with jurisdiction over the project (including, but not limited to, a general plan, specific plan, local coastal program, or zoning ordinance) adopted for the purpose of avoiding or mitigating an environmental effect?	☐	☐	☒	☐
c) Conflict with any applicable habitat conservation plan or natural community conservation plan?	☐	☐	☐	☒

3.10.1 Environmental Setting

The project area is located in open marine waters of the state, and is not subject to any general plans, zoning designations, or land use plans that govern terrestrial development and land uses. However, the project area is adjacent to the coastal zone, and development within this area is guided by local coastal programs developed by local governments in partnership with the California Coastal Commission in accordance with the California Coastal Act. In addition, other regulatory plans that govern activities within the project area include the MLPA and associated MPAs as discussed in Sections 2.2 and 3.4.1 of this IS/Proposed ND and the proposed Spiny Lobster FMP that is the subject of this Initial Study.

The project area is within a marine environment whose maritime uses include commercial fishing vessel traffic and recreational fishing vessel uses. Land uses on the islands within the project area include low-intensity agriculture, recreation, research, and military use. There are also some residential and commercial land uses within the islands (County of Santa Barbara 2014). Adjacent land uses include residential and commercial development along the coastline and recreational and commercial facilities including marinas and boat launching facilities.

3.10.2 Discussion

a) Physically divide an established community?

No Impact. There are coastal communities adjacent to the project area and on Santa Catalina Island within the project area; however, because the FMP and regulatory amendments would only result in changes to seasonal fishing activities within the marine environment, no communities would be divided, either directly or indirectly, as a result of the changes to activities within the California spiny lobster fisheries from implementation of the FMP and regulatory amendments. Therefore, there would be no impact.

b) Conflict with any applicable land use plan, policy, or regulation of an agency with jurisdiction over the project (including, but not limited to, a general plan, specific plan, local coastal program, or zoning ordinance) adopted for the purpose of avoiding or mitigating an environmental effect?

Less than Significant. The FMP and regulatory amendments would not conflict with the MLPA or regulations governing MPAs (14 CCR Sections 632(b) and 2014). In addition, the FMP and regulatory amendments would not conflict with any existing local coastal program, because these regulatory changes would not affect development activities subject to a local coastal program. Therefore, this impact would be less than significant.

c) Conflict with any applicable habitat conservation plan or natural community conservation plan?

No Impact. The project area is not subject to a habitat conservation plan or natural community conservation plan. In addition, the proposed project is implementation of the proposed Spiny Lobster FMP and regulatory amendments, which are the subjects of this Initial Study. The Spiny Lobster FMP is intended to sustainably manage the California spiny lobster resource and seeks to improve the long-term sustainability of the fisheries. Therefore, there would be no impact.

3.11 MINERAL RESOURCES

ENVIRONMENTAL ISSUES	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
XI. Mineral Resources. Would the project:				
a) Result in the loss of availability of a known mineral resource that would be of value to the region and the residents of the state?	☐	☐	☐	☒
b) Result in the loss of availability of a locally important mineral resource recovery site delineated on a local general plan, specific plan, or other land use plan?	☐	☐	☐	☒

3.11.1 Environmental Setting

Mineral resources within the project area are limited to petroleum hydrocarbon resources, which include oil and gas deposits. The entire coast of California has the potential for the presence of oil and gas reservoirs, and there are currently active submerged lands leases producing petroleum hydrocarbons off the coast of southern California (CDFW 2002). In addition, there are several oil and gas fields within the project area (BOEM 2009).

3.11.2 Discussion

a) Result in the loss of availability of a known mineral resource that would be of value to the region and the residents of the state?

No Impact. Although there are oil and gas extraction sites within the project area, implementation of the FMP and regulatory amendments would not affect the production or extraction of those resources. Currently lobster traps can be set along submerged pipelines and this would not change with implementation of the FMP and regulatory amendments. Thus, ~~there; nor would~~ there would be no loss of any known mineral resources, or preclusion of future access to any mineral resources. Therefore, there would be no impact.

b) Result in the loss of availability of a locally important mineral resource recovery site delineated on a local general plan, specific plan, or other land use plan?

No Impact. Although there are oil and gas extraction sites within the project area, as discussed in this section under question “a” above, the FMP and regulatory amendments would not affect the production or extraction of these resources. Thus, there would be no loss of or preclusion of future access to any mineral resources. Therefore, there would be no impact.

3.12 NOISE

ENVIRONMENTAL ISSUES	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
XII. Noise. Would the project result in:				
a) Exposure of persons to or generation of noise levels in excess of standards established in the local general plan or noise ordinance, or in other applicable local, state, or federal standards?	☐	☐	☒	☐
b) Exposure of persons to or generation of excessive groundborne vibration or groundborne noise levels?	☐	☐	☐	☒
c) A substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project?	☐	☐	☐	☒
d) A substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project?	☐	☐	☒	☐
e) For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project expose people residing or working in the project area to excessive noise levels?	☐	☐	☒	☐
f) For a project within the vicinity of a private airstrip, would the project expose people residing or working in the project area to excessive noise levels?	☐	☐	☒	☐

3.12.1 Environmental Setting

Existing noise conditions are governed by the presence of noise-sensitive receptors, the location and type of noise sources, and overall ambient noise levels. Noise-sensitive land uses are generally considered to include those uses where noise exposure could result in health-related risks to individuals, as well as places where a quiet setting is an essential element of their intended purpose. Residential dwellings are of primary concern because of the potential for increased and prolonged exposure of individuals to both interior and exterior noise levels. Additionally, land uses such as parks, schools, historic sites, cemeteries, and recreation areas are also generally considered sensitive to increases in exterior noise levels. Places of worship, and transit lodging, and other places where low interior noise levels are essential are also considered noise-sensitive. Those noted noise-sensitive land uses are also considered vibration-sensitive land uses, in addition to commercial and industrial buildings, where vibration would interfere with operations within the building, including levels that may be well below those associated with human annoyance.

It is widely accepted that humans are able to begin to detect sound level increases of 3 decibels (dB) in typical noisy environments. Further, a 5 dB increase is generally perceived as a distinctly noticeable increase, and a 10-dB increase is generally perceived as a doubling of loudness.

The proposed FMP and regulatory amendments would affect recreational and commercial lobster fishing activity in the open ocean and along coastal regions from Monterey County to San Diego County. Fishing activities would mostly occur offshore, distant from sensitive receptors. The project could also affect

activities at docks and marinas. Existing residential dwellings and other sensitive receptors are not likely be located close to marinas or docks~~;~~ but some could be present, depending on location.

Noise ordinances vary by County and City jurisdictions. Generally, operational noise levels are limited more strictly during nighttime hours so as to limit sleep disturbance at sensitive receptors. As such, higher noise levels from operational noise sources are generally allowed during daytime hours.

3.12.2 Discussion

a) Exposure of persons to or generation of noise levels in excess of standards established in the local general plan or noise ordinance, or in other applicable local, state, or federal standards?

Less than Significant. The FMP and regulatory amendments would not result in any construction activity that would generate noise disturbances. Additionally, the proposed FMP would not result in an increase in overall fishing vessel activity. In localized ocean areas, some concentration of fishing vessel operation could occur due to regulatory restrictions (e.g., District closures). However, sensitive receptors would not be present and there would be no substantial effect on the existing noise conditions from implementation of the project. Additionally, affected docking areas would likely not be in close proximity to sensitive receptors, such as hospitals, child care centers, schools, and elderly care facilities. Although some residences and water-side parks may be located close to docks, the FMP would not result in an increase in overall fishing activity ~~and~~; therefore, would not increase noise levels compared to existing conditions. Therefore, this impact would be less than significant.

b) Exposure of persons to or generation of excessive groundborne vibration or groundborne noise levels?

No Impact. The FMP would not result in any construction or other activities that would generate groundborne vibration or groundborne noise levels. Therefore, there would be no impact from implementation of the proposed project.

c) A substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project?

No Impact. The proposed FMP and regulatory amendments would not result in any permanent, fixed noise sources at docks or on the water beyond current levels. The proposed FMP would only affect fishing vessel activity, which are transient~~,~~ and vary by season and individual geographies/Districts. Thus, the proposed project would not result in any permanent increase in ambient noise levels in the project vicinity above existing levels. Therefore, there would be no impact as a result from implementation of the proposed project.

d) A substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project?

Less than Significant. The proposed FMP and regulatory amendments would not result in any temporary construction activity that would result in temporary or periodic noise disturbances. The proposed FMP would not result in overall increases in fishing vessel activity~~;~~ except in minor, localized situations from possible future implementation of one or more of the FMP HCR toolbox options (e.g., District closures). However, there would be no substantial effect on existing noise levels from implementation of the proposed project. Therefore, this impact would be less than significant.

e) For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project expose people residing or working in the project area to excessive noise levels?

Less than Significant. Although offshore areas within the project area may be within 2 two miles of public or public use airports, especially airports located directly on a shoreline, the proposed project would not expose people residing or working in the project area to excessive noise levels. There are almost a dozen coastal airports within the project region including the Santa Barbara Airport, Santa Crus Island Airport, Los Angeles International Airport, San Diego Airport, three smaller airports on Santa Catalina and San Clemente islands, and a few naval air bases. The proposed FMP would not result in increases in fishing vessel activity, except in minor, localized situations related to possible future implementation of one or more of the FMP HCR toolbox options (e.g., District closures). However, there would be no substantial effect on the existing conditions noise levels from implementation of the proposed project. In addition, the project would also not locate sensitive receptors near the vicinity of a public or public use airport. Therefore, this impact would be less than significant.

f) For a project within the vicinity of a private airstrip, would the project expose people residing or working in the project area to excessive noise levels?

Less than Significant. Although offshore areas within the project area may be within 2 miles of private airstrip, especially airstrips located directly on a shoreline, the FMP would not result in increases in fishing vessel activity except in minor, localized situations related to possible future implementation of one or more of the FMP HCR toolbox options (e.g., District closures). However, there would be no substantial effect on existing conditions from implementation of the proposed project. In addition, the project would also not locate sensitive receptors near the vicinity of a private airstrip. Therefore, this impact would be less than significant.

3.13 POPULATION AND HOUSING

ENVIRONMENTAL ISSUES	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
XIII. Population and Housing. Would the project:				
a) Induce substantial population growth in an area, either directly (for example, by proposing new homes and businesses) or indirectly (for example, through extension of roads or other infrastructure)?	☐	☐	☒	☐
b) Displace substantial numbers of existing homes, necessitating the construction of replacement housing elsewhere?	☐	☐	☐	☒
c) Displace substantial numbers of people, necessitating the construction of replacement housing elsewhere?	☐	☐	☐	☒

3.13.1 Environmental Setting

According to the U.S. Census Bureau, in 2014 the population of the six-county area that borders the project area totaled is estimated to be approximately 18 million (U.S. Census Bureau 2013). The 2014 population of the state ~~in 2014 was~~ of California is estimated at more than 38 million (U.S. Census Bureau 2013). Santa Catalina Island is the only significantly inhabited island within the project area, with a total population of 4,096 in 2010 (County of Los Angeles 2015).

3.13.2 Discussion

a) Induce substantial population growth in an area, either directly (for example, by proposing new homes and businesses) or indirectly (for example, through extension of roads or other infrastructure)?

Less than Significant. The FMP and regulatory amendments would not include construction of new housing or commercial businesses. Therefore, no direct population growth would result from implementation of the FMP or regulatory amendments. In addition, the proposed changes would not require or indirectly cause any new construction or any infrastructure modification, and no additional seasonal or permanent staff would be needed for operations and maintenance of the fishery.

The California spiny lobster fisheries have been occurring for many years, including the establishment of commercial fishing businesses to harvest lobsters, which has generated economic activity. The FMP and regulatory amendments could modify this economic activity in limited ways, but that activity would not be of a magnitude to stimulate the establishment of new businesses, population growth, or the construction of additional housing. In addition, no project characteristics would induce population growth or encourage or facilitate other activities that could substantially affect the environment, either individually or cumulatively, because the potential magnitude of economic change would be very small.

The commercial lobster fishery is a valuable fishery, with the total ex-vessel value of more than $18 million in 2014 (CDFW 2015a: Appendix VI). An economic study prepared for the 2011-2012 fishing season estimated the total recreational expenditure at approximately $37 million (CDFW 2015a: Appendix VI).

However, the FMP and regulatory amendments would not cause substantial changes in the profitability of the lobster fishery such that it would induce population growth. From an economic perspective, the project would sustain the fishery for both commercial and recreational use. Therefore, this impact would be less than significant.

b) Displace substantial numbers of existing homes, necessitating the construction of replacement housing elsewhere?

No Impact. The FMP and regulatory amendments would not remove any homes or require construction of replacement housing. Therefore, there would be no impact.

c) Displace substantial numbers of people, necessitating the construction of replacement housing elsewhere?

No Impact. The FMP and regulatory amendments would not displace any people or require construction of replacement housing. Therefore, there would be no impact.

3.14 PUBLIC SERVICES

ENVIRONMENTAL ISSUES	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
XIV. Public Services. Would the project:				
a) Result in substantial adverse physical impacts associated with the provision of new or physically altered governmental facilities, or the need for new or physically altered governmental facilities, the construction of which could cause significant environmental impacts, in order to maintain acceptable service ratios, response times, or other performance objectives for any of the public services:				
Fire protection?	☐	☐	☐	☒
Police protection?	☐	☐	☐	☒
Schools?	☐	☐	☐	☒
Parks?	☐	☐	☐	☒
Other public facilities?	☐	☐	☐	☒

3.14.1 Environmental Setting

The CDFW Southern District provides law enforcement related primarily to State fish and game laws in the project area. The California Division of Boating and Waterways (DBW) oversees all aspects of recreational boating in California including public access, safety and education, and consumer and environmental protection (DBW 2014). The U.S. Coast Guard also patrols all navigable waterways along the coast and coordinates regularly with all sheriff's departments. The U.S. Coast Guard Pacific Area covers maritime safety, security, and stewardship in the Pacific, including the project area (U.S. Coast Guard 2015).

There is one school, Avalon High School located on Santa Catalina Island, within the project area. The Channel Islands National Park is also within the project area (National Park Service 2015).

3.14.2 Discussion

a) Result in substantial adverse physical impacts associated with the provision of new or physically altered governmental facilities, or the need for new or physically altered governmental facilities, the construction of which could cause significant environmental impacts, in order to maintain acceptable service ratios, response times, or other performance objectives for any of the public services:

Fire protection?

No Impact. The FMP and regulatory amendments would not involve the construction of any new government facilities or the alteration of any existing government facilities that would increase the demand for fire protection services. In addition, the project area is within the marine environment and the potential for fires would be limited to those on board commercial or recreational fishing vessels. The FMP and regulatory

amendment would not increase the overall number of vessels in the project area or the demand for fire services. Therefore, there would be no impact.

Police protection?

No Impact. As discussed above, the FMP and regulatory amendments would not involve the construction of any new government facilities or the alteration of any existing government facilities that would increase the demand for police protection services. The FMP and regulatory amendment would not increase the overall number of vessels in the project area or the demand for police or other law enforcement services. Therefore, there would be no impact.

Schools?

No Impact. As discussed above, the FMP and regulatory amendments would not involve the construction or alternation facilities that would increase the demand for schools. There is one school within the project area; however, implementation of the FMP and regulatory amendments would not affect that school. Therefore, there would be no impact.

Parks?

No Impact. As discussed above, the FMP and regulatory amendments would not involve the construction or alteration of any facilities that would increase the demand for parks. The Channel Island National Park is within the project area; however, the FMP and regulatory amendment would not increase the use of or have an effect on this park. Therefore, there would be no impact.

Other public facilities?

No Impact. As discussed above, the FMP and regulatory amendments would not involve the construction or alteration of any facilities that would increase the demand for other public facilities. In addition, there are only 196 commercial permits and the majority of recreational vessels are not docked at public marinas. District closures could cause shifts in the location or intensity of lobster fishing within the project area; however, these shifts would not be substantial enough to require construction of new marinas or other public facilities. Therefore, there would be no impact.

3.15 RECREATION

ENVIRONMENTAL ISSUES	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
XV. Recreation. Would the project:				
a) Increase the use of existing neighborhood and regional parks or other recreational facilities such that substantial physical deterioration of the facility would occur or be accelerated?	☐	☐	☒	☐
b) Include recreational facilities or require the construction or expansion of recreational facilities that might have an adverse physical effect on the environment?	☐	☐	☒	☐

3.15.1 Environmental Setting

Recreational fishing for California spiny lobster occurs throughout the project area, except within areas closed to lobster fishing. Recreational fishermen capture California spiny lobster using hoop nets or by hand when diving (SCUBA or skin diving). Historically, diving has been more prevalent than hoop netting, although hoop netting has become the most common lobster fishing method over the past 10 years.

Other recreational uses within the project area include surfing, kayaking, beach-going, swimming, sailing, and shore and boat-based wildlife viewing. The Channel Islands National Park is also within the project area. The islands are accessible by park concessionaire boats and planes or private boat. Recreational opportunities on the islands include hiking, camping, snorkeling, kayaking, bird watching, whale watching, and photography (National Park Service 2015).

There are also a number of recreational facilities along the coast adjacent to the project area, including marinas, boat launching facilities, and beaches.

3.15.2 Discussion

a) Increase the use of existing neighborhood and regional parks or other recreational facilities such that substantial physical deterioration of the facility would occur or be accelerated?

Less than Significant. The FMP and regulatory amendments would not increase the overall level of recreational lobster fishing or change other recreational opportunities within the project area. District closures, if needed in the future, could result in shifts in the recreational fishing intensity or location within the project area during one or more seasons. However, these changes would fluctuate based on biological factors from season to season and would not cause an overall change in the amount of lobster fishing. Shifts in recreational fishing could result in slight changes in location and effort to the degree that various marinas and boat launching facilities are used, if District closures were to cause a shift in the location of open fishing grounds. This change would be small and would fluctuate between seasons depending on the factors in the Harvest Control Rule matrix described in Chapter 2, “Project Description.” The Channel Island National Park is located within the project area; however, there would be no effect on this park, because fishing activity would occur outside its boundaries. No neighborhood or other parks would be affected by the FMP or regulatory amendments, because all fishing activity is in the marine environment. Therefore, this impact would be less than significant.

b) Include recreational facilities or require the construction or expansion of recreational facilities that might have an adverse physical effect on the environment?

Less than Significant. As discussed above under "a," of this section, the FMP and regulatory amendments would not substantially change the recreational opportunities or activities within the project area. In addition, the project does not propose an expansion of the California spiny lobster fishing area; fishing areas would remain within the current extent of the project area, as described in Section 1.2, "Project Location." Therefore, no construction or expansion of recreational facilities including marinas and launching facilities would be required by any potential changes in fishing activity caused by the project and no new marinas or launching facilities would need to be constructed. This impact would be less than significant.

3.16 TRANSPORTATION/TRAFFIC

ENVIRONMENTAL ISSUES	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
XVI. Transportation/Traffic. Would the project:				
a) Conflict with an applicable plan, ordinance or policy establishing measures of effectiveness for the performance of the circulation system, taking into account all modes of transportation including mass transit and non-motorized travel and relevant components of the circulation system, including but not limited to intersections, streets, highways and freeways, pedestrian and bicycle paths, and mass transit?	☐	☐	☒	☐
b) Conflict with an applicable congestion management program, including, but not limited to level of service standards and travel demand measures, or other standards established by the county congestion management agency for designated roads or highways?	☐	☐	☐	☒
c) Result in a change in air traffic patterns, including either an increase in traffic levels or a change in location that results in substantial safety risks?	☐	☐	☐	☒
d) Substantially increase hazards due to a design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment)?	☐	☐	☐	☒
e) Result in inadequate emergency access?	☐	☐	☒	☐
f) Conflict with adopted policies, plans, or programs regarding public transit, bicycle, or pedestrian facilities, or otherwise decrease the performance or safety of such facilities?	☐	☐	☐	☒

3.16.1 Environmental Setting

Federal regulations concerning marine navigation are codified in 33 Code of Federal Regulations (CFR) Parts 1 through 399 and are implemented by the U.S. Coast Guard and the U.S. Army Corps of Engineers. Federal regulations for marine vessel shipping are codified in 46 CFR Parts 1 through 599 and are implemented by the U.S. Coast Guard, Maritime Administration, and Federal Maritime Commission (CDFW 2002).

Types of transportation in the nearshore area include: commercial ships (e.g., tankers, container ships, bulk carriers, military vessels), commercial fishing vessels, research vessels, and recreational boating. The major ports within the project area are Los Angeles, Long Beach, and the Port of San Diego (CDFW 2002).

3.16.2 Discussion

a) Conflict with an applicable plan, ordinance or policy establishing measures of effectiveness for the performance of the circulation system, taking into account all modes of transportation including mass transit and non-motorized travel and relevant components of the circulation system, including but not limited to intersections, streets, highways and freeways, pedestrian and bicycle paths, and mass transit?

Less than Significant. The proposed FMP and regulatory amendments would not conflict with any plans or policies related to circulation. Regulatory options linked to the HCR, such as potential future District closures, could result in shifts in the location and/or intensity of boating, which may result in a small effect on the distance traveled by individual fishermen to and from marinas to access fishing boats (both commercial and recreational), but would not increase overall travel. The regulatory amendments could also result in changes in the distance that fishermen travel to marinas and the distance that vessels travel if some Districts within the project area are closed (and if fishermen and the distance travelled by individual vessels from one District to another). However, all traffic would continue to occur within the same project area and to the same marinas and boat launching facilities that are currently used for lobster fishing. Commercial and recreational vessels would continue to operate in accordance with existing boating regulations governing circulation on waterways. Therefore, this impact would be less than significant.

b) Conflict with an applicable congestion management program, including, but not limited to level of service standards and travel demand measures, or other standards established by the county congestion management agency for designated roads or highways?

No Impact. There are no congestion management programs that are applicable to the project area, as it occurs within the marine environment and is not subject to any congestion management program for roads or highways. In addition, the FMP and regulatory amendments would cause little to no change in the amount of congestion within the project area from commercial and recreational vessels and would not increase the number of permits that would result in additional vessels on the water. Therefore, implementation of the FMP and regulatory amendments would not conflict with any congestion management programs. There would be no impact.

c) Result in a change in air traffic patterns, including either an increase in traffic levels or a change in location that results in substantial safety risks?

No Impact. As discussed in Section 3.8.1, there are several private and public airports within and adjacent to the project area that contribute to air traffic over the project area. However, the FMP and regulatory amendments are entirely within the marine environment and implementation of the regulatory changes would not affect any air traffic patterns. Therefore, there would be no impact.

d) Substantially increase hazards due to a design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment)?

No Impact. No new facilities would be constructed under the proposed FMP or regulatory amendments, and implementation of these changes would not involve any design feature related to any transportation of traffic-related infrastructure. Therefore, there would be no impact.

e) Result in inadequate emergency access?

Less than Significant. The proposed FMP and regulatory amendments would not change emergency access within the project area. In addition, as discussed in this section under questions "a" and "b" above, there would potentially be small shifts (minor increases or decreases) in boat traffic ~~to shift~~ within the project area's various Districts if District closures occur, resulting in reduced congestion in some areas and ~~potentially~~ a greater potential in others, but there would be no increases in the overall number of vessels that are permitted to fish that would result in vessel traffic congestion or other navigational hazards. ~~However~~ Further, as discussed above, this boat traffic would be seasonal and there would be no substantial change overall. Therefore, this impact would be less than significant.

f) Conflict with adopted policies, plans, or programs regarding public transit, bicycle, or pedestrian facilities, or otherwise decrease the performance or safety of such facilities?

No Impact. There are no public transit, bicycle, or pedestrian facilities within the project area. Implementation of the FMP and regulatory amendments would not affect any of these facilities. Therefore, there would be no impact.

3.17 UTILITIES AND SERVICE SYSTEMS

	ENVIRONMENTAL ISSUES	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
XVII.	**Utilities and Service Systems. Would the project:**				
a)	Exceed wastewater treatment requirements of the applicable Regional Water Quality Control Board?	☐	☐	☐	☒
b)	Require or result in the construction of new water or wastewater treatment facilities or expansion of existing facilities, the construction of which could cause significant environmental effects?	☐	☐	☐	☒
c)	Require or result in the construction of new storm water drainage facilities or expansion of existing facilities, the construction of which could cause significant environmental effects?	☐	☐	☐	☒
d)	Have sufficient water supplies available to serve the project from existing entitlements and resources, or are new or expanded entitlements needed?	☐	☐	☐	☒
e)	Result in a determination by the wastewater treatment provider that serves or may serve the project that it has adequate capacity to serve the project's projected demand, in addition to the provider's existing commitments?	☐	☐	☐	☒
f)	Be served by a landfill with sufficient permitted capacity to accommodate the project's solid waste disposal needs?	☐	☐	☐	☒
g)	Comply with federal, state, and local statutes and regulations related to solid waste?	☐	☐	☐	☒
h)	Interfere with utilities?	☐	☐	☒	☐

3.17.1 Environmental Setting

Many types of utilities exist in the nearshore area off the coast of California. They can generally be classified into three groups: offshore cables, offshore oil and gas pipelines, and service pipelines. Communication cables, both offshore and onshore, are regulated by the Federal Communications Commission and the California Public Utilities Commission. Offshore pipelines are under the regulatory jurisdiction of a number of federal and State agencies. In federal waters, the Federal Energy Regulatory Commission, Bureau of Ocean Energy Management, and the U.S. Department of Transportation are responsible for regulating various aspects of oil and gas pipelines. The California State Lands Commission; the Pipeline Safety Division of the Office of the State Fire Marshal; and the Department of Conservation's Division of Oil, Gas, and Geothermal Resources regulate pipelines within state waters. Service pipelines, such as sewage treatment plant outfalls, are regulated by the State Water Resources Control Board through their issuance of National Pollution Discharge Elimination System permits. The location of many submerged cables and sewage outfalls constructed before 1984 are identified on National Oceanic and Atmospheric Administration's nautical charts. However, the various locations of the U.S. Navy undersea communication cables are generally classified information and their locations are not revealed (CDFW 2002).

3.17.2 Discussion

a) Exceed wastewater treatment requirements of the applicable Regional Water Quality Control Board?

No Impact. The project is the implementation of an FMP and associated regulatory amendments for the California spiny lobster fishery pursuant to the MLMA. No restrooms would be constructed as part of the proposed FMP or regulatory amendments, and no wastewater would be generated. Therefore, the FMP and regulatory amendments would not exceed wastewater treatment requirements of the applicable RWQCBs within the project area. In addition, the project would not require the construction of new or expanded wastewater treatment facilities that would exceed those wastewater treatment requirements. There would be no impact on wastewater treatment facilities.

b) Require or result in the construction of new water or wastewater treatment facilities or expansion of existing facilities, the construction of which could cause significant environmental effects?

No Impact. Implementation of the proposed FMP and regulatory amendments would not include any facilities that would require water and would not increase the demand for water. In addition, as discussed under Section 3.17.2, question "a" above, the FMP and regulatory amendments would result in no impact related to construction of new or expanded wastewater treatment facilities. Therefore, there would be no impact.

c) Require or result in the construction of new storm water drainage facilities or expansion of existing facilities, the construction of which could cause significant environmental effects?

No Impact. No land use changes or development are proposed as part of the FMP or regulatory amendments that would generate stormwater that would require or result in the construction of new storm water drainage facilities or the expansion of existing facilities within the project area. Existing facilities would not be affected under the proposed FMP and regulatory amendments. No new facilities or expanded facilities are anticipated as a result of implementation of the FMP and regulatory amendments. Therefore, there would not be any required construction of stormwater drainage facilities and existing facilities would not generate any additional stormwater that would require expansion of an existing facility. Therefore, there would be no impact on stormwater drainage facilities.

d) Have sufficient water supplies available to serve the project from existing entitlements and resources, or are new or expanded entitlements needed?

No Impact. Implementation of the proposed FMP and regulatory amendments would not include any land uses or facilities that would require water and would or increase the demand for water. Therefore, there would be no impact related to water supply capacity.

e) Result in a determination by the wastewater treatment provider that serves or may serve the project that it has adequate capacity to serve the project's projected demand, in addition to the provider's existing commitments?

No Impact. As discussed in Section 3.17.2, question "a." FMP and regulatory amendments would not require the construction of new or expanded wastewater treatment facilities. Therefore, there would be no impact related to wastewater treatment capacity.

f) Be served by a landfill with sufficient permitted capacity to accommodate the project's solid waste disposal needs?

No Impact. Although some solid waste is currently generated by the California spiny lobster fishery, implementation of the FMP and regulatory amendments would not result in an overall increase in the level of fishing activity, and therefore, in the amount of the solid waste than that currently generated by the fishery. In addition, it is anticipated that the proposed regulatory amendments related to servicing and collecting traps could result in an increase in trap recovery; consequently, reducing marine debris and a reduction of solid waste related to unrecovered traps. Therefore, there would be no impact on landfill capacity.

g) Comply with federal, state, and local statutes and regulations related to solid waste?

No Impact. The proposed FMP and regulatory amendments would not result in a change in compliance with solid waste regulations. Therefore, there would be no impact.

h) Interfere with utilities?

Less than Significant. Although there are submerged utilities within the project area, the locations of these utilities are identified on navigational maps (except for classified utilities), and would be avoided. In addition, the FMP and regulatory amendments would not result in an overall increase in fishing activity or number of traps that would have contact with the sea floor. Therefore, the FMP and regulatory amendments would not cause an increase in interference with utilities. This impact would be less than significant.

3.18 MANDATORY FINDINGS OF SIGNIFICANCE

	ENVIRONMENTAL ISSUES	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
XVIII.	**Mandatory Findings of Significance.**				
a)	Does the project have the potential to substantially degrade the quality of the environment, substantially reduce the habitat of a fish or wildlife species, cause a fish or wildlife population to drop below self-sustaining levels, threaten to eliminate a plant or animal community, reduce the number or restrict the range of an endangered, rare, or threatened species, or eliminate important examples of the major periods of California history or prehistory?	☐	☐	☒	☐
b)	Does the project have impacts that are individually limited, but cumulatively considerable? ("Cumulatively considerable" means that the incremental effects of a project are considerable when viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable future projects.)	☐	☐	☒	☐
c)	Does the project have environmental effects that will cause substantial adverse effects on human beings, either directly or indirectly?	☐	☐	☐	☒

Authority: Public Resources Code Sections 21083, 21083.5.

Reference: Government Code Sections 65088.4.
Public Resources Code Sections 21080, 21083.5, 21095; *Eureka Citizens for Responsible Govt. v. City of Eureka* (2007) 147 Cal.App.4th 357; *Protect the Historic Amador Waterways v. Amador Water Agency* (2004) 116 Cal.App.4th at 1109; *San Franciscans Upholding the Downtown Plan v. City and County of San Francisco* (2002) 102 Cal.App.4th 656.

3.18.1 Discussion

a) Does the project have the potential to substantially degrade the quality of the environment, substantially reduce the habitat of a fish or wildlife species, cause a fish or wildlife population to drop below self-sustaining levels, threaten to eliminate a plant or animal community, reduce the number or restrict the range of an endangered, rare, or threatened species, or eliminate important examples of the major periods of California history or prehistory?

Less than Significant. As evaluated in this IS/Proposed ND, the proposed project would not substantially degrade the quality of the environment, substantially reduce the habitat of a fish or wildlife species, cause a fish or wildlife population to drop below self-sustaining levels, threaten to eliminate a plant or animal community, reduce the number or restrict the range of an endangered, rare, or threatened species, or eliminate important examples of the major periods of California history or prehistory. The proposed FMP and regulatory amendments would benefit the California spiny lobster fishery by adaptively managing it for sustainability and by avoiding any significant increase in adverse effects on the surrounding environment from fishing activity. Thus, this would be a less-than-significant impact.

b) Does the project have impacts that are individually limited, but cumulatively considerable? ("Cumulatively considerable" means that the incremental effects of a project are considerable when viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable future projects.)

Less than Significant. The potential for adverse cumulative effects were considered in the response to each question in Sections 3.1 through 3.18 of this IS/Proposed ND. In addition to project-specific impacts, this evaluation considered the potential for incremental effects that are cumulatively considerable. As a result of this evaluation, there is no substantial evidence that there are adverse cumulative effects associated with the proposed FMP and regulatory amendments that would have significant impacts or require mitigation. Pursuant to the MLMA, this project in combination with past, present, and probable future projects would contribute to the conservation of marine ecosystems and marine living resources, and would not contribute to adverse impacts to existing marine environmental conditions. Therefore, the proposed project would not otherwise combine with impacts of related development to add considerably to any cumulative impacts in the region. Cumulative impacts would be less than significant.

c) Does the project have environmental effects that will cause substantial adverse effects on human beings, either directly or indirectly?

No impact. The potential for adverse direct or indirect impacts to humans beings were considered in the evaluation of environmental impacts for this IS/Proposed ND. As a result of this evaluation, the project would not have environmental effects that would cause substantial adverse direct or indirect effects on human beings. No impact would occur.

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5 LIST OF PREPARERS

California Department of Fish and Wildlife

Tom Mason ..... Senior Environmental Scientist (Supervisory)
Julia Coates ..... Environmental Scientist
Travis Buck ..... Environmental Scientist
Marina Som ..... Environmental Scientist
Carlos Mireles ..... Environmental Scientist
Joseph Milton ..... Staff Counsel

Ascent Environmental, Inc.

Curtis E. Alling, AICP ..... Principal-in-Charge
Mike Eng ..... Project Manager
Stephanie Rasmussen ..... Assistant Project Manager
Brenda Hom ..... Air Quality and Climate Change Specialist
Lisa Kashiwase ..... GIS Specialist
Corey Alling ..... Graphics
Gayiety Lane ..... Document Production

Applied Marine Sciences, Inc.

Jay Johnson ..... Senior Oceanographer, Managing Principal
James Elliot ..... Senior Marine Biologist

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Appendix A

Summary of Marine Biological Resources and Background Water Quality in the Proposed Spiny Lobster Fisheries Management Plan Project Area and Potential Environmental Effects of the FMP on Marine Biological Resources and Water Quality

APPLIED marine SCIENCES

Technical Memorandum

Summary of Marine Biological Resources and Background Water Quality in the Proposed California Spiny Lobster Fishery Management Plan (FMP) Project Area and Potential Environmental Effects of the Proposed FMP and Regulatory Changes on Marine Biological Resources and Water Quality

***Prepared by**: Jay A. Johnson, Sr. Oceanographer, Principal and James Elliott, Sr. Marine Biologist; Applied Marine Sciences*

***Date:** November 13, 2015*

Marine Environmental Setting

California spiny lobsters (*Panulirus interruptus)* are endemic to the west coast of North America, with adults and sub-adults primarily inhabiting the region between Monterey, California and Magdalena Bay, Baja California, Mexico (Wilson 1948, Schmidt 1921, CDFW 2011), in water depths ranging from the intertidal zone to 64 meters (m) (210 feet [ft.]). Although adults are occasionally observed in Monterey Bay, the water temperatures are typically too cold to support reproduction and these individuals are assumed to have located to the area as larvae during El Niño events (Cascorbi 2004). For the purposes of this assessment, the California Spiny Lobster Fishery Management Plan (FMP) Study Area (Study Area) is the coastal water of California between the U.S.-Mexico border and the north end of Monterey Bay between the lower intertidal zone to a depth of 64 m (210 ft.).

Information on existing marine biological communities and habitats within the Project Area, as well as special status species, was obtained from regional plans and reports, including the final California Environmental Quality Act (CEQA) Environmental Impact Reports (EIRs) for the South Coast Marine Protected Areas Project (URS 2010) and Central Coast Marine Protected Areas Project (Jones & Stokes 2006), and other biological literature.

Ecosystems & Habitats

The Study Area encompasses multiple and diverse habitats and biological communities that are not only critical to maintaining the state's marine biodiversity, but also in maintaining sustainable resources and preserving the state's natural heritage. Marine ecosystems occurring within the coastal zone are initially divided into either the pelagic zone (water column) or the demersal zone (at or near the seafloor). Predominant demersal habitats include rocky and sand/gravel intertidal zones, coastal marshes, tidal flats, estuaries, and nearshore subtidal areas including seagrass beds, kelp forests, sand/mud soft substrate, natural and artificial hard substrate, and submarine canyons,

A dynamic oceanographic context further increases the biological complexity of the Southern California Bight, with complicated current patterns, upwelling, retention zones, freshwater plumes, and the interaction of warm and cold biogeographic regimes all playing a role.

Open Water Habitat (Pelagic Zone)

The pelagic or open water column ecosystem (to a water depth of approximately 200 meters) is a key region for most of coastal California since it in within this region that the majority of primary

production occurs (Jones & Stokes 2006). Marine biodiversity in this ecosystem is strongly influenced by various oceanographic processes, such as currents, water masses, and temperature. Variation in factors such as water temperature, upwelling and currents determine areas of productivity where krill, squid, anchovy, seabirds, sea turtles and marine mammals congregate in the pelagic ecosystem. In addition, oceanographic processes and cross-shelf transport can significantly affect recruitment patterns of fish and invertebrates in intertidal and nearshore communities.

The importance of these processes and their predictability is guiding our increasing knowledge concerning persistent oceanographic features, such as upwelling areas, retention areas, and freshwater plumes as important influences on regional productivity, recruitment patterns, and the movement and distribution of many species (URS 2010).

In the Project Area, which includes the Southern California Bight[1] and Central California (as far north as Monterey Bay), the primary currents are the southward-flowing, cold water California Current and the subsurface northward-flowing, warmer water California Countercurrent (McLain and Thomas 1983). In the fall and winter, the flow of the California Current is reduced and the California Countercurrent becomes stronger. As a result, the California Countercurrent flows closer to the ocean surface and more inshore and is referred to as the Davidson Current. This convergence at Point Conception creates a major biogeographic boundary that many species do not cross. Additionally, winds, ocean temperatures and salinities, tides, coastal topography, and ocean bottom features affect ocean circulation patterns.

The Project Area is typically characterized by three "seasons" that are driven largely by oceanographic conditions. These seasons are the upwelling season, wind relaxation period, and winter storm period. Upwelling of cold, nutrient-rich waters occurs in early spring and summer and generally peaks in May and June; however, there is significant variability in upwelling between years and with latitude. Upwelling is also associated with coastal features, such as headlands, and bathymetric features such as the shelf-slope break and offshore banks.

The California Current is also characterized by highly variable oceanographic conditions. The El Niño-Southern Oscillation (ENSO) is a large-scale change in atmospheric pressure, trade winds, and sea surface temperatures (SST) of the tropical Pacific that occurs every few years and has significant effects on the California Current System. During ENSO events, there is a reduction in upwelling of cold nutrient rich waters, increased onshore and northward flow, increased SST, and increased northward advection of warm, subtropical waters. ENSO events generally result in a decline in zooplankton and reductions in productivity that can affect fish, seabird, and marine mammal populations (URS 2010; Jones & Stokes 2006). The effect of climate change on ENSO events is not known (Collins et al. 2010).

Seafloor Habitats (Demersal Zone)

For the purposes of this document, the seafloor habitats present within the Project Area are initially divided between intertidal and subtidal regions, and then further separated by substrate type (as hard or soft substrate) and key ecosystems, such as kelp forests and eelgrass beds.

Intertidal Region

The shoreline represents a transition zone between the marine and terrestrial environments, and includes many important ecosystems and communities. These include cobble and rocky shores,

[1] The Southern California Bight is the coastal region between the U.S.-Mexico border and Point Conception in Santa Barbara County, California.

sandy beaches, tidal flats, coastal marsh along the shores of estuaries and lagoons, and manmade structures such as piers, jetties, and seawalls. Although sandy beaches dominate the shoreline, rocky areas also are present within the Project Area, especially within the Channel Islands and along the Central California coast. Marsh and tidal flat habitats are less common in the Project Area, and are generally found within sheltered bays and estuaries.

Rocky Shorelines:
Rocky intertidal communities, from the splash zone to the lower intertidal zone, vary in composition and structure with tidal height and wave exposure and with underlying geology. Mussel beds (*Mytilus* spp.), algal beds (*Endocladia muricata*, *Hesperophycus californicus*, *Silvetia compressa*, crustose and erect coralline algae, and many other species), and surfgrass (*Phyllospadix* spp.) are distributed patchily along rocky shores and support high biodiversity as these flora create structure to which larval organisms can settle and juveniles can find protection from predators and harsh environmental conditions.

In addition, intertidal boulders, jutting reefs, and tidepools are home to many species of snails, algae, barnacles, mussels, anemones, crabs, sea stars, and fish. Boulder/Cobble areas, also referred to as heterogeneous gravel habitats, often provide a layer of protection for burrowing organisms such as clams, chitons, and crustaceans that live in the coarse sand and gravel below (Lees 2013). Also, the mostly rocky shores of the Channel Islands and sandy beaches near rocky points on the Central California (and less so in southern California) mainland coast host a number of rookery/haulout sites for pinnipeds, including harbor seals (*Phoca vitulina richardsi*), California sea lions (*Zalophus californianus californianus*), and Northern elephant seals (*Mirounga angustirostris*), as well as colony/roosting areas for seabirds, including pigeon guillemots (*Cepphus Columba*), pelagic cormorants (*Phalacrocorax pelagicus*), Brant's cormorants (*Phalacrocorax penicillatus*), and Xantus's murrelets (*Synthliboramphus hypoleucus*) (URS 2010). Adult California spiny lobsters can occasionally be found in seagrass beds and rocky intertidal areas in the lower intertidal zones that remain submerged most of the year. Juveniles are reported to use rocky intertidal and seagrass beds as a nursery area (Engle 1979, URS 2010).

Sandy Beaches:
Sandy beach communities are structured in large part by grain size, slope of the beach, and wave energy. Most Project Area beaches are made up of fine-grained sand; however, a significant number of coarse-grained gravel beaches exist as well (URS 2010, Jones & Stokes 2006). Beaches are dynamic systems that change with wind and waves. Generally, sand is eroded from beaches in the winter and re-deposited in the summer, resulting in annual changes in beach slope and width. Seasonal fluctuations in sand abundance are affected by the creation of artificial hardened shorelines and of sand-retention structures such as groins. Sandy beaches also change over time, and these long-term changes and erosion rates can also have an affect on the land shoreward of the beach. A variety of invertebrates live in the sand and in wracks of decaying seaweed and other detritus on the sand surface, although accumulation of these materials is moderated in many locations due to beach grooming. Snails, bivalves (clams), insects, spiders, isopods, amphipods, and polychaetes (marine worms) are among the organisms that inhabit sandy beaches, and most serve as food sources for larger vertebrates, including the federally endangered western snowy plover. A variety of species including the western snowy plover, California least tern, and many pinnipeds, utilize sandy beaches for resting or rearing young. Sandy beaches play a central role in the lifecycle of some fish species, such as the California grunion (*Leuresthes tenuis*), which has a range extending from Magdalena Bay, Baja California, Mexico to the mouth of the San Francisco Bay (plus a small population in San Francisco Bay [Martin personal communication]). This small fish lays its eggs in the sand (approximately 50 to 75 mm below the surface) on beaches throughout its range with

most of the spawning occurring on Southern California sandy beaches (Allen et al. 2006; Fritzsche et al. 1985; Roberts et al. 2007; URS 2010).

Estuaries & Lagoons:
Estuaries form at the mouths of rivers and streams where freshwater and saltwater meet, and their habitats and associated biological communities vary based on salinity. This salinity may change seasonally and over longer timeframes depending upon freshwater inputs and creation or removal of barriers between the estuary and the open coast. Typically, two kinds of coastal estuaries occur: one type is permanently or semi-permanently open to the ocean and the second type is seasonally separated from the sea by sand bars. Both kinds of estuaries can be found within the Project Area and contain coastal marshes, tidal flats, and eelgrass beds.

Estuaries and lagoons are very productive coastal ecosystems and play a key role as nursery habitat for many coastal invertebrates and fish. Within the Southern California Bight portion of the Project Area, the estuaries tend to have low freshwater inputs and, therefore, generally lack freshwater and anadromous species, such as salmon and steelhead; although the latter and the Pacific lamprey are reported to occur in small annual runs (URS 2010). Key species that spend most of their lives in Southern and Central California estuaries include Pacific staghorn sculpin (*Leptocottus armatus*), bay blenny (*Hypsoblennius gentilis*), bay pipefish (*Syngnathus leptorhynchus*), arrow goby (*Clevelandia ios*), cheekspot goby (*Ilypnus gilberti*), shadow goby (*Quietula y-cauda*), as well as California killifish (*Fundulus parvipinnis*), spotted sand bass (*Paralabrax maculatofasciatus*), barred sand bass (*Paralabrax nebulifer*), several species of anchovy (*Anchoa delicatissima*, *A. compressa*), and the federally endangered tidewater goby (*Eucyclogobius newberryi*). Species that utilize estuaries seasonally, or for part of their life cycle, include topsmelt (*Atherinops affinis*), California halibut (*Paralichthys californicus*), yellowfin croaker (*Umbrina roncador*), stingray (*Urobatis halleri*), northern anchovy (*Engraulis mordax*), sharks, and several species of perch and turbot (Allen et al. 2006).

Although many Project Area estuaries contain eelgrass beds, utilization of these specific habitats by juvenile California spiny lobster has been poorly studied. In a study of California spiny lobsters in San Diego Bay using trapping, dive surveys, and acoustic tagging, lobsters were found in eelgrass and rocky habitat located near the mouth of the bay (Hovel and Neilson 2011).

Seagrass Beds:
Seagrass habitats are ecosystems that support an abundant and biologically diverse assemblage of aquatic fauna. The most common type of seagrass in estuaries and sheltered coastal bays in California is eelgrass (*Zostera marina*). A second variety of eelgrass, *Zostera pacifica*, occurs along the open coast in Southern California. Eelgrass is a flowering plant that forms dense beds and its leaves and dense, matted root system help prevent erosion and maintain stability in nearshore areas by decreasing water flow, enhancing sediment accumulation, and providing habitat for recruitment of animal species. Eelgrass beds also provide refuge, foraging, breeding, or nursery areas for many species of invertebrates, fish, and birds. Eelgrass beds are known to be located in estuaries, bays, and along the nearshore mainland coast and the Channel Islands (URS 2010).

Although *Zostera* occurs in select open coast locations, the most common type of seagrass present along the open coast is surfgrass (*Phyllospadix* spp.), also a flowering plant, which forms beds that fringe rocky coastline areas from the zero-tide level to approximately 10 to 15 ft. below the zero-tide level. *Phyllospadix* is known to occur along the northern Channel Islands, at Point Conception, along the coast of San Diego County, and at multiple locations along the central coast including near

Morro Bay and Monterey Bay. Surfgrass serves as an important nursery habitat for a variety of fish and invertebrates, including the California spiny lobster (Engle 1979; URS 2010; Jones & Stokes 2006).

Subtidal Habitats

Soft Substrate:

Soft-substrate habitats are the predominant seafloor coastal habitat throughout the Project Area. These habitats and the biological communities inhabiting them vary depending on the sediment composition. Sediment composed primarily of silt and clay is typically high in organic carbon and detrital feeding polychaetes, gastropods, and other taxa dominate the infauna. Alternatively, sandy sediment that is typically devoid of organic carbon is populated by filter feeding and carnivorous ostracods, polychaetes, amphipods, and pelecypods. Soft-substrate habitats are also found in higher energy environments where wave and bottom current energy regularly work the sediments (URS 2010; Jones & Stokes 2006).

Soft-substrate habitats are typically less taxonomically diverse with lower biotic abundance than hard-substrate habitats. Likewise, the level of taxonomic diversity and abundance typically increase with depth and the shift from highly dynamic, wave-influenced shallow waters to lower energy and less physically disturbed silt-clay sediments found in deeper water depths. Also, in deeper soft-substrate habitats, the population density tends to decrease with depth, while the standing crop increases with depth; this makes for unique species assemblages at various water depths.

Hard Substrate:

Hard-substrate habitats (often referred to as rocky reefs or hard bottom habitat) occur less frequently in the coastal water of California than soft substrate habitats. Typical species that associate with hard substrate habitats differ greatly with depth, substrate composition, and height above the seafloor. Topographic relief changes with bottom composition, ranging from gravel, cobble, and small boulders or smooth exposed rocky outcropping, to small boulders of less than a half meter (1.6 ft.) in height, to larger outcropping boulders and features that extend one meter or more above the seafloor. Low relief and mixed hard substrate habitats provide needed hard substratum to which kelp (*Macrosystis* and *Nereocystis*) and other brown, red and green algae can attach in the nearshore photic zone[2] (typically <100 ft depth). In addition, many invertebrates such as temperate water corals, soft corals/sea fans, sponges, tunicates, bryozoans, molluscs, and multiple species of anemones require hard substratum for attachment. These sessile (i.e., attached to the substrate) organisms are accompanied by an assortment of crabs, shrimp, sea stars, brittle stars, and other mobile taxa.

In addition to sessile organisms, the structural complexity of hard substrate itself provides habitat and protection for mobile invertebrates and fish. Hard-bottom habitats in each depth zone are considered to be separate habitats due to differences in associated species. In addition, the ecological assemblages associated with rocky habitats can also be influenced by the type of rock (e.g. sedimentary versus granitic reefs) or size of substrata, such as cobble versus boulder. Hard substrate habitats that occur in each of these geologically different zones supports distinct ecological assemblages.

Finally, in addition to natural hard substrate habitat, artificial man made rock jetties, pier pilings, concrete and steel bulkheads and created artificial reef structures exist within the Project Area.

[2] The Photic Zone is the surface layer of the ocean that receives sunlight.

Many artificial reefs are designed to mimic rocky reef habitats and have been constructed from a variety of materials (URS 2010) or to provide recreational opportunities by repurposing decommissioned ships or structures (Lewis and McKee 1989).

Kelp Forests:
Biogenic habitats of particular importance to coastal California are kelp forests. Two different types of kelp forests occur in the state: giant kelp (*Macrocystis pyrifera*) and bull kelp (*Nereocystis luetkeana*). For the purposes of this document, these kelp forests are identified as separate habitats since each type of kelp forest host distinguishable assemblages of organisms. Except for a few occurrences at San Miguel Island, bull kelp does not occur in the Southern California Bight region; however, the related deep-water elk kelp (*Pelagophycus porra*) occurs at depths of 60–270 ft on rock and sand along the mainland (e.g., Point Loma) and at several of the Channel Islands (Santa Catalina, San Clemente, Santa Barbara, and Santa Cruz). Other kelps are typically smaller or low-lying, and often referred to as understory canopy kelps. These understory canopy kelps include palm kelps (*Eisenia arborea*, *Pterygophora californica*), boa kelp (*Egregia menziesii*), simple bladed kelps (*Laminaria* spp., *Saccharina* spp.) and sieve and ribbed kelps (*Agarum fimbriatum, Costaria costata*) (Foster and Schiel 1985; Lindberg and Lindstrom 2010).

Giant kelp forms dense canopy areas with extensive vertical structure that are utilized by many kinds of marine life. Generally, giant kelp forests form over rocky substrate located within a relatively narrow band between 5 m and 20 m water depth where the combination of available hard substrate and adequate light provide conditions for growth (Foster and Schiel 1985). Thus, kelp forests are somewhat limited within the Project Area. Areas of particular kelp abundance include Point Cabrillo, Stillwater Cove, Granite Creek, Point Conception, Gaviota, Coal Oil Point, Campus Point-Goleta, Point Dume, Palos Verdes Peninsula, La Jolla, Point Loma, and the vicinity of the offshore islands, most notably Santa Catalina, San Miguel, Santa Rosa, San Nicolas, and San Clemente islands.

Studies have shown that the persistence and extent of kelp forests are affected by climatic and oceanographic changes, abundances of grazers, and fishing and other anthropogenic influences. Grazers, especially sea urchins, can play a large role in localized distribution of kelp (Harrold and Reed 1985), particularly when unchecked by predators such as lobster.

Kelp forests are among the most productive marine habitats along the coast of California providing habitat, feeding grounds, and nursery areas for many species of fishes and invertebrates. Juveniles of many nearshore rockfish species occur in the mid-water or upper kelp canopy. Juveniles and adults of many nearshore rockfish species, as well as cabezon, greenlings, lingcod, and many other species, associate with bottom habitats in kelp forests. Giant kelp also provides nutrient subsidies to sandy beaches as wrack washed in with tides, forming the basis of the detritus food chain for beach invertebrates and shorebirds (Dugan et al. 2003; Dugan 2006; URS 2012; Jones & Stokes 2006)

Beginning in the 1950's, giant kelp forests that were once productive off Orange, San Diego, and Los Angeles counties began to deteriorate. Pollution from domestic and industrial wastes, increased water turbidity from urban runoff, increased sea urchin grazing possibly caused by a reduction in predators, storms, and low nutrients and high temperatures caused by El Niño conditions have all been identified as factors that have contributed to this decline (Foster and Schiel 2010). As a result, major kelp restoration programs have been implemented throughout the Southern California Bight region of the Project Area.

Marine Protected Areas:

In 1999, the California legislature passed the Marine Life Protection Act that is designed to protect the state's marine natural heritage through the establishment of a statewide network of marine protected areas (MPAs). MPA locations were selected specifically so that they, in combination and spacing along the coastline, can protect the diversity and abundance of California's marine life, habitats, and ecosystems (CDFW 2015). Within the Project Area, there are 76 MPAs and 2 special closures and their existence is a key consideration in the proposed California Spiny Lobster FMP (Table 1). Of these 76 MPAs, only 7 allow any commercial or recreational harvesting of California Spiny Lobsters.

Table 1: California Marine Protected Areas Located Within the California Lobster FMP Project Area.

California Marine Protected Area	Lobster Take Allowed
Mainland Central California MPAs	
Monterey County	
Elkhorn Slough State Marine Reserve	
Elkhorn Slough State Marine Conservation Area	
Moro Cojo Slough State Marine Reserve	
Soquel Canyon State Marine Conservation Area	
Portuguese Ledge State Marine Conservation Area	
Edward F. Ricketts State Marine Conservation Area	
Lovers Point-Julia Platt State Marine Reserve	
Pacific Grove Marine Gardens State Marine Conservation Area	
Asilomar State Marine Reserve	
Carmel Pinnacles State Marine Reserve	
Carmel Bay State Marine Conservation Area	
Point Lobos State Marine Reserve	
Point Lobos State Marine Conservation Area	
Point Sur State Marine Reserve	
Point Sur State Marine Conservation Area	
Big Creek State Marine Reserve	
Big Creek State Marine Conservation Area	
San Luis Obispo County	
Piedras Blancas State Marine Reserve	
Piedras Blancas State Marine Conservation Area	
Cambria State Marine Conservation Area and State Marine Park	R
White Rock (Cambria) State Marine Conservation Area	
Morro Bay State Marine Recreational Management Area	
Morro Bay State Marine Reserve	
Point Buchon State Marine Reserve	
Point Buchon State Marine Conservation Area	
Santa Barbara County	
Vandenberg State Marine Reserve	
Point Conception State Marine Reserve	
Kashtayit State Marine Conservation Area	R
Naples State Marine Conservation Area	
Campus Point State Marine Conservation Area	

California Marine Protected Area	Lobster Take Allowed
Goleta Slough State Marine Conservation Area	
Los Angeles County	
Point Dume State Marine Conservation Area	
Point Dume State Marine Reserve	
Point Vicente State Marine Conservation Area	
Abalone Cove State Marine Conservation Area	
Orange County	
Bolsa Bay State Marine Conservation Area	
Bolsa Chica Basin State Marine Conservation Area	
Upper Newport Bay State Marine Conservation Area	
Crystal Cove State Marine Conservation Area	C, R
Laguna Beach State Marine Reserve	
Laguna Beach State Marine Conservation Area	
Dana Point State Marine Conservation Area	C, R
San Diego County	
Batiquitos Lagoon State Marine Conservation Area	
Swami's State Marine Conservation Area	
San Elijo Lagoon State Marine Conservation Area	
San Dieguito Lagoon State Marine Conservation Area	
San Diego-Scripps Coastal State Marine Conservation Area	
Matlahuayl State Marine Reserve	
South La Jolla State Marine Reserve	
South La Jolla State Marine Conservation Area	
Famosa Slough State Marine Conservation Area	
Cabrillo State Marine Reserve	
Tijuana River Mouth State Marine Conservation Area	
Island MPAs	
Richardson Rock State and Federal Marine Reserve (San Miguel Island)	
San Miguel Island Special Closure	
Harris Point State and Federal Marine Reserve (San Miguel Island)	
Judith Rock State Marine Reserve (San Miguel Island)	
Carrington Point State Marine Reserve (Santa Rosa Island)	
Skunk Point State Marine Reserve (Santa Rosa Island)	
South Point State and Federal Marine Reserve (Santa Rosa Island)	
Painted Cave State Marine Conservation Area (Santa Cruz Island)	R
Gull Island State and Federal Marine Reserve (Santa Cruz Island)	
Scorpion State and Federal Marine Reserve (Santa Cruz Island)	
Anacapa Island Special Closure	
Anacapa Island State and Federal Marine Reserve	
Anacapa Island State and Federal Marine Conservation Area	C, R
Footprint State and Federal Marine Reserve (Anacapa Channel)	
Begg Rock State Marine Reserve (San Nicolas Island Quad)	
Santa Barbara Island State and Federal Marine Reserve	
Arrow Point to Lion Head Point State Marine Conservation Area (Catalina Island)	
Blue Cavern Onshore State Marine Conservation Area (Catalina Island) Formerly known as Blue Cavern State Marine Conservation Area	
Blue Cavern Offshore State Marine Conservation Area (Catalina Island) Formerly known as Bird Rock State Marine Conservation Area	
Long Point State Marine Reserve (Catalina Island)	
Casino Point State Marine Conservation Area (Catalina Island)	

California Marine Protected Area	Lobster Take Allowed
Lover's Cove State Marine Conservation Area (Catalina Island)	
Farnsworth Onshore State Marine Conservation Area (Catalina Island)	
Farnsworth Offshore State Marine Conservation Area (Catalina Island)	
Cat Harbor State Marine Conservation Area (Catalina Island)	C, R

Source: CDFW 2015 https://www.wildlife.ca.gov/Conservation/Marine/MPAs/Network/Southern-California and https://www.wildlife.ca.gov/Conservation/Marine/MPAs/Network/Central-California
C = Commercial lobster fishing allowed, R = Recreational lobster fishing allowed

Key Marine Taxa

California Spiny Lobster

The California spiny lobster (Randall 1840) is a large marine crustacean that is fished commercially and recreationally since the 1880s (Craig et al. 2011; Shaw 1986) as a preferred food source. They are found from Monterey Bay, California, to Bahia Magdalena, Baja California, Mexico; and a small population is also found in northwestern waters of the Gulf of California (Shaw 1986) in rocky areas where they shelter beneath rocks and in crevasses during the day from low intertidal to 210 ft water depths. The majority of lobster population is found south of Point Conception, California (Barsky 2001). However, they have been reported to occur as far north as San Luis Obispo, California (Jensen 2014). They are omnivorous, feeding on the bottom at night by scavenging along the sea floor as well as feeding on a wide range of prey. As juveniles, their most common foods are molluscs, algae, sponges, hydroids, polychaetes, crustaceans, and sea urchins (Shaw 1986) while mature lobster consume red and purple sea urchins (*Strongylocentrotus franciscanus* and *purpuratus*) (Tegner and Levin 1983), molluscs such as mussels (*Mytilus californianus*) (Robles et al. 1990), and scavenge dead animals and detritus (Craig et al. 2011).

The ecological role of the California spiny lobster as predators of sea urchins in the nearshore benthic community is extremely important (Tegner and Dayton 2000, Lafferty 2004). Unchecked populations of these sea urchins are known to devastate giant kelp forests; thus, removing an important source of food and shelter for southern California marine biota and creating urchin barrens.

Lobsters mate from November through May (Barsky 2001) and spawn primarily from May through July (Shaw 1986). The age at sexual maturity is estimated to occur between 5 and 9 years for females and between 3 and 6 years for males. It has been found that approximately 50 percent of females are mature at a carapace length (CL) of 66 millimeters (mm) (2.6 inches [in.]) , and 90 percent at 69 mm (2.7 in.) CL, and carry between 50,000 and 800,000 eggs (Shaw 1986).

The number of eggs carried by a female is size dependent as larger females produce more eggs. For example, Barsky (2001) reported, "…females sampled at San Clemente Island carried between 120,000 (2.6 inches CL) to 680,000 (3.6 inches CL) eggs." Fertilized eggs hatch into tiny larvae (phyllosomas) that drift with the currents as far offshore as 350 miles and as deep as 400 ft while feeding on other planktonic animals while undergoing 12 molts (Barsky et al. 2003). The larvae transform into a juvenile stage (puerulus), which swims inshore, settles to the bottom, and begins to grow if suitable habitat is found, usually in surfgrass, mussel beds, or shallow water crevices (Barsky 2001; Barsky et al. 2003). While the numbers of eggs and initially spawned larvae are large

per individual female, the proportion surviving to settle in acceptable habitat is small. The loss of phyllosomas and pueruli is considerable due to high predation in the planktonic stage, currents that may sweep the larvae out of the geographical range acceptable for survival (Johnson 1960a), and low probability of the pueruli landing in an area of appropriate habitat.

California Department of Fish and Wildlife commercial and recreational harvesting measures currently implemented to ensure that an adequate proportion of the lobster population is composed of mature individuals that are capable of providing an adequate number of eggs for spawning include:

- Establishing a minimum size limit for lobster that can be taken in both the commercial and recreational fisheries (3.25 inches [in] CL). This allows spawning before an individual reaches legal size (sexual maturity is reached at approximately 2.5 in. CL [5 or 6 years] while the legal size is reached in 7 to 11 years) (Barsky et al. 2003).
- Requiring that lobster traps have escape ports allowing sublegal sized lobsters to escape.
- Establishing commercial and recreational lobster fishing seasons that run from early October to mid-March, thus reducing the possibility that any egg-carrying females are taken before they spawn.
- All lobster traps must have a destruct device to ensure that lost traps do not continue to fish indefinitely, continuing to trap lobster and other species (Barsky et al. 2003).
- Although the opening size is not specified, commercial lobster traps exclude the largest lobsters as the opening is sized to ensure capture of legal sized lobsters that meet market preferences (Neilson 2011).
- The number of Commercial Lobster Operator Permits is capped, creating a limited-entry fishery. Currently, there is no restriction on the total number of traps by individual permit or total number of traps fished.
- Recreational lobster fishing by divers is limited to collection by hand; no spearing or use of tools permitted.
- Recreational fishermen must have a valid sportfishing license with an ocean enhancement stamp and must also purchase a lobster report card and record information for each fishing event.
- Non-diving recreational fishermen may take lobster using 2-10 baited hoop nets, depending on the location of use, as long as the nets meet specifications by CDFW.
- Recreational lobster take is limited to seven lobsters per day and an individual may not possess more than seven total (in person, in vehicle, or at home, even if frozen) with an exception (fee applied) for multi-day fishing excursions.
- Most Marine Protected Areas (MPAs) prohibit the take of lobster.

While adult lobsters live in subtidal areas of rocky habitat, juveniles spend their first two years in surfgrass located in the lower intertidal and shallow-subtidal habitats (Barsky 2001). It is thought that adult lobsters migrate annually from offshore (deeper than 15 m [50 ft.]) to inshore as water warms following winter. Females generally move in shallower (water depths less than 9 m [30 ft.]) when carrying eggs in May and June. Many lobsters may move offshore in late October and November, possibly for protection from winter storms. Recent results of a predictive model based on lobster density data collected by divers and benthic habitat mapping inside and outside of the South La Jolla State Marine Reserve in southern California predicted that lobster densities "exhibited strong depth dependence" with higher densities in shallower areas (water depth

shallower than approximately -12 m [-40 ft.]) with acceptable bottom habitat even though nearby deeper areas (between -14 m [-40 ft]. and -18 m [-60 ft.]) also had rocky habitat (Hovel et al. 2015).

Lobsters are commercially and recreationally harvested along the California coastline primarily from Point Conception to the U.S.-Mexico border except their take is not allowed in most Marine Protected Areas (MPAs) and in some fishing districts. There are seven MPAs where recreational lobster fishing is allowed and four where commercial lobster fishing is allowed (Table 1).

While there is anecdotal information (Spearboard.com 2015) of lobster take at the northern limit of the California spiny lobster range in Monterey Bay, California, the majority of both commercial and recreational fishing occurs south of Point Conception and at the Channel Islands, where allowed. The Santa Barbara area was the northernmost area with commercial take of California spiny lobster for the 2013-2014 season (October 2013 through mid-March 2014) (CDFW 2014). The Santa Barbara area, which includes ports in Santa Barbara and Ventura counties, had the highest reported landings of lobster for the 2013-2104 season with a total of 289,587 pounds (lbs). The San Diego area, which includes ports in San Diego County, reported the second highest landings with 266,617 lbs. Finally, the Los Angeles area, which includes ports in Los Angeles and Orange counties, reported the third highest landings with 255,023 lbs. The total reported landings for California during this period was 811,227 lbs.

Neilson (2011) analyzed the commercial catch through 2010 and found two trends starting in 1976. From 1976 until 1999, total weight taken per year was variable with an upward trend to approximately 300 tonnes (~661,000 lbs). From the 2000-2001 to the 2009-2010 seasons, commercial landings were above that level. Neilson stated that "these two trends are not associated with changes in effort, size of the fishing grounds (essentially the coastal and offshore island regions of the entire bight), or changes in gear" and occurred after any regulation changes that might have affected the catch. Catch averaged over 11 years by geographic area within the California lobster fishery showed that the three areas: Santa Barbara (composite of landings at ports in Santa Barbara and Ventura counties), Los Angeles (composite of landings at ports in Los Angeles and Orange counties), and San Diego (composite of landings at ports in San Diego county) had similar proportions of the total catch (36, 31, and 33 percent, respectively) with percentages remaining fairly consistent through the time period; thus, no localized drop or increase was indicated. He also reported that DFG Block 860 in the San Diego area accounted for the majority of the San Diego County commercial catch, was 20 percent of the total southern California commercial take, and had a high recreational take. Block 860 is located from just south of Point La Jolla to the approximate center of the Silver Strand peninsula and includes the entrance and north area of San Diego Bay. As of 2012, nested within this block are three MPAs: South La Jolla State Marine Reserve, South La Jolla State Marine Conservation Area, and Cabrillo State Marine Reserve.

Commercial landing data from lobster fishing season 2010-2011 through 2013-2014 (Table 2) show that levels of catch continued to exceed the pre-2000 levels reported by Neilson (2011).

Comparison of numbers of traps pulled in 2010 compared to 2012 did show an increase in fishing effort (939,485 pulled in 2010 and 1,131,700 in 2012) with similar catch per unit effort (CPUE) (Hovel et al. 2015). This level of fishing effort is a continuation of an increase that started in 2006 (Neilson 2011), but has not resulted in a consistently increasing take of lobster. In fact, the season with the largest commercial landing weight in recent seasons is 2004-2005 before the latest increase in fishing effort (Table 2).

The recreational fishery has changed between 1992 and 2007 with the use of hoop nets; both traditional and rigid hoop nets becoming the preferred gear to take lobster and supplanting the take of lobster by hand (by either skin or Scuba diving) (Neilson 2011; Neilson and Buck 2008). Prior to 2008, recreational lobster catch was not documented except for an intensive one-season sampling in 2007 (Neilson and Buck 2008). Since the 2008-2009 lobster season, recreational fishermen were required to possess a lobster report card and record catch information. Thus, only recently has there been information available to evaluate the amount of recreational catch and provide comparison to the commercial catch. Each fisherman has their own card with a line to record information for each fishing trip, including date, location, type of gear, and the number of lobster taken with that gear. If the location or gear type is changed, that information must be recorded on a new line on the card.

Table 2: Commercial Landing (lbs) of California Spiny Lobster in California for Lobster Fishing Seasons 2000-2001 through 2013-2014 (CDFW)

Year	Landing Weight (lbs)	Year	Landing Weight (lbs)
2000-2001	702,207	2007-2008	674,049
2001-2002	681,670	2008-2009	728,186
2002-2003	717,832	2009-2010	752,673
2003-2004	681,647	2010-2011	695,361
2004-2005	919,809	2011-2012	749,628
2005-2006	698,478	2012-2013	867,514
2006-2007	881,025	2013-2014	811,227

The number of recreational fishing trips for lobster during the 2014-2015 lobster season was reported by CDFW to be estimated at 111,552, based on returned lobster report cards. Lobster caught per trip was 1.9 in the 2014-2015 season. The average number of lobsters kept per trip has remained stable at approximately 2 lobsters kept per trip for each of the eight years that lobster report card data are available. Further, an estimated 344,472 lbs. were reported as taken by recreational fishing during the 2014-2015 lobster season, which accounts for approximately 26 percent of the total weight of lobsters landed by the commercial and recreational fisheries combined for the 2014-2015 lobster season (Buck 2015). Top catch locations for the recreational fishery include Catalina Island, San Diego Bay, Long Beach/Middle Breakwater, and Santa Monica Bay (Buck 2014).

Neilson (2011) analyzed the various data collected by CDFW to assess the lobster stock by looking for changes in trends and results of modeling. Neilson found that the lobster population appears stable based on the results, although total catch by the fishing sector may be close to the maximum take. Weight of lobster taken per year was consistent for the time period1998 to 2008. This was

despite an increase in the number of traps fished, although the CPUE remained within a standard deviation of the average CPUE for that decade. Based on logbook data, high catch rates occurred during the first few weeks of each fishing season followed by a substantial decrease in catch that continues for the remainder of the season with occasional increases or decreases. Consistently, the majority of the season's catch (80 percent) occurred in approximately the first half of the season. Average weight per lobster taken varied between 1.3 to 1.6 lbs. in that decade, and 8 of the 10 years had weights of 1.3 or 1.4 lbs. per lobster. This size equates to a first or second year legal size and is a preferred market size. The percentage of total catch that were sublegal sized lobster (shorts) across the Southern California Bight was 70 percent. Over the 10 years, the proportion of shorts remained relatively constant implying that the sublegal size population is stable.

The CDFW's conclusion that the lobster fishery is stable was based on the analyses of a ten-year period of commercial lobster fishing data. At the time of their analyses, adequate recreational fishing data was not available to use in the assessment (Neilson 2011). From the data available at the time and assumptions made on fishing level for unreturned report cards, recreational fishing was estimated to have harvested 44 percent of the reported commercial catch for the assessment period. Recreational fishing did not experience the drop in CPUE after the first few weeks of each season that the commercial fishery experienced. This may be due to recreational fishermen accessing different areas such as piers, jetties, and bays. How this might affect the overall lobster population was not addressed.

Special Status Species

Within the Project Area, many special status species are known to inhabit or utilize the coastal waters. These special status species include those taxa afforded special protection under the Federal Endangered Species Act (FESA), the California Endangered Species Act (CESA), the Federal Marine Mammal Protection Act (MMPA), or the Federal Magnuson-Stevens Fishery Conservation and Management Act. In addition to those species afforded legislative protection, both the National Oceanic and Atmospheric Administration (NOAA) National Marine Fisheries Service (NMFS) and the CDFW have identified certain species as a "species of concern". This is because either agency has some concerns regarding the species status or because of potential threats to that species or there is insufficient information is available to indicate a need to list the species under FESA or CESA.

Table 3 contains all FESA, CESA and MMPA special status species known or suspected to occur within the Project Area as well as any species identified by NOAA-NMFS or CDFW as species of concern. Table 4 lists all fish and invertebrate species managed under one of three Fishery Management Plans developed by the Pacific Fisheries Management Council.

Table 3: Special-Status Marine Species That May Occur Within the Waters of the Project Area

Common Name *Scientific Name*	Listing Status		General Habitat	Potential for Species Occurrence Within Project Area	Time Period Present in Project Area Waters
	Federal FESA/ MMPA	State CESA			
***Bird Species*[1]**					
Western snowy plover (coastal population) (*Charadrius alexandrinus nivosus*)	T/-	SSC	Nest adjacent to or near tidal waters along the mainland coast, peninsulas, offshore islands, and adjacent bays and estuaries; twenty breeding sites are known in California from Del Norte to San Diego County; coastal beaches above the normal high tide limit in sparsely-vegetated flat, open areas with sandy or saline substrates.	P	Year-round[2]
California least tern (*Sterna antillarum browni*)	FE/-	CE, CFP	Nests on sandy upper ocean beaches along the San Francisco Bay and the Southern California coast from southern San Luis Obispo County south to San Diego County; forages on adjacent estuaries or the open ocean.[2]	P	Reduced presence in Project Area fall through spring. Fall southward migration for overwintering. Little is known about the actual migration routes south of the California border.[3]
California brown pelican (*Pelecanus occidentalis californicus*)	-	CFP	Present along the entire coastline, but does not breed north of Monterey County; extremely rare inland; littoral ocean zones just outside surf line; nests on offshore islands.[4]	P	Year-round
California black rail *Laterallus jamaicensis coturniculus*	-	CT, CFP	The most numerous coastal group inhabits tidal marshes mainly in the northern San Francisco Bay area, with smaller occurrences at sites from Bodega Bay to northwest Baja California. The second, intermediate-sized Central Valley group occurs at interior wetlands of Butte, Nevada, Placer, San Joaquin, and Yuba counties.[5]	P	Year-round
Ridgeway rail (previously California Clapper Rail)	FE/-	CE, CFP	Coastal wetlands and brackish areas around San Francisco, Monterey, and Morro bays.[6]	P	Year-round

Common Name *Scientific Name*	Listing Status		General Habitat	Potential for Species Occurrence Within Project Area	Time Period Present in Project Area Waters
	Federal FESA/ MMPA	State CESA			
Rallus obsoletus					
Light-footed clapper rail *Rallus longirostris levipes*	FE/-	CE, CFP	Distributed throughout coastal salt marsh habitat from Santa Barbara County, California to San Quintín Bay, Baja California, Mexico.[2]	P	Year-round
Marbled murrelet *Brachyramphus marmoratus*	FT/-	CE	From Oregon to northern Monterey Bay in central California. Birds winter throughout the breeding range and also occur in small numbers off southern California.[7]	P	Year-round
Scripps's murrelet *Synthliboramphus scrippsi*	-	CT	During the breeding season, the entire Scripps's murrelet population is concentrated within a fairly small region off the coasts of southern California and Mexico. However, birds disperse after breeding, sometimes as far north as British Columbia. Over eighty percent of the U.S. breeding population of Scripps's murrelets occurs on the Channel Islands.[8]	P	Move onshore to breed, generally in February or March, with the breeding season lasting up to six months. Present in study area during the rest of the year.[9]
Guadalupe murrelet *Synthliboramphus hypoleucus*	-	CT	Commonly breeds on the Channel Islands. Visits the southern California offshore waters on rare occasions.[8]		Year-round
Double-crested cormorant (*Phalacrocorax auritus*)	-	SSC	Winters along the entire California coast and inland over the Coast Ranges into the Central Valley from Tehama County to Fresno County; a permanent resident along the coast from Monterey County to San Diego County; rocky coastlines, beaches, inland ponds, and lakes; needs open water for foraging; nests in riparian forests or on protected islands	P	Year-round
Fish Species[1]					
Sacramento River winter-run ESU Chinook salmon	FE/-	CE	Ocean waters, Sacramento and San Joaquin Rivers; migrates from ocean through San Francisco Bay–Delta	P	Adults

Common Name *Scientific Name*	Listing Status		General Habitat	Potential for Species Occurrence Within Project Area	Time Period Present in Project Area Waters
	Federal FESA/ MMPA	State CESA			
Oncorhynchus tshawytscha			to freshwater spawning grounds		
Central Valley spring-run ESU Chinook salmon *O. tshawytscha*	FT/-	CT	Ocean waters, Sacramento and San Joaquin Rivers; migrates from ocean through San Francisco Bay–Delta to freshwater spawning grounds	P	Adults
Central Valley fall-run/late fall-run Chinook salmon *O. tshawytscha*.	FSC/-	-	Ocean waters, Sacramento and San Joaquin Rivers; migrates from Ocean through San Francisco Bay–Delta to freshwater spawning grounds, including the Napa River	P	Adults
Central California coast ESU Coho salmon *Oncorhynchus kisutch*	FE/-	CE	Ocean waters, Sacramento and San Joaquin Rivers; migrates from ocean through San Francisco Bay–Delta to freshwater spawning grounds	P	Adults
Steelhead - southern California DPS *Oncorhynchus mykiss*	FE/-	-	Migrates from ocean to coastal rivers and streams from San Mateo Creek in north San Diego County to the Smith River near the Oregon border.[2]	P	Adults
Steelhead - south central California coast DPS *O. mykiss*	FT/-	-	Ocean waters, streams and rivers ranging from Watsonville south to San Luis Obispo.[12]	P	Adults
Central California coast DPS steelhead trout *O. mykiss*	FT/-	CSC	Ocean waters, Sacramento and San Joaquin Rivers; Migrates from ocean through San Francisco Bay-Delta to freshwater spawning grounds	P	Adults
California Central Valley DPS steelhead trout *O. mykiss*	FT/-	-	Ocean waters, Sacramento and San Joaquin Rivers; Migrates from ocean through San Francisco Bay-Delta to freshwater spawning grounds	P	Adults
Green Sturgeon (Northern DPS) *Acipenser medirostris*	-	CSC	Spawn in the Klamath River in northern California. As adults, Northern DPS green sturgeon migrate seasonally	P	Year-round

Common Name *Scientific Name*	Listing Status		General Habitat	Potential for Species Occurrence Within Project Area	Time Period Present in Project Area Waters
	Federal FESA/ MMPA	State CESA			
			along the West Coast, congregating in bays and estuaries in California during the summer and fall months.[14]		
Green Sturgeon (Southern DPS) *A. medirostris*	FT/-	CSC	Marine and estuarine environments and Sacramento River	P	Year-round
Tidewater goby *Eucyclogobius newberryi*	FE/-	CSC	Coastal lagoons, estuaries, and marshes in coastal California from the Smith River (Del Norte County) to Aqua Hedionda Lagoon (San Diego County).[2]	NP	NA
Invertebrate Species[1]					
White abalone *Haliotis sorenseni*	FE/-	-	Range from Point Conception to central Baja California, Mexico, usually at depths greater than 75 feet. Often associated with deep living kelp beds.[2]	C	Year-round[15]
Black abalone *Haliotis cracherodii*	FE/-	-	Inhabits rocky intertidal areas (to depths of 20 feet in Southern California) from Oregon to southern Baja California, often within the high-energy surf zone. Presence on San Clemente Island and recruitment observed on San Nicolas and Santa Cruz Islands.[2]	C	Year-round[16]
Marine Mammal Species[1,17]					
Pacific harbor seal *Phoca vitulina*	-/FP	-	Coastal waters, and throughout the San Francisco Bay-Delta	C	Year-round
California sea lion *Zalophus californianus*	-/FP	-	Coastal waters, and throughout the San Francisco Bay-Delta	C	Year-round
Northern Elephant Seal *Mirounga angustirostris*	-/FP	-	Northern elephant seals are the largest phocid, or "true" seal, in the Northern Hemisphere. They are found in the eastern and central North Pacific Ocean. They range as far north as Alaska and as far south as Mexico, with	C	Primarily April to August with occasional occurrences in October and November. Not known to be present beyond the western segment of Central

Common Name *Scientific Name*	Listing Status		General Habitat	Potential for Species Occurrence Within Project Area	Time Period Present in Project Area Waters
	Federal FESA/ MMPA	State CESA			
			established Central California breeding colonies on the Farallon Islands, at Año Nuevo State Park, and near San Simeon, California.[3] In recent years, young-of-the-year individuals have been observed hauling out on the sandy beach at Crissy field.		Bay.
Guadalupe fur seal *Arctocephalus townsendi*	FT/FP	CT, CFP	Primarily Baja California, Mexico, but occasionally found on San Miguel and San Nicolas islands; rocky insular shorelines and sheltered coves	C	Present August through April. Breeding occurs solely on Isla Guadalupe, Mexico from May to July.[2]
Harbor porpoise *Phocoena phocoena*	-/FP	-	An inshore species inhabiting shallow, coastal waters and occasional large rivers, including San Francisco Bay-Delta	P	Year-round
Dall's porpoise *Phocoenoides dalli*	-/FP	-	Present along entire coast of California, primarily inhabiting offshore, deepwater habitat.[18]	P	Year-round
Bottlenose Dolphin *Tursiops truncatus*	-/FP	–	Found along the California coastline, bottlenose dolphins segregate into coastal or oceanic ecotypes with the coastal ecotype inhabiting waters within 1-Kilometer of shore normally between Baja, California and Point Conception	C	Potentially year-round
Common dolphins *Delphinus* spp.	-/FP	-	Present along entire coast of California, mainly offshore in areas with high seafloor relief.[19]	P	Year-round
Risso's dolphin *Grampus griseus*	-/FP	-	Present along entire coast of California, inhabiting deep oceanic and continental slope waters 400-1,000 m deep.[20]	P	Year-round
Pacific white-sided dolphin *Lagenorhynchus obliquidens*	-/FP	-	Pacific white-sided dolphins are found in temperate waters of the North Pacific (along entire coast of California). They inhabit waters from the continental shelf to the deep open ocean.[21]	P	Year-round
Northern right whale dolphin	-/FP	-	Present along entire coast of California. North-south	C	Year-round

Common Name *Scientific Name*	Listing Status		General Habitat	Potential for Species Occurrence Within Project Area	Time Period Present in Project Area Waters
	Federal FESA/ MMPA	State CESA			
Lissodelphis borealis			movements have been documented based on water temperature changes, with the movements south during the colder winter and autumn months, and north during the warmer spring and summer months.[22]		
Southern Sea Otter *Enhydra lutris*	FT/FP	CFP	Nearshore coastal environments between Santa Barbara and Half Moon Bay. Although historic inhabitants of San Francisco Bay prior to being hunted to near extinction, only occasional sightings of otters within the Bay occur.[2]	C	Potentially year-round
Gray whale – Eastern North Pacific DPS *Eschrichtius robustus*	FDL/FP	-	Coastal Waters.	C	December to April, during migration from Alaska to Baja California, occasionally enter San Francisco Bay-Delta, transient
Humpback whale *Megaptera novaeangliae*	FE/FD	-	Coastal Waters	C	April to December, during migration, occasionally enter the San Francisco Bay-Delta, transient
Short-finned pilot whale *Globicephala macrorhynchus*	-/FP	-	Found primarily in deep waters throughout tropical and subtropical areas of the world; a small population (less than 300) has been documented off the California coast. This population was larger prior to the 1982-83 El Nino.[23]	P	Year-round, in small numbers.
Sei whale *Balaenoptera borealis*	FE/FP	-	Occur in subtropical, temperate, and subpolar waters around the world. They prefer temperate waters in the mid-latitudes, along the continental shelf and slope.[24]	P	Year-round
North Pacific right whale *Eubalaena japonica*	FE/FP	-	North Pacific right whales inhabit the Pacific Ocean, particularly between 20° and 60° latitude.[25]	P	Year-round
Fin whale *Balaenoptera physalus*	FE/FP	-	Found along entire coast of California. Fin whales are migratory, moving seasonally into and out of high-latitude feeding areas, but the overall migration pattern	C	Potentially year-round.

Common Name *Scientific Name*	Listing Status		General Habitat	Potential for Species Occurrence Within Project Area	Time Period Present in Project Area Waters
	Federal FESA/ MMPA	State CESA			
			is complex, and specific routes have not been documented.[26]		
Blue whale *Balaenoptera musculus*	FE/FP	-	Blue whale populations migrate towards the poles, into cooler waters, in the summer to feed. They migrate back towards the equator, into warmer waters, in the winter to breed.[27]	C	In spring and fall during migration to and to and from poles.
Common Minke whale *Balaenoptera acutorostrata*	-/FP	-	Widespread distribution in the Northern Hemisphere, and are found throughout the northern Atlantic and Pacific Oceans. Their range extends from the ice edge in the Arctic during the summer to close to the equator during winter. Animals in the inland waters of California/Oregon/Washington are considered "residents" because they establish home ranges.[28]	C	Year-round
Orca (Killer) whale *Orcinus orca*	FE/FP	-	Occur along entire coast of California. Some resident and some transient populations.[29]	C	Distributed south to central California in winter.
Cuvier's beaked whale *Ziphius cavirostris*	-/FP	-	Can be found in most oceans and seas worldwide. Migration patterns are not known.[30,31]	P	Year-round
Bryde's whale *Balaenoptera edeni*	-/FP	-	Very small population documented off coast of California. Primarily occurs in tropical and warm temperate waters.[32]	P	Potentially year-round
Sperm whale *Physeter macrocephalus*	FE/FP	-	Ranges from the ice-edge of both hemispheres to the equator but concentrates in so-called "grounds" which coincide with areas of high marine productivity. In California, sperm whales can be seen in waters off the continental slope from November to April.[33]	P	Year-round
Marine Reptile Species[1]					
Green sea turtle *Chelonia mydas*	T/-	-	Not common within state waters of Southern California, although they are regularly sighted	C	Potentially year-round

Common Name *Scientific Name*	Listing Status		General Habitat	Potential for Species Occurrence Within Project Area	Time Period Present in Project Area Waters
	Federal FESA/ MMPA	State CESA			
			in the warm water effluent channels of power generating stations (San Gabriel River).[2]		
Loggerhead sea turtle – North Pacific DPS *Caretta caretta*	E/-	-	In the eastern Pacific, loggerheads have been reported as far north as Alaska, and as far south as Chile. In the U.S., occasional sightings are reported from the coasts of Washington and Oregon, but most records are of juveniles off the coast of California.[34]	C	Potentially year-round
Olive ridley sea turtle *Lepidochelys olivacea*	T/-	-	In the Eastern Pacific, they occur from Southern California to Northern Chile.[35]	C	Transient presence during migration between feeding and breeding grounds.
Leatherback sea turtle *Dermochelys coriacea*	E/-	-	Western Pacific leatherbacks engage in one of the greatest migrations of any air-breathing aquatic marine vertebrate, swimming from tropical nesting beaches in the western Pacific (primarily Papua Barat, Indonesia, Papua New Guinea, and the Solomon Islands) to foraging grounds in the neritic eastern North Pacific.[36]	C	Present during foraging periods, likely in low numbers due to population decline.
Species of Special Concern					
Surfgrass *Phyllospadix spp.*	FSC[37]	-	*Phyllospadix scouleri* and P. torreyi occur in the Pacific from Southeast Alaska to the tip of Baja California and Mexico.[38]	C	Year-round
Eelgrass *Zostera marina*	FSC[39]	CSC	*Zostera marina* is widespread and circumglobal in northern latitudes, found throughout the north Atlantic and north Pacific and in the Mediterranean and Black Seas. *Zostera marina* extends into the Arctic in Alaska, Canada, Greenland, and northern Europe and to the tropics in Baja California, Mexico.[40]	C	Year-round
Purple hydrocoral *Stylaster californicus [Allopora californica]*	-	CSC[41]	Inhabit subtidal depths (up to 315 feet) from Vancouver Island (Canada) to central Baja California (Mexico). Current-swept rocky reefs and pinnacles.[2]	C	Year-round

Common Name *Scientific Name*	Listing Status		General Habitat	Potential for Species Occurrence Within Project Area	Time Period Present in Project Area Waters
	Federal FESA/ MMPA	State CESA			

SOURCE CODES

FESA = Federal Endangered Species Act
MMPA = Marine Mammal Protection Act

Federal (U.S. Fish and Wildlife Service [USFWS]):
FDL =Delisted
FE = Listed as Endangered (in danger of extinction) by the federal government
FT = Listed as Threatened (likely to become Endangered within the foreseeable future) by the federal government
FP = Proposed for Listing as Endangered or Threatened
FC = Candidate to become a proposed species
FSC = Federal Species of Concern. The USFWS no longer lists Species of Concern but recommends that species considered to be at potential risk by a number of organizations and agencies be addressed during project environmental review. *NMFS still lists Species of Concern.

Federal (National Oceanographic and Atmospheric Administration [NOAA] National Marine Fisheries Service (NMFS) MMPA):
FD = Depleted Population
FP = Federally Protected

CESA = California Endangered Species Act

State (California Department of Fish and Game [CDFG]):
CE = Listed as Endangered by the State of California
CT = Listed as Threatened by the State of California
CR = Listed as Rare by the State of California (plants only)
CSC = California Species of Special Concern

Potential for Species Occurrence within Project Area:
C = Confirmed
P = Potentially may occur
NP = Not present
NA = Not applicable

Sources: [1] CNDDB (2015), [2]URS (2010), [3] USFWS (2006), [4] Smithsonian Marine Station at Fort Pierce (2015), [5] ICF (2012), [6]CDFG (1999), [7] USFWS (2015), [8]NPS (2015), [9]Harvey et al. (2012), [10]O'Farrell et al. (2012), [11]California Trout (2015a), [12]NMFS (2010), [13]California Trout (2015b), [14]NOAA (2015a), [15] CBD (2015a), [16] CBD (2015b), [17] Smultea, MA and TA Jefferson (2014), [18]CMS (2015a), [19]CMS (2015b), [20]CMS (2015c), [21]NMFS (2015a), [22]NMFS (2015b), [23]NMFS (2015c), [24]NMFS (2015d), [25]NMFS (2015e), [26]NMFS (2015f), [27]WWF (2015), [28]NMFS (2015g), [29]NMFS(2015h), [30]NMFS (2015i), [31]NMFS (2014), [32]NMFS (2015j), [33]NOAA (2015b), [34]NMFS (2015k), [35]NMFS (2015l), [36]NMFS (2015m), [37]UCSC (2015), [38]IUCN (2015a), [39]CDFG (2008), [40]IUCN (2015b), [41]CDFG (2015)

Table4: Federally Managed Fish and Invertebrate Species Under the Magnuson-Stevens Act Present in the California Spiny Lobster FMP Project Area

Coastal Pelagic Species[1]		
General Habitat: Schools migrate in coastal waters; found in the water column anywhere from the surface to 1,000 meters deep[2]		
Northern anchovy (*Engraulis mordax*)	Pacific (chub) mackerel (*Scomber japonicus*)	Market squid (*Doryteuthis opalescens*)
Pacific sardine (*Sardinops sagax*)	Jack mackerel (*Trachurus symmetricus*)	Krill (*euphausids*)
Pacific Coast Groundfish Species[3]		
General Habitat: Groundfish species have strong affinities to a particular location or substrate type. Estuaries, sea grass beds, canopy kelp, rocky reefs, and other "areas of interest" (e.g., seamounts, offshore banks, canyons) are designated Habitat Areas of Particular Concern (HAPCs) for groundfish managed species[3]		
Arrowtooth flounder	Flathead sole	Rex sole
Aurora rockfish	Freckled rockfish	Rock sole
Bank rockfish	Gopher rockfish	Rosethorn rockfish
Big skate	Grass rockfish	Rosy rockfish
Black rockfish	Greenblotched rockfish	Rougheye rockfish
Black-and-yellow rockfish	Greenspotted rockfish	Sablefish
Blackgill rockfish	Greenstriped rockfish	Sand sole
Blue rockfish	Harlequin rockfish	Sharpchin rockfish
Bocaccio	Honeycomb rockfish	Shortbelly rockfish
Bronzespotted rockfish	Kelp greenling	Shortraker rockfish
Brown rockfish	Kelp rockfish	Shortspine thornyhead
Butter sole	Leopard shark	Silvergray rockfish
Cabezon	Lingcod	Soupfin shark
Calico rockfish	Longnose skate	Speckled rockfish
California scorpionfish	Longspine thornyhead	Spiny dogfish
California skate	Mexican rockfish	Splitnose rockfish
Canary rockfish	Olive rockfish	Spotted ratfish
Chameleon rockfish	Pacific cod	Squarespot rockfish
Chilipepper rockfish	Pacific grenadier	Starry flounder
China rockfish	Pacific hake (Pacific whiting)	Starry rockfish
Copper rockfish	Pacific ocean perch	Stripetail rockfish
Cowcod	Pacific sanddab	Swordspine rockfish
Curlfin sole	Petrale sole	Tiger rockfish
Darkblotched rockfish	Pink rockfish	Treefish

Dover sole	Pinkrose rockfish	Vermilion rockfish
Dusky rockfish	Pygmy rockfish	Widow rockfish
Dwarf-red rockfish	Quillback rockfish	Yelloweye rockfish
English sole	Redbanded rockfish	Yellowmouth rockfish
Finescale codling	Redstripe rockfish	Yellowtail rockfish
Flag rockfish		
Highly Migratory Species[4,5]		
General Habitat: Travel long distance in epipelagic and mesopelagic oceanic waters[4]		
Common thresher shark (*Alopias vulpinus*)	Albacore tuna (*Thunnus alalunga*)	Skipjack tuna (*Katsuwonus pelamis*)
Pelagic thresher shark (*Alopias pelagicus*)	Bigeye tuna (*Thunnus obesus*)	Striped marlin (*Tetrapturus audax*)
Bigeye thresher shark (*Alopias superciliosus*)	Northern bluefin tuna (*Thunnus thynnus*)	Broadbill swordfish (*Xiphias gladius*)
Shortfin mako shark (*Isurus oxyrinchus*)	Yellowfin tuna *(Thunnus albacares)*	Dorado/mahi mahi (*Coryphaena hippurus*)
Blue shark (*Prionace glauca*)		

[1]Pacific Fishery Management Council (2011a)
[2]http://www.westcoast.fisheries.noaa.gov/fisheries/pelagic/coastal_pelagic_species_lfhist_bio.html
[3]Pacific Fishery Management Council (2014)
[4]Pacific Fishery Management Council (2011b)
[5]URS (2010)

Water Quality

Coastal water quality throughout the Project Area is affected by onshore and offshore activities and artificial structures. These activities and structures include wastewater and industrial outfalls, piers and jetties, ports, marinas, and harbors, maintenance dredging, and beach nourishment. The laws, regulations, and policies designed to protect water quality within the Project Area include:

Federal Law, Regulations, and Policies:

- Federal Water Pollution Control Act of 1972 (Clean Water Act) (33 U.S.C. 1251 et seq.)
- Rivers and Harbors Act of 1899
- Coastal Zone Management Act of 1972 (16 U.S.C. 1451-1464)
- Magnuson-Stevens Fishery Conservation and Management Act
- National Marine Sanctuaries Act
- Estuary (Estuarine) Protection Act of 1968 (PL 90-454, as amended; 16 U.S.C. 1221 et seq.)
- National Park Act of August 19, 1916 (Organic Act), 16 U.S.C. 1, et seq.)
- Marine Protection, Research and Sanctuaries Act (33 U.S.C. 1401 et seq.)
- National Wildlife Refuge System Administration Act of 1966 and National Wildlife Refuge System Improvement Act of 1997
- Oil Pollution Act of 1990 (33 U.S.C. 2701-2761)

- Executive Order 11990 – Protection of Wetlands
- Endangered Species Act (ESA) of 1973

State Law, Regulations, and Policies:

- Public Trust Doctrine
- Porter-Cologne Water Quality Control Act (Porter-Cologne)
- State Water Resources Control Board SWRCB Regulations for CWA Section 316(b)
- California Coastal Act (California Public Resources Code Sections 30000, et seq.)
- Lempert-Keene-Seastrand Oil Spill Prevention and Response Act of 1990
- Public Resources Code, Division 6, Sections 6001, et seq. (California State Lands Commission Tide and Submerged Lands)

Statewide Management Plans and Executive Orders:

- Ocean Plan
- Water Quality Control Plan for Control of Temperature in Coastal Interstate Waters and Enclosed Bays and Estuaries of California (Thermal Plan)
- Policy on the Use of Coastal and Estuarine Waters for Power Plant Cooling
- Water Quality Control Plan for Enclosed Bays and Estuaries

A wide range of pollution sources, both land- and water-based, affect water quality in the Project Area. Treated wastewater discharges associated with urbanized areas can contain both domestic and industrial wastes. Storm runoff from urbanized and non-urbanized areas can contain a variety of pollutants, with agricultural watersheds often contributing loads of pesticides and nutrients to nearshore waters. Land use varies considerably from region to region, with Los Angeles County receiving the poorest water quality reports for the state (URS 2010).

There are five primary factors affecting the offshore water quality within the Project Area. These factors are: 1) point source wastewater (regulated industrial and municipal discharges), 2) non-point source discharges (e.g., stormwater discharges), 3) harmful algal blooms, 4) contaminated sediment, and 5) oil spills. These issues are described in more detail below.

Point Source Pollution: There are specific locations (point sources) where industrial pollution enters coastal waters. Discharges from these locations are generally regulated by state or federal agencies, as listed above. The origins of these point sources include municipal wastewater treatment and disposal systems and industrial sites, such as desalination plants, power plants, aquaculture sites, and research marine laboratories.

Non-point Source Pollution: Non-point source pollution is the leading cause of degraded water bodies across the country. Non-point pollution sources include urban runoff, resource extraction (offshore energy extraction, sand mining, drilling and pumping of petroleum products onshore), boats (recreational vessels, commercial vessels and cruise ships), and agriculture.

Algal Blooms: Certain species of phytoplankton and cyanobacteria pose threats to marine water quality through rapid reproduction or release of toxins. Harmful algal blooms occur naturally in surface waters under conditions of elevated water temperature, high nutrient levels, and reduced water flow and circulation.

Contaminated Sediments: There are many areas along the California coast that have contaminated sediments and some have been designated as superfund sites by the federal government (NIH 2015).

Oil and Hazardous Material Spills: California has been the site of numerous accidental oil spills due to heavy oil and hazardous material tanker traffic, marine shipping, the presence of oil platforms located off the Southern California coast, and crude oil and refined produce pipelines running from platforms to onshore sites as well as along the coast.

Depending on the specific location along the coast within the California Spiny Lobster FMP Project Area, any one or all of these factors can be of concern to the general water quality of the area.

Potential Environmental Effects of the Proposed California Spiny Lobster FMP on Marine Biological Resources and Water Quality

Marine Biological Resources

Potential Effects on Special Status Species

As presented in the Marine Resources discussion above, there are many special status species found within the California Spiny Lobster FMP Project Area. These include fish, mammals, invertebrates, birds, reptiles, and plants. Some of these species are protected under either the FESA or CESA, afforded special protection under the MMPA, managed under the Magnuson-Stevens Act, or otherwise considered species of special concern by NOAA-NMFS, CDFW, or USFWS. The coastal waters of California located within the Project Area are used extensively by these species for foraging habitat, nursery areas, or as critical habitat.

Appendix A provides a list of FMP management tools and regulatory amendments with examples of reasonably foreseeable compliance responses that could be associated with the proposed regulatory changes. Appendix A is not meant to be an exhaustive list of compliance responses that have the potential to occur through implementation of the FMP and regulatory amendments. It is important to note that CDFW is directed to use the best readily available science to meet the ecosystem and fishery objectives of the MLMA when developing any future applications of the FMP management tools in Appendix A. The implementation of the management actions and provisions contained within the proposed California Spiny Lobster FMP (CFDW 2014) and presented in Appendix A, are not expected to result in any increase in effects to these species, either directly or indirectly, such as an increase in bycatch of any of these species or as a result of habitat modification. Two key components of the California Spiny Lobster FMP are the continued limitation on the number of commercial fishermen allowed to participate (i.e., limited-entry) in the fishery and the proposed change in the trap limit, which is expected to reduce the number of traps over time. These provisions in combination with the other immediately implementable or potentially implementable fishery management actions triggered by the fisheries stock reference points identified in the FMP (Appendix A), are all anticipated to result in an overall reduction in potential effects to marine biological resources in general, including special status species.

Additionally, proposed changes in the trap servicing interval from 4 days to 7 days (CDFW 2014, Appendix A) is also not expected to result in any detectable effects on marine resources since the total time the traps are in use does not change. The season start and end dates remain in force and traps are allowed to be in-water "fishing" the entire time, as long as they are serviced every 7 days.

One potential issue identified for marine mammals, especially larger whales, is the potential for entanglement with lobster trap gear. During the period from 2000 to 2012, the number of commercial fishing gear (all types of fishing gear for various fisheries) entanglements by large marine mammals, mostly whales, offshore California, Oregon and Washington has averaged about 11 per year. Within California coastal waters the number has averaged 8 entanglements per year (Caretta et al. 2014; NOAA Stranding Database 2015).

The actual number of entanglements is unknown since most reports are based on opportunistic sightings reported to the National Marine Fisheries Service and/or disentanglement response organizations. Both the gray whale (*Eschrichtius robustus*) and the humpback whale (*Megaptera novaeangliae*) appear to be the most frequently reported entangled whale species, although fin (*Balaenoptera physalus*), minke (*Balænoptera acuto-rostrata)* and sperm whales (*Physeter macrocephalus*) whales have been observed entangled (Caretta et al. 2014; NOAA Stranding Database 2015).

Confirmed California whale entanglements appear to be caused by lobster/crab traps (38 percent), drift nets (30 percent), and unidentified gear (32 percent) (NOAA 2015d). For the years from 2008 to 2014, NOAA reported a total of 81 marine mammal entanglements offshore California, Oregon and Washington, with three being attributed to lobster fishing gear (Caretta *et. al.* 2014, NOAA Stranding Database 2015). During the period of increased entanglement reports occurring in California between January 2014 and June 2015, there were 49 marine mammal entanglements recorded by NOAA, of which only 1 was attributed to lobster fishing equipment with the majority being attributed to unknown fishing equipment (59%) and the remainder to gillnets (6%), longline fishing gear (2%), and Dungeness crab (22%) and spot prawn traps (8%) (NOAA Stranding Database 2015).

At present, the populations of gray, Minke, fin, humpback, and sperm whales offshore California have increased substantially since being initially listed by the FESA in 1973. Specifically, an estimate of the gray whale population in the west coast is estimated to be about 19,000 individuals and at an optimum sustainable population size, as defined by the MMPA (NOAA 2015a). The west coast humpback whale population is estimated to be growing at a rate of approximately 8 percent per year between 1991 and 2008 (Shannon *et. al*. 2015). The Minke whale population is considered stable NOAA 2015b). Population estimates and recovery rates for both the fin whale and the blue whale are unknown, although both have recovered significantly since the closure of whaling (NOAA 2015c; CBD 2015).

The potential for increased whale entanglements from lobster traps as a result of the fishery management measures and regulations included in the California Spiny Lobster FMP is unlikely CDFW 2014). The management measures and regulatory actions outlined in the FMP will ultimately reduce the number of lobster traps being deployed through the proposed trap limit while the existing restricted access program, which limited the number of permits, creates an overall net effect of reducing the number of fishermen engaged in the commercial fishery over time. The project is also designed to decrease the number of lost or abandoned traps. These actions are expected to minimize the potential risk for entanglement with lobster trap gear over the levels currently being experienced by the fishery prior to the implementation of the proposed California Spiny Lobster FMP. If entanglements increase in the future, CDFW is responsible for monitoring and evaluating the effectiveness of conservation and management measures in place, assessing the causes of the entanglements and, where feasible, implementing measures that reduce entanglements.

Potential Effect on Riparian Habitat or Identified Sensitive Biological Habitats and Communities

The proposed California Spiny Lobster FMP will continue to operate as a limited-entry fishery and over time the number of commercial fishermen is expected to decease though the attrition of non-transferable permits in the fishery (CDFW 2014; Appendix A). Additionally, the FMP proposes to limit the number of traps allowed to be used by a Commercial Lobster Permit operator, in any one season. This action is expected to reduce overall the total number of traps used in the fishery.

Although both commercial and recreational fishermen routinely target lobster in kelp forests and within or adjacent to hard substrate habitat, the provisions of the proposed California Spiny Lobster FMP (Appendix A) are expected to reduce the potential effect posed by both the recreational and commercial fishery in these sensitive habitat areas by reducing the total number of traps deployed in the commercial fishery. Additionally, the FMP identifies multiple reference points (CDFW 2014; Appendix A) for the managed fishery that if triggered could result in additional management and regulatory strategies being implemented. These include further changes to the commercial trap limit, changes to the recreational bag limit, implementing a total allowable catch, implementing district closures, changing the season length, changing the minimum legal size for harvested lobsters, establishing a maximum legal size, and implementing a sex selective fishery (i.e., male-only fishery or female-specific size restrictions) (CDFW 2014). Each of these actions would further reduce potential effects to sensitive natural marine communities present within the Project Area.

Potential Effects on Protected Wetlands

Although within the Project Area there exist eelgrass beds within coastal estuaries that are considered coastal wetlands under Section 404 of the Clean Water Act that might be used by juvenile California spiny lobsters, no commercial or recreational fishing is known to occur at these locations. Additionally, if some limited legal recreational fishing is occurring at these locations, the proposed modifications to the California Spiny Lobster FMP are not expected to result in any alteration or removal of these eelgrass beds.

Potential Effect on Fish or Wildlife Migratory Patterns, Corridors, or Nursery Sites

As discussed above in the Section entitled, Potential Effects on Special Status Species, entanglements between migrating marine mammals and commercial trap gear is a known occurrence. However, the resource management actions and accompanying regulations proposed in the California Spiny Lobster FMP (CDFW 2014; Appendix A) are not expected to result in any increase in potential entanglements. Collectively, these actions should minimize the potential risk for entanglement with lobster trap gear over the levels currently being experienced by the fishery.

Additionally, the resource management actions proposed in the California Spiny Lobster FMP are not anticipated to result in any increase in potential interference with fish or wildlife species movements or impede the use of any native wildlife nursery sites greater than currently exists and because of the gear reduction should reduce any current effects caused by the fishery.

Potential Effect on Locally Protected or Managed Biological Resources

The proposed fishery management actions included in the proposed California Spiny Lobster FMP by CDFW (2014) (Appendix A) are not expected to result in any changes to local policies, ordinances or conservation plans within the Project Area. Most notably, commercial and recreational fishing restriction or allowances in California's Marine Protected Areas, as established by the MLPA. The proposed California Spiny Lobster FMP takes into consideration the establishment of the state's marine protected areas as contributing to maintaining a healthy lobster population within state coastal waters.

Water Quality

The proposed California Spiny Lobster FMP and associated implementation regulations (CDFW 2014; Appendix A) are anticipated to have no detectable or substantive effect on the ocean water quality within the Project Area. The commercial and recreational fisheries, as currently managed, do not involve the discharge of pollutants to surface waters, the generation of runoff water, the use of ground water, result in inundation by seiche, tsunami, or mudflow, have any effect on onshore drainage patterns, housing, or flood hazard zones that expose people or structures to significant risk of loss, injury or flooding, or otherwise substantially degrade overall water quality

Deployment of lobster traps in areas of potentially high-contaminated sediments could result in the resuspension or redistribution of those contaminants to immediately adjacent waters, but under normal circumstances, the deployment and recovery of lobster traps results in little disturbance of seafloor sediments (CDFW 2014). Additionally, the proposed FMP implementing regulations (CDFW 2014; Appendix A) are intended to decrease the overall level of effort for the commercial fishery by reducing the number of lobster traps deployed annually in the fishery. This action can be reasonably anticipated to reduce the overall disturbance of bottom sediments during initial trap deployment, servicing, and recovery at the end of the season.

Similarly, the limited-entry nature of the fishery, the slight increase in time between servicing traps from 4 to 7 days, and the reduction in the number of traps each licensed commercial fisherman can deploy can reasonably be anticipated to result in some reduction in boat trips by commercial fishermen and therein a reduction in the risk of boating accidents or other accidental events which could result in the release of hydrocarbons and other potential contaminants to coastal ocean waters in the Project Area.

Finally, the recreational California spiny lobster fishery, like the commercial fishery, is not expected to pose any effect on coastal ocean water quality greater than it already might pose, which is assessed to be no expected effect or overall impact.

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Appendix A: Table 2.3 from the Draft Negative Declaration for the Spiny Lobster Fishery Management Plan and Proposed Regulatory Amendments (Source: Ascent 2015)

Table 2-3 Proposed FMP Measures/Regulatory Amendments and Examples of Reasonably Foreseeable Compliance Responses

FMP Management Tools	Examples of Compliance Responses
Changing the commercial trap limit	◢ Would place a limit on the total number of traps used in the fishery, which would be beneficial to benthic habitats and potentially reduce overall bycatch and marine mammal interactions.
Changing the recreational bag limit[1]	◢ Could lead to an increase or decrease in fishing effort and total catch, depending upon the bag limit being increased or decreased
Setting a Total Allowable Catch	◢ Could result in a change to total catch relative to current catch and more or less pressure on the lobster population and marine environment.
District Closures	◢ Could result in fishing effort shifts (i.e., increased pressure) from a closed District to remaining open areas and additional travel by some fishermen.
Changing the season length[1]	◢ Could result in either an increase or decrease in recreational and commercial fishing effort and total catch.
Changing minimum legal size	◢ Could increase recreational and commercial fishing effort because it would initially take longer for fishermen to catch legal sized lobsters. Initially it would result in overall reduction in catch for both the commercial and recreational fisheries until the lobster population caught up to the new size limit. If minimum size were decreased, it would likely not have as much an impact on effort, but this could lead to decreases in spawning output.
Establishing a maximum legal size	◢ Would protect larger lobsters, which could increase egg production and SPR.
Establishing a sex selective fishery (i.e., male-only fishery or female-specific size restriction)[1]	◢ Would reduce total catch in the fishery and could lead to increased recreational and commercial fishing effort, because it would take more time to reach a limit of legal lobsters of the appropriate sex.
Regulatory Amendments	**Examples of Compliance Responses**
Requiring traps to be serviced at least every 7 days (currently 4 days)	◢ Potentially less frequent servicing/tending to traps could result in increased bycatch, and increased gear loss, which could increase effects on benthic habitats and marine mammal gear interactions.
Adding a provision to allow permit holders to recover up to 6 lost traps belonging to other permit holders	◢ Would allow the recovery of lost traps by other permit holders, which could reduce ghost fishing effects, and possibly reduce marine mammal interactions and benefit benthic habitats.
Reporting of commercial trap loss	◢ Would provide CDFW with additional essential fishery information needed to inform management decisions and could benefit trap recovery efforts.
Defining abandoned traps. Traps considered abandoned if not retrieved 14 days after the season ends. Fifteen days after the commercial season ends lobster operator permit holders and CDFW	◢ Would aid lost fishing gear recovery projects by allowing the recovery of lost traps by other permit holders and CDFW designees. The recovery of lost traps would reduce ghost fishing, possibly reduce gear interactions with marine mammals and benefit benthic habitats.

Table 2-3 Proposed FMP Measures/Regulatory Amendments and Examples of Reasonably Foreseeable Compliance Responses	
designees may recover an unlimited number of abandoned lobster traps	
Extending the period (from 6 to 9 days) for deploying and retrieving traps before and after the season	◢ Would allow for safer trap deployment and retrieval which could result in less gear loss. May result in lobster traps and associated gear being in the ocean for up to 3 additional days pre and post season.
Clarifying SCUBA gear possession on commercial vessels	◢ Could result in less gear loss, because it would allow fishermen to recover gear at the time of loss.
Improving fishery dependent data collection	◢ Would support the long-term sustainable management of the lobster fishery. ◢ Could result in earlier detection of issues and a subsequent improvement in adaptive management response time to resolve these issues.
Setting the trap limit to 300 traps per permit with the ability to purchase a second permit for a maximum 600 traps	◢ Would reduce the total number of traps in the water at one time and possibly reduce the chances for entanglement by marine species. ◢ Could reduce the total amount of fishing effort, because fishermen would be limited to 300 traps per permit. ◢ Could reduce vessel travel time for those that currently fish more than 300 traps. ◢ Could result in less abandoned traps, because it provides incentive for fishermen to recover their traps and equipment due to a limited number of trap tags issued each season.
Changing recreational season opener from 12:01 am to 6:00 a.m.	◢ Could reduce harm caused to the marine environment and improve safety by removing the midnight season opener. This may reduce accidents, damage to the marine environment, and loss of equipment because fishing effort would be spread out over daylight hours and no longer all focused at midnight.
Potentially requiring hole-punching or fin-clipping of retained lobsters in the sport fishery	◢ Could reduce the illegal sale of sport-caught lobster, which would benefit the lobster resource.

[1]Features that could increase recreational lobster activity.

Appendix B

Letters to Tribal Representatives

State of California – Natural Resources Agency
DEPARTMENT OF FISH AND WILDLIFE
Santa Barbara Field Office
1933 Cliff Drive, Suite 9
Santa Barbara, CA 93109
www.wildlife.ca.gov

EDMUND G. BROWN JR., Governor
CHARLTON H. BONHAM, Director

October 10, 2013

Name
Title
Business
Street Address
City, STATE Zip

Dear Honorable [FILL IN FULL NAME], Chairperson:

The California Department of Fish and Wildlife (Department) would like to inform you as a tribal representative that its Marine staff will be writing and compiling a Spiny Lobster Fishery Management Plan (FMP) over the next several months. The Department would like to know if spiny lobster is a culturally significant species to your Tribe, and, if so, if you would like to provide input into the development of the FMP or to seek government-to-government consultation with the Department about the FMP and the management of the spiny lobster fishery.

The Marine Life Management Act requires that the fishery management plan shall form the primary basis for managing California's commercial and sport marine fisheries. The spiny lobster supports important commercial and sport fisheries in southern California, and this FMP will ensure the continued health of the lobster fisheries in California.
The FMP will summarize all the readily available information on spiny lobster and its fisheries including: lobster natural history and population dynamics; fishery landings, regulations, and participants; current management and conservation measures; monitoring of the fisheries; essential fisheries information that is still needed; and a harvest control rule(s) should the lobster resource show signs of being overfished.

The Department has received suggestions and recommendations from various stakeholder groups, and has worked with a Lobster Advisory Committee that was created last year to develop recommendations. The lobster FMP website is: http://www.dfg.ca.gov/marine/lobsterfmp/ .

The Department understands that the spiny lobster fishery may be of interest to some tribes in California, and the Department is soliciting input from tribes. The Department is also committed to understanding tribal interests, if any, relating to the spiny lobster fisheries in southern California before the draft FMP is completed. Next year, the draft lobster FMP will be peer reviewed both scientifically and by the general public. While tribes can provide comments on the spiny lobster FMP at that time, the Department would like to understand tribal interests early in the process.

The Department would welcome your preliminary input on southern California's spiny lobster resource and fisheries by November 15, 2013, so that it might be considered when writing the draft FMP. Please send your comments to Ms. Kristine Barsky, Senior Marine Biologist and Lobster FMP Coordinator, via email at Kristine.Barsky@wildlife.ca.gov or to the address above. If you would like more information on

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the lobster FMP, or would like to set up either an informal informational meeting or a formal government-to-government consultation, please contact Ms. Barsky at (805) 985-3114.

We look forward to receiving your comments.

Sincerely,

Craig Shuman
Manager of the Marine Region

ec: Steven Ingram, Senior Staff Counsel and Tribal Liaison
Office of the General Counsel
Department of Fish and Wildlife

Sonke Mastrup, Executive Director
California Fish and Game Commission

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Tribes contacted for the Lobster FMP process

Tribe Contacted
Costanoan Ohlone Rumsen Carmel Tribe
Fernandeno Tataviam Band of Mission Indians
Gabrieleno/Tongva San Gabriel Band of Mission Indians
Gabrielino Tongva Nation
San Fernando Band of Mission Indians
Tehachapi Indian Tribe
Juaneño Band of Mission Indians
Juaneno Band of Mission Indians Acjachemen Nation
Juaneno Band of Mission Indians Acjachemen Nation
Barona Group of the Capitan Grande
Campo Kumeyaay Nation
Ewiiaapaayp Tribal Office
Inaja Band of Mission Indians
Jamul Indian Village
Kwaaymii Laguna Band of Mission Indians
La Jolla Band of Mission Indians
La Posta Band of Mission Indians
Los Coyotes Band of Mission Indians
Manzanita Band of Kumeyaay Nation
Mesa Grande Band of Mission Indians
Pala Band of Mission Indians
Pauma Band of Yuima
Rincon Band of Mission Indians
San Luis Rey Band of Mission Indians
San Pasqual Band of Mission Indians
Santa Ysabel Band of Diegueno Indians
Sycuan Band of the Kumeyaay Nation
Northern Chumash Tribal Council
Salinan Tribe of Monterey & San Luis Obispo Counties
Coastal Band of the Chumash Nation
Santa Ynez Band of Mission Indians
Viejas Band of Mission Indians

State of California – Natural Resources Agency
DEPARTMENT OF FISH AND WILDLIFE
Santa Barbara Field Office
1933 Cliff Drive, Suite 9
Santa Barbara, CA 93109
www.wildlife.ca.gov

EDMUND G. BROWN JR., Governor
CHARLTON H. BONHAM, Director

October 19, 2015

Contact name
Tribal group name
Address

Dear Honorable Tribal Representative:

The California Department of Fish and Wildlife (Department) would like to inform you as a tribal representative that several items are under development regarding the management of California's spiny lobster fisheries, and we are inviting your Tribe to provide input before these items are submitted to the Fish and Game Commission (Commission) for their possible consideration. In particular, the Department will be delivering two principle items to the Commission during 2015 and 2016: 1) a California Spiny Lobster Fishery Management Plan (FMP), and 2) new spiny lobster commercial and recreational fishery regulations. We anticipate proposing the first item at the Commission's December 2015 meeting and the second item at the Commission's February 2016 meeting. The Department would like to know whether your Tribe is interested in providing input on one or both of these proposed management items. At your discretion, your Tribe's input could be provided during the established provisions under the Commission process for public input beginning in December 2015, or through discussions or formal government-to-government consultation prior to December.

The California Spiny Lobster FMP

The Marine Life Management Act requires that fishery management plans (FMPs) shall form the primary basis for managing California's commercial and sport marine fisheries. The California spiny lobster resource supports important commercial and recreational fisheries in southern California, and this FMP sets a management framework for the fishery to ensure the continued health of the fisheries in California.

The FMP summarizes all the readily available information on spiny lobster and its fisheries including: lobster natural history and population dynamics; fishery landings, regulations, and participants; current management and conservation measures; monitoring of the fisheries; essential fisheries information that is still needed; and a harvest control rule to provide for a sustainable harvest.

The Department has received suggestions and recommendations from various stakeholder groups, and has worked with a Lobster Advisory Committee that was created to develop recommendations. The draft California Spiny Lobster FMP is currently available on the Departments spiny lobster FMP website at http://www.dfg.ca.gov/marine/lobsterfmp/ .

Amending Spiny Lobster Commercial and Recreational Regulations

The Department is scheduled to request authorization to publish notice of intent to amend regulations associated with the FMP at the Commission's February 2016 meeting. Proposed commercial spiny lobster regulation amendments that will be considered by the Commission include: a commercial trap

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limit; increasing the trap service requirement from 4 to 7days; extending the period (from 6 to 9 days) for deploying and retrieving traps before and after the season; and reporting of commercial trap loss. Proposed recreational amendments include: requiring the hole-punching or fin-clipping of all retained lobsters; changing the timing of the recreational season opener from 12:01 am to 6 a.m. on the first Saturday of the season; require hoop net operators to mark hoop net floats with GO-ID numbers; and clarifying methods of take for crustaceans.

If you would like more information on the California Spiny Lobster FMP or the proposed regulatory amendments, or to request a printed copy of the draft FMP, please contact Mr. Tom Mason, Senior Environmental Scientist, by email, tom.mason@wildlife.ca.gov, or by phone, (562) 342-7107. If you would like to request formal government-to-government consultation, please contact Steven Ingram, Tribal Liaison, by email, tribal.liaison@wildlife.ca.gov, or by phone, (916) 651-7401.

We look forward to receiving your input.

Sincerely,

Craig Shuman, D. Env.
Regional Manager, Marine Region

ec: Steven Ingram, Senior Staff Counsel and Tribal Liaison
Office of the General Counsel
Department of Fish and Wildlife

Sonke Mastrup, Executive Director
California Fish and Game Commission

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Tribe Contacted
Agua Caliente Band of Cahuilla Indians
Augustine Band of Cahuilla Mission Indians
Barona Group of the Capitan Grande
Cabazon Band of Mission Indians
Cahuilla Band of Indians
Campo Band of Mission Indians
Chemehuevi Reservation
Colorado River Indian Tribe
Ewiiaapaayp Tribal Office
Fort Mojave Indian Tribe
Iipay Nation of Santa Ysabel
Inaja Band of Diegueño Mission Indians
Jamul Indian Village
La Jolla Band of Mission Indians
La Posta Band of Mission Indians
Los Coyotes Band of Mission Indians
Manzanita Band of Kumeyaay Nation
Mesa Grande Band of Diegueño Mission Indians
Morongo Band of Mission Indians
Pala Band of Mission Indians
Pauma Band of Luiseño Indians
Pechanga Band of Mission Indians
Ramona Band of Cahuilla Mission Indians
Rincon Band of Mission Indians
San Manuel Band of Mission Indians
San Pasqual Band of Diegueño Mission Indians
Santa Rosa Band of Cahuilla Indians
Santa Ynez Band of Mission Indians
Soboba Band of Mission Indians
Sycuan Band of the Kumeyaay Nation
Torres-Martinez Desert Cahuilla Indians
Twenty-Nine Palms Band of Mission Indians
Viejas Band of Kumeyaay Indians

Draft CA Spiny Lobster Fishery Management Plan Adoption

Fish and Game Commission Meeting, April 13, 2016

Dr. Julia Coates
Environmental Scientist, Marine Region

Presentation Outline

- Recap FMP delivery and discussion meetings
- Summary of public comments
- Response to comments & FMP edits
- Environmental review (CEQA)
- Next steps

Ron McPeak

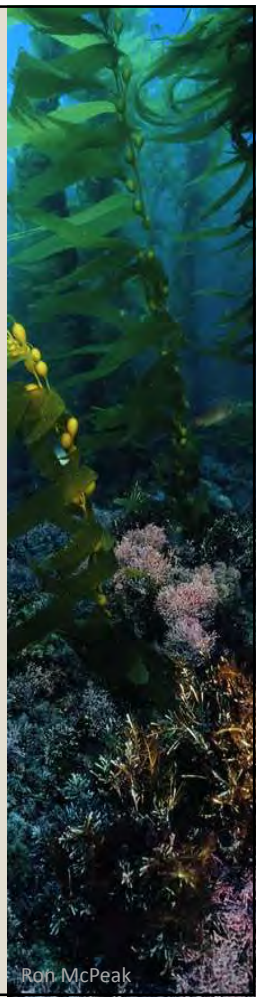
Recap of Delivery & Discussion Meetings

- FMP development
- Harvest control rule management framework
- FMP edited in response to peer review
- Inoperative statutes
- LAC near-consensus recommendations and other issues not identified by LAC

Derek Stein, CDFW

Public Comments

- Summary of comments, FMP edits & Department responses in binder
- No changes to the HCR
- 3 general categories
  - Whale entanglement
  - Recreational fishery
  - Fishery-independent data
- Regulatory comments to be addressed in the rulemaking process



FMP Edits

- Whale entanglement
  - Scope of issue, recognition of serious injury, updated stock assessments (2.3.3)
- Recreational fishery
  - Need for data improvements and possible collection methods (5.1.1 & 5.2)
- Fisheries-independent data
  - Support development of new, collaborative programs (4.2.2 & 5.1)
  - CalCOFI phyllosoma data (5.1.2)
- FMP does not preclude development of new data streams or regulations (6.2.1)

FMP Edits Cont.

- LAC near-consensus items
  - Ban of conical hoop nets & recreational season limit
  - Forward to Appendix IX
- Issues not discussed during LAC process
  - Comment summary

Environmental Review (CEQA)

- Initial Study/Negative Declaration – no significant effects resulting from FMP + regulatory package
- Released for a 45-day public review period (1/21/16 to 3/7/16)
- Comments of note
  - Tribal consultation
  - Environmental Impact Report rather than ND due to whale impacts
- See responses to comments in the Final IS/ND

CEQA
Whale Entanglement

- Accountability for traps
  - Trap limit
  - Mandatory trap loss reporting
- Aids to enforcement
  - Trap tags
- Aids to trap recovery
  - Definition of abandonment
  - SCUBA gear allowed
  - Log improvements: GPS, # traps in use, electronic

Ron McPeak

Next Steps

- Request FMP adoption and CEQA certification today
- Regulatory proposal discussion today
- Initial statement of reasons (ISOR) in your binder
- Possible adoption of regulations at June meeting

Thank You / Questions

Dr. Julia Coates
Julia.Coates@wildlife.ca.gov
Environmental Scientist, Marine Region

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State of California
Department of Fish and Wildlife

Memorandum

Date: March 23, 2016

To: Michael Yaun
Acting Executive Director
Fish and Wildlife Commission

From: Charlton H. Bonham
Director

Subject: **Agenda Item and Submittals for the April 13-14, 2016 Fish and Game Commission Meeting Regarding Adoption of the Draft California Spiny Lobster Fishery Management Plan**

The Department of Fish and Wildlife (Department) is submitting two documents to the Fish and Game Commission (Commission) related to the draft California Spiny Lobster Fishery Management Plan (CA lobster FMP): 1) a summary of public comments regarding the draft CA lobster FMP with Department responses; and 2) a revised draft CA lobster FMP including edits based on public comment and Commission direction.

The draft CA lobster FMP is designed to guide future management of the fishery and to ensure the sustainability of the CA spiny lobster resource as well as create an orderly fishery. The CA lobster FMP meets the requirements of the Marine Life Management Act (MLMA) which requires that Fishery Management Plans form the primary basis for managing the state's marine fisheries. The Department crafted the CA lobster FMP following guidance from the constituent group, the Lobster Advisory Committee and has also regularly updated the Marine Resources Committee, the Commission and solicited open communications with California Tribal governments and tribes.

The draft CA lobster FMP was delivered to the Commission at the December 2015 meeting and was discussed by the Commission at the February 2016 meeting. Public comments have been accepted beginning with the December meeting. The comment summary includes comments received up to March 23, 2016. The Department requests that the Commission consider adopting the CA lobster FMP at the April 13, 2016 meeting.

If you have any questions regarding this item, please contact Dr. Craig Shuman, Regional Manager, Marine Region at (805) 568-1246.

The public notice for this proposed adoption should identify Senior Environmental Scientist, Tom Mason as the Department's point of contact. He can be reached at (562) 342-7107 or via email at Tom.Mason@wildlife.ca.gov.

Attachments:
Draft California Spiny Lobster Fishery Management Plan
Summary of Public Comments on the Draft California Spiny Lobster Fishery Management Plan

ec: Stafford Lehr, Acting Deputy Director
Wildlife and Fisheries Division
Stafford.Lehr@wildlife.ca.gov

Craig Shuman, Regional Manager
Marine Region
Craig.Shuman@wildlife.ca.gov

Sonke Mastrup, Program Manager
State Managed Invertebrate Fisheries
Marine Region
Sonke.Mastrup@wildlife.ca.gov

Robert Puccinelli, Captain
Law Enforcement Division
Robert.Puccinelli@wildlife.ca.gov

Tom Mason, Supervisor
Invertebrate FMP
Tom.Mason@wildlife.ca.gov

Summary of Public Comments on the Draft California Spiny Lobster Fishery Management Plan

Prepared by the California Department of Fish and Wildlife

March 16, 2016

The Draft California Spiny Lobster Fishery Management Plan (FMP) was delivered by the California Department of Fish and Wildlife (Department) to the Fish and Game Commission (Commission) at its December 2015 meeting. This initiated a public comment period with comments accepted by the Commission both verbally at the December and subsequent meetings, and in written form. The comment period closes with FMP adoption, potentially at the April, 2016 meeting. The table below summarizes all comments received by the Department or the Commission as of March 29 and provides the Department response.

The majority of comments fell into three general topics including 1) whale entanglement, 2) a desire for increased use of fisheries-independent data and 3) a perceived lack of data and conservation and management measures for the recreational fishery included in the FMP. General responses to these issues are provided below and specific responses to each comment are within the table. While the FMP contains a description of the LAC commercial and recreational regulatory recommendations, they are not under consideration by the Commission as part of the FMP adoption process. The LAC regulatory recommendations and other lobster fishery regulations will be considered in a separate Commission rule making process and comments related to them will be addressed in that process.

The Department recognizes the growing problem of marine mammal interactions with fishing gear in CA and is approaching the problem first by working with the Dungeness Crab Fishing Gear Working Group. A large proportion of interactions have been with Dungeness crab gear and this fishery will serve as a test case to help understand the underlying causes and the development of solutions that may apply to other trap fisheries. The FMP does not preclude proposal of new regulations in the future, such as specifications for trap spacing, as recommendations are further developed and vetted through the Dungeness crab fishery. Section 6.2.1 of the FMP notes the Commission's authority to adopt new regulations concerning the lobster fishery without amendment to the FMP as well as Commission and Department authority to promulgate regulations during emergencies. Additionally, aspects of the FMP harvest control rule and associated regulatory proposals may lessen interaction with mammals. The trap limit will result in a reduction of gear as non-transferable permits exit the fishery and may result in an immediate reduction. Accountability for lost gear will be improved by the trap limit as well as proposed gear loss reporting requirements and improvements to the commercial logbook.

Fisheries-independent data is critical for effective fisheries management. This is because data derived from fisheries can be confounded with changes in fishing technology and regulations, fisherman behavior, and market forces. The Marine Life Management Act directs the department to prepare FMPs based on the best scientific information that is available or that "can be obtained without substantially delaying the preparation" (FGC 7072(b)). Fisheries-dependent data is collected continuously on

commercial fishing logs and landing receipts, provides the most consistent information currently available to the Department, and is reflective of a majority of lobster catch. For these reasons fisheries-dependent data sources were chosen to form the basis of the harvest control rule reference points. Several fisheries-independent data sources are identified in section 5 of the FMP, which discusses essential fisheries information. These data sources will be extremely important to managers when prompted by the harvest control rule to investigate the underlying processes when the proposed reference points cross their thresholds. The Department will seek opportunities to strengthen fisheries-independent data collection through collaborations and may include them in the harvest control rule at a future time through FMP amendment.

The California spiny lobster fishery is unusual in that it supports both an important commercial fishery and significant recreational take. The Department is committed to maintaining traditional differences in allocation and function between the recreational and commercial fisheries consistent with the consensus recommendation of the Lobster Advisory Committee, as noted in section 4.5 of the FMP. The Department is aware of the need for more data on the recreational fishery and will seek opportunities to implement additional recreational data collection methods. The near-consensus LAC proposals for additional controls on the recreational fishery are now highlighted in a forward to Appendix IX. Six of the eight conservation and management measures in the FMP's harvest control rule toolbox could be applied to the recreational fishery.

Table 1. Public comments received by the Commission office on the Draft California Spiny Lobster Fishery Management Plan during the public comment period from December 9, 2015 to March 16, 2016. The Department response column indicates how each comment may be addressed.

Last Name (First Last)	Agency/ Organization	Comment Format	Comment # & Date	Topic(s) Raised	Summary of Comment	Department Response
April Wakeman	The Sportfishing Conservancy	Verbal Testimony	C-1 12/9/2015	Regulations (Hoop Net)	Concern that current hoop net regulation that restricts the measurement of lobsters to the water surface is not safe or practical. Request that regulations be amended to allow lobsters to be measured aboard a boat and the prompt release of any undersize lobsters into the water.	The comment is not related to the FMP process but related to CA lobster regulations considered in a separate Commission process. The Commission requested the Department to address the issue raised by the commenter in an upcoming Commission rulemaking package to implement the FMP and proposed CA lobster fishing regulations.
Mike McCorkle	Commercial Lobster Fisherman	Verbal Testimony	C-2 12/9/2015	Regulations (Permit Transferability)	There has been reluctance by the Department and people involved in the FMP process to discuss making non-transferable permits transferable. Would like to see consistency in the application of permit transferability since all permits are transferable in both the Dungeness and California Rock Crab fisheries. Recommends that both non-transferable and transferable lobster operator permits be transferable.	Development of the FMP was based on a collaborative effort by the Department and LAC. A series of public and advisory meetings were held from April 2012 to September 2013 to solicit advice, feedback, and recommendations regarding issues and actions to be considered during FMP development. The Department also solicited feedback from the commercial sector via a survey of all permit holders to stimulate discussion and refinement of management proposals. Different approaches for achieving a fishery-wide reduction in traps were discussed, including tiered permits. However consensus on a tiered approach was not

Last Name (First Last)	Agency/ Organization	Comment Format	Comment # & Date	Topic(s) Raised	Summary of Comment	Department Response
						achieved. The LAC reached agreement on a consistent trap limit for all permit holders while maintaining the existing division between transferable and non-transferable permits.
Jim Salazar	Coastal Conservation Association of California; Lobster Advisory Committee (LAC) Recreational Fishing representative	Verbal Testimony	C-3 12/9/2015	Regulations (Mechanized Puller)	Supports the Department and LAC efforts on the Fishery Management Plan (FMP) and regulatory proposals. Encourages the Commission to support the LAC Consensus Recommendations minus the power puller handicap restriction.	Noted.
Shad Catarius	Commercial Lobster Fisherman; LAC Commercial Fishing Member	Verbal Testimony	C-4 12/9/2015	Regulations (Hole-punching)	Further consideration is needed by the Commission in regard to the LAC consensus recommendations that require recreationally retained lobsters be hole-punched as there may be potential issues with commercial take.	While the FMP contains a description of the LAC commercial and recreational regulatory recommendations, they are not under consideration by the Commission as part of the FMP adoption process. The LAC regulatory recommendations and other CA lobster fishery regulations will be considered in a separate Commission rule making process and comments related to them will be addressed in that process.
Shad Catarius	Commercial Lobster Fisherman; LAC Commercial	Verbal Testimony	C-5 12/9/2015	HCR	The Harvest Control Rule (HCR) does not consider recreational fishing as a variable for management under the FMP.	The Marine Life Management Act (MLMA) provides that fishery management plans shall allocate increases or restrictions in fishery

Last Name (First Last)	Agency/ Organization	Comment Format	Comment # & Date	Topic(s) Raised	Summary of Comment	Department Response
	Fishing Member					harvest fairly among recreational and commercial sectors participating in the fishery (FGC §7072(c)). The Department's development of the HCR was the result of substantial input by the LAC and independent scientific reviewers to ensure the equity of the proposed management and conservation measures across all sectors of the CA lobster fishery. Current data streams are more reliable and consistently collected for the commercial fishery than the recreational fishery. While the recreational fishery accounts for a substantial portion of the take, the commercial take is larger. For these reasons, reference points representing the commercial fishery were chosen. The Department will seek to improve recreational fishery data streams and refine technical models that inform the HCR as new data sources become available.

Last Name (First Last)	Agency/ Organization	Comment Format	Comment # & Date	Topic(s) Raised	Summary of Comment	Department Response
Shad Catarius	Commercial Lobster Fisherman; LAC Commercial Fishing Member	Verbal Testimony	C-6 12/9/2015	HCR (SPR)	The Spawning Potential Ratio (SPR) needs to be reevaluated in light of the findings from a new baseline study which would modify the SPR calculation.	Model sensitivity analyses show that a change in female size at sexual maturity would not result in a change in SPR reference point position relative to the threshold. This is because both current and threshold SPR calculations use the same reproduction parameters. However, the Department agrees that information on fecundity and size at maturity should be improved and understanding potential regional differences in these parameters is important.
Joe Exline	Lobster Fisherman	Verbal Testimony	C-7 12/9/2015	HCR (SPR)	Would like clarification on the models used to assess the status of the stock. Concerned about how changes to the model would impact catch.	Please see the revised Appendix X of the FMP: Cable-CDFW Model Report.
Joe Exline	Lobster Fisherman	Verbal Testimony	C-8 12/9/2015	Regulations (Hoop Net)	Supports the proposal to amend the hoop net regulation to allow for onboard measurement of lobsters and immediate return of undersized lobsters to the water.	See response C-1.
Joe Exline	Lobster Fisherman	Verbal Testimony	C-9 12/9/2015	Regulations (Hoop Net, GO-ID)	Concern about how proposed regulatory language would address vessel operators who loan hoop nets marked with their GO-ID numbers to visitors on board their vessel that exceed the five hoop net limit currently allowed per person.	See response to C-4.

Last Name (First Last)	Agency/ Organization	Comment Format	Comment # & Date	Topic(s) Raised	Summary of Comment	Department Response
Wayne Kotow	Coastal Conservation Association of California	Verbal Testimony	C-10 12/9/2015	Regulations (Mechanized Puller)	Supports efforts by the Department and LAC on the FMP and regulatory proposals. With the exception of the power puller handicap restriction, would like the Commission to adopt the LAC Consensus Recommendations.	See response C-4.
Dana Murray	Heal the Bay	Verbal Testimony	C-11 12/9/2015	Regulations (Hoop Net)	Supports the Department's effort on the FMP. Would like the Department to reconsider some of the near consensus regulatory options that were discussed during the LAC meetings. Concerned that the recreational fishing sector, in particular hoop netting, may be overlooked. The MLMA specifies that restrictions be equitably allocated between the recreational and commercial fishing sectors.	Noted. See response C-5.
Dana Murray	Heal the Bay	Verbal Testimony	C-12 12/9/2015	Lobster Report Card; Essential Fishery Data	Although there has been an increase in the number of Lobster Report Cards returned to the Department in recent year, would like to see other fishery independent data presented in future iterations.	The Department recognizes that recreational fishery-dependent data is limited. As discussed in Section 5 of the FMP, the need to improve existing data has shaped the Department's CA lobster-related research since 2007, and specific data types needs and priorities for research are identified in Table 5-1 of the FMP. The FMP will undergo continual refinement as new information and data are obtained.

Last Name (First Last)	Agency/ Organization	Comment Format	Comment # & Date	Topic(s) Raised	Summary of Comment	Department Response
Chris Voss	Commercial Lobster Fisherman	Verbal Testimony	C-13 12/9/2015	FMP HCR Matrix	Supports the Department's work on the FMP. Would like to see the lessons learned from the lobster FMP process and HCR approach applied to other fisheries, specifically the red abalone that is currently undergoing the FMP development process.	Noted.
Sean Hastings	NOAA Channel Islands National Marine Sanctuary; LAC Federal Agency Member	Verbal Testimony	C-14 12/9/2015	Gear/Trap Loss	Supports the Department's effort on the FMP. Informed the Commission that the Channel Islands National Marine Sanctuary has secured a grant from the NOAA Marine Debris Program for a project to prevent and reduce lobster trap loss, and will keep the Department apprised of that effort.	Noted.
Mike Conroy	West Coast Fisheries Consultants	Verbal Testimony	C-15 12/9/2015	Essential Fishery Data	Support the Department's efforts on the FMP. Appreciates that the effort to gather more essential fishery information is a higher priority for the Department since much of the data that went into the deriving the elements of the FMP was based on commercial fishery data and the data on the recreational fishery is very data poor.	See response to C-12.
Mike Conroy	West Coast Fisheries Consultants	Verbal Testimony	C-16 12/9/2015	FMP HCR (SPR)	Interested to see whether the observations of smaller berried females will have any impact on the SPR considering lobsters are known to spawn two or three times before they reach legal size limit.	See response to C-6.

Last Name (First Last)	Agency/ Organization	Comment Format	Comment # & Date	Topic(s) Raised	Summary of Comment	Department Response
Mike Conroy	West Coast Fisheries Consultants	Verbal Testimony	C-17 12/9/2015	FMP HCR (CPUE)	The 0.9 threshold for the catch per unit effort (CPUE) is too conservative since the fishery is experiencing a shift in effort over the last couple of years due to: (1) higher market price for lobster, (2) new entrants into the fishery that are still learning how the fishery operates, and (3) changes in fishing habits that are not currently reflected in the CPUE.	While the 0.9 threshold is conservative, management response is discretionary and will only follow investigation of underlying causes for reference point positions. The Department is aware that there are many other potential influences on the reference points other than biological and ecological issues with the stock. It is reasonable that the CPUE-based reference point is currently below the threshold as this mirrors the well-recognized increase in effort.
Mike Beanan	Laguna Bluebelt Coalition	Verbal Testimony	C-18 12/9/2015	Regulations (Gear/Trap)	Concern about damage to kelp forest from setting lobster traps along the south boundary of the Laguna State Marine Conservation Area. Suggests that traps should be set at least 50 to 100 feet away from the kelp forest.	There is some potential for lobster traps to damage kelp. Movement of traps on the bottom could scour newly settled sporophytes. Adult kelp may become entangled in trap lines and be ripped out or damaged. The Department is not aware of evidence suggesting this risk is substantial. Also, these issues are likely to arise primarily during storm events. Often fishermen remove their gear during these events. Implementation of the trap limit will lead to a reduction in the overall number of traps in the fishery over time and this may help to lessen the risk of damage to kelp.
Mike	Laguna Bluebelt	Verbal	C-19	Regulations	Recommends setting a limit on trap	The Department recognizes the

Last Name (First Last)	Agency/ Organization	Comment Format	Comment # & Date	Topic(s) Raised	Summary of Comment	Department Response
Beanan	Coalition	Testimony	12/9/2015	(Whale Entanglement)	density along the coast to prevent whale entanglement.	growing problem of marine mammal interactions with fishing gear in CA and is approaching the problem first by working with the Dungeness Crab Fishing Gear Working Group. A large proportion of interactions have been with Dungeness crab gear and this fishery will serve as a test case to develop understanding of the underlying causes and solutions that may apply to other trap fisheries. Nothing in the CA lobster FMP precludes proposal of new regulations in the future such as specifications for trap spacing if this is found to be effective in reducing entanglements. Several of the current regulatory proposals associated with the FMP will serve to lessen the risk of entanglement. The trap limit will result in a reduction of gear as non-transferable permits exit the fishery and may result in an immediate reduction. Accountability for lost gear will be improved by the trap limit and proposed gear loss reporting requirements. Proposed improvements to the commercial logbook as well as an ongoing effort towards electronic logs will aid in understanding the circumstances around entanglements and may lead to solutions.

Last Name (First Last)	Agency/ Organization	Comment Format	Comment # & Date	Topic(s) Raised	Summary of Comment	Department Response
Mike McCorkle	Commercial Lobster Fisherman	Letter	C-20 12/10/2015	Regulations (Permit Transferability)	Comment mirrors C-2. The issue of permit transferability has not been adequately addressed by the Department, Department staff, LAC, or Commission. Would like to see more transparency in the FMP process in regard to this issue.	See response to C-2.
Mike McCorkle	Commercial Lobster Fisherman	Letter	C-21 12/10/2015	Regulations (Permit Transferability)	Recommends a two-tier system for lobster operator permits in which all permit will be transferable. Under this new permit system, current non-transferable permittees would fall under the "second tier" permit class with a trap limit of 200 traps. This would result in an immediate reduction of 4,600 traps (46 permittees reduced from 300 to 200 traps). And, at an average of 1lb per trap, this would result in a reduction of about 4,600lbs of lobsters landed every 4 days throughout the 5-month season, or a reduction of about 172,500lbs of lobster during a season. Given that the average landings for the 4 years that the FMP has been envisioned is 837,665lbs, this proposed permit system represents a 20 percent reduction in lobster landings.	See response to C-2.
Mike McCorkle	Commercial Lobster Fisherman	Letter	C-22 12/10/2015	Regulations (Permit Transferability)	When lobster permits were made limited-entry (about 15 years ago) and non-transferable permits were issued, there were about 60 (possibly more). Today there are only 46. At	Noted. See response to C-2.

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					this rate of attrition (about one permit per year), there will be continually fewer permits in the future regardless of the transferability issue.	
Kurt Lieber	Ocean Defense Alliance (ODA)	Letter	C-23 1/6/2016	Regulations (Whale Entanglement)	ODA is concerned that trap lines would become a severe hazard to whales. ODA provided an exhibit that mapped the GPS coordinates of traps on a 2.2-mile trap line on the east side of Santa Monica Bay to illustrate the potential risk of entanglement from closely set traps. They urge the Commission to consider adopting stricter regulations that would mandate traps to be set no closer than 100 feet apart.	Noted. See response to C-19.
Eric Miller		Email	C-24 1/15/2016	Essential Fishery Data (Fishery-independent Data)	Urges the Department to work towards developing more fishery-independent data collection so future assessments are based less on fishery-dependent data.	As resources allow, the Department will look to improve fisheries-independent data streams as noted in section 4.2.2 and 5.1 of the FMP.
Eric Miller		Email	C-25 1/15/2016	Recreational Fishery Assessment	The increasing pressure wrought by the recreational fishery deserves a more focused effort to assess its effect on the population. Eggleston et al. (2003) studied the Caribbean spiny lobster fishery in Florida where a recreation-only fishing period exists, similar to the California regulations. This paper was not referenced in the FMP. Careful consideration should be given to this paper as it outlines a novel, but unambiguous method of	Recognition of the potential for SCUBA surveys to assist in assessing fishery impacts and optimize management responses was added to the FMP section on dive surveys in section 5.1.1 along with a reference to Eggleston et al. (2003).

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					assessing the relative impact the recreational fishery may be having on the standing stock.	
Eric Miller		Email	C-26 1/15/2016	FMP Correction	The reference below should be added to the FMP's reference list. Miller, E.F. 2014. Status and trends in the southern California spiny lobster fishery and population: 1980-2011. Bulletin of the Southern California Academy of Sciences. 113: 14-33	Reference added.
Eric Miller		Email	C-27 1/15/2016	FMP Correction	On page 40 of the draft FMP, the reference to Miller (2014) is incorrectly quoted in regards to California spiny lobster's response to the Pacific Decadal Oscillation and similar environmental indices. Table 3 (Miller 2014) lists a significant p value, but this is for data that was not corrected for autocorrelation. When corrected for autocorrelation, the critical r absolute value is 0.68. At this corrected r value, there is no longer a significant correlation between PDO and the California spiny lobster young of-the-year abundance (YOY) index. In fact, after adjusting for autocorrelation, no environmental index was significantly correlated with the YOY index. The last sentence of the results section from Miller (2014) reads: "When adjusted for autocorrelation in both the YOYI and NPGO, no significant correlation was detected with any of the	The previous reference to Miller (2014) on page 40 was changed and now reads "Commercial landings of CA lobster appear to be influenced by warm and cold water regimes driven by the Pacific Decadal Oscillation (PDO) (Neilson, 2011). Fisheries-independent data on lobster abundance based on entrainment in power plant systems does not show a correlation between young of the year or slightly sub-legal lobsters and environmental indices including PDO (Miller, 2014). However, increases in abundance and decreases in average size at some power plants after the 1989 regime shift do indicate the potential for recruitment success to be driven by changes in environmental factors at longer time scales (Miller, 2014)."

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					environmental indices (Table 3)."	
Julian Koslow	Research Oceanographer (Emeritus) at Scripps Institution of Oceanography	Email	C-28 1/21/2016	Essential Fishery Information (Fishery-independent Data)	Dismayed that the current draft plan fails to utilize readily available fishery-independent data from the ongoing CalCOFI program on phyllosoma abundance as a measure of spawning stock biomass. The proposed FMP depends on catch and commercial catch per unit effort (CPUE) data. These fishery dependent data sources are well-known to potentially lead to biased estimates (generally overestimates) of stock size, leading to overly optimistic assessments of how the stock is faring. This is particularly disturbing in the case of the California spiny lobster fishery, in which the recreational fishery is known to be increasing based on a change in fishing technology (increased use of hoop nets), with considerable uncertainty about current total landings. However, there is likely under-reporting of actual catch, as noted in the CSLFMP.	The Department recognizes the value of the Koslow et al. (2013) study of lobster phyllosoma and of the ongoing phyllosoma data stream. While phyllosoma abundance was not considered appropriate to form the basis of a reference point within the harvest control rule, information on phyllosoma will be very valuable when managers are prompted by the HCR to investigate stock status. Additional text describing this was added to the FMP section on larval collectors in section 5.1.2. The Department will seek to maintain allocation of the resource between the commercial and recreational fisheries that does not deviate greatly from the current status as was recommended by the LAC and noted in section 4.5 of the FMP. As resources allow, the Department will look to improve estimates of recreational landings to improve total landings estimates and improve fisheries-independent data streams as noted in section 4.2.2 and 5.1 of the FMP.
Julian Koslow	Research Oceanographer (Emeritus) at Scripps	Email	C-29 1/21/2016	Essential Fishery Information (Fishery-	Emphasizes the importance of using fishery-independent data due to under-reporting of actual catch information. The abundance of Stage	See response to C-28.

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	Institution of Oceanography			independent Data)	1 phyllosoma are readily available from the ongoing CalCOFI program. Larval abundance data have already been shown to be significantly correlated with spawning stock biomass for a number of fisheries, including the anchovy and sardine off California (Koslow et al. 2011). A recent study indicates that stage 1 phyllosoma abundance was correlated with trends in CA lobster landings from the 1950s to ~1980 but since about 1980 the generally increased trend in lobster landings is not matched by an increase in phyllosoma abundance (Koslow et al. 2012). This indicates that fishing mortality has been increasing.	
Julian Koslow	Research Oceanographer (Emeritus) at Scripps Institution of Oceanography	Email	C-30 1/21/2016	Correction	Note that the use of CalCOFI phyllosoma data is not listed in Table 5-1 as a potential index of abundance, although it is mentioned in the text.	Larval abundance was added to Table 5-1 as a potential index of stock abundance.
Catherine Kilduff, Kristen Monsell	Center for Biological Diversity	Letter	C-31 1/28/2016	Regulations (Trap Limit, Non-transferable permits, Hoop Net Buoy Markings, and District Closures)	Supports trap limit & non-transferrable permits; hoop net buoy marking; and authorizing the Department to implement district closures when necessary.	See response to C-4

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Catherine Kilduff, Kristen Monsell	Center for Biological Diversity	Letter	C-32 1/28/2016	Regulations (District Closure)	The Department should have authority to implement district closures and other time/area management measures not only when reference points relevant to lobster are crossed, but also when conservation concerns relevant to other species arise. Such actions should not require amendment to the lobster FMP.	Expansion of the HCR to include reference points outside of the lobster fishery is considered to be outside the scope of this FMP and could become intractable. Section 6.2.1 states that the Commission can adopt new regulations concerning the CA lobster fishery without amendment to the FMP and also notes the Commission's authority to promulgate emergency regulations. Nothing in the FMP would prevent the Department or the Commission from implementing management measures in the HCR toolbox, or new management measures, to address conservation concerns for species other than lobster if the need arises.
Catherine Kilduff, Kristen Monsell	Center for Biological Diversity	Letter	C-33 1/28/2016	Regulations (Electronic Log Book)	Electronic logs should be required by 2019 and should include data loggers or vessel monitoring to provide spatially accurate effort data. Electronic logs should require fishers to document lost gear. Spatial data on gear use and gear loss should be cataloged in a database and used to assess factors associated with gear loss (locations, times of year) and overlap with whale migratory routes.	The Department is working towards electronic logs for all fisheries. Currently a CPFV voluntary electronic log is in place and one is in development for the lobster fishery, as is noted in section 5.1.1. Until electronic reporting is fully in place, the Department is proposing improvements to the commercial lobster paper log as well as a mandatory gear loss reporting form to be completed at the end of each season.

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Catherine Kilduff, Kristen Monsell	Center for Biological Diversity	Letter	C-34 1/28/2016	Regulations (Soak Time)	"Vehemently" oppose extending service interval. Shorter intervals may decrease the time that an entanglement would go unnoticed. Suggest that radio-frequency identification devices be placed on traps to assist enforcement with monitoring service intervals.	See response to C-4 and C-19
Catherine Kilduff, Kristen Monsell	Center for Biological Diversity	Letter	C-35 1/28/2016	FMP (Bycatch/Entanglement)	The FMP discussion of marine mammal bycatch minimizes the impact of lobster gear interactions and with the respect to the scope of the problem of California pot and trap entanglements. The plan does not recognize that entanglements categorized as resulting in "serious injury" are likely to result in mortality and many entanglement events that could not be positively assigned to a particular fishery are likely to have been lobster gear. Omitting information about unidentified entanglement in the plan precludes consideration and adoption of measures that can contribute to solving the whale entanglement problem.	Additional context on the scale of the whale entanglement issue and the acknowledgement that some entanglement events from unknown gear types may be due to lobster gear was added to section 2.3.3 on page 12. Also see response to C-19
Catherine Kilduff, Kristen Monsell	Center for Biological Diversity	Letter	C-36 1/28/2016	Regulations (Cumulative Fishery Mortality and Serious Injury)	The MMPA's List of Fisheries should include the CA lobster fishery as a Category II fishery because of the cumulative fishery mortality and serious injury for endangered humpback whales.	No action. The comment is related to the Marine Mammal Protection Act and determinations made by the National Marine Fishery Service.

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Catherine Kilduff, Kristen Monsell	Center for Biological Diversity	Letter	C-37 1/28/2016	Regulations (Whale Entanglement)	To address the problem of lobster fishing gear entangling whales, recommend setting a minimum distance between traps to allow safe passage of whales and boat traffic, and instituting a program for retrieving lost gear.	See response C-19
Sarah Abramson Sikich and Dana Roeber Murray	Heal the Bay	Letter	C-38 1/28/2016	Regulations	Generally support the draft FMP, particularly the trap limit and non-transferrable permits, identifying recreational gear, and electronic logs.	Noted.
Sarah Abramson Sikich and Dana Roeber Murray	Heal the Bay	Letter	C-39 1/28/2016	FMP (Essential Fisheries Information)	Identify primary knowledge gaps for lobster fishery management as 1) reliable catch data (particularly recreational), 2) catch monitoring that includes individual-level size distribution, and 3) improved growth and production models to inform the HCR.	The Department recognizes that these are important areas for future research. Section 5 of the FMP outlines information needs, existing and potential research methods, and potential collaborations.
Sarah Abramson Sikich and Dana Roeber Murray	Heal the Bay	Letter	C-40 1/28/2016	FMP (Essential Fisheries Information)	State that research and monitoring is only mentioned briefly in sections 4.7 and 6, description should be more robust, and knowledge gaps should be identified and prioritized, and potential collaborations should be outlined. Given the uncertainty in recreational catch and the fact that LAC outcomes were driven by majority vote and therefore may not always reflect the most conservative options with regard to conservation, the Department should prepare a	Section 5 of the FMP outlines information needs, existing and potential research methods, and potential collaborations. Information needs are prioritized in Table 5-1. The Department will continue to monitor recreational catch relative to commercial catch using the existing resources for recreational report cards and will seek opportunities to implement additional recreational data collection methods. Until secure

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					clear roadmap for how better information to inform management will be acquired.	funds and collaborators are identified, it is premature for the FMP to outline a clear roadmap for recreational data collection. The nonconsensus LAC proposals for additional controls on the recreational fishery are now highlighted in a forward to Appendix IX of the FMP.
Sarah Abramson Sikich and Dana Roeber Murray	Heal the Bay	Letter	C-41 1/28/2016	Recreational Fishery Data (Creel Survey)	The Department should conduct a creel survey to update information on composition of the recreational fishery between divers and hoop netters.	The Department recognizes that either a creel survey or a telephone survey, that would be complementary to the report cards, could be useful for tracking recreational gear use. The potential use of a telephone survey was added to the FMP section on recreational report cards in section 5.1.1.
Sarah Abramson Sikich and Dana Roeber Murray	Heal the Bay	Letter	C-42 1/28/2016	Recreational Fishery Data (Size and Sex)	Would like to see further improvement in recreational catch estimates and these estimates should include size and sex data.	The Department recognizes that improved recreational catch estimates are important and could be accomplished with the use of a telephone survey in combination with the report card system. Size and sex data would be useful but only if collected on a regular basis. Additional text noting the desirability of a telephone survey was added to the FMP section on recreational report cards in section 5.1.1. Text noting the potential use of creel surveys for collection of recreational size data was added to

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						the FMP section on stock composition in section 5.2. Current resources do not allow for regular creel surveys for collection of size and sex data.
Sarah Abramson Sikich and Dana Roeber Murray	Heal the Bay	Letter	C-43 1/28/2016	Regulations (Recreational Fishery)	Perceive an inequity in the proposed controls of commercial and recreational fisheries. Would like stronger controls on recreational take and this would have been apparent if LAC "near consensus" items were shared as well as the consensus items.	Six out of the eight conservation and management measures in the HCR toolbox could be applied to the recreational fishery. However, these measures do not include the two near consensus recommendations from the LAC. Those have now been highlighted in a forward to Appendix IX of the FMP.
Sarah Abramson Sikich and Dana Roeber Murray	Heal the Bay	Letter	C-44 1/28/2016	LAC Process	An MLMA compliance checklist should have been "front and center" during the LAC process.	The Department will take this recommendation into consideration for future FMP planning processes.
Sarah Abramson Sikich and Dana Roeber Murray	Heal the Bay	Letter	C-45 1/28/2016	LAC Process	Future advisory councils should be given clearer guidance and expectations. Some on the LAC were confused by an apparent shift in focus from scientific research to social issues and issues of balance between the sectors.	See response to C-44.
Sarah Abramson Sikich and Dana Roeber Murray	Heal the Bay	Letter	C-46 1/28/2016	LAC Process	Suggest future FMPs engage in EFI research early, use results to inform advisory council discussions, then allow time for additional scientific analyses to be completed based on council feedback.	See response to C-44.

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Sarah Abramson Sikich and Dana Roeber Murray	Heal the Bay	Letter	C-47 1/28/2016	LAC Process	Peer review should have taken place earlier in the process.	See response to C-44.
Sarah Abramson Sikich and Dana Roeber Murray	Heal the Bay	Letter	C-48 1/28/2016	FMP/Fishery Data (Entanglement)	Information on interactions with mammals in the FMP only reflects data up to 2012.	Information on mammal interactions in the FMP reflected data that was current with output of the latest draft. The Department has been in communication with the National Marine Fisheries Service (NMFS) and has access to the NMFS stranding database. That database was referenced in section 2.3.3 along with NMFS mammal stock assessments published in 2014. Stock assessments published in 2015 are now referenced.
Sarah Abramson Sikich and Dana Roeber Murray	Heal the Bay	Letter	C-49 1/28/2016	Entanglement	Lobster fishermen should participate in the whale entanglement workgroup along with Dungeness crab fishermen.	The Department is taking a collaborative and focused approach to investigating solutions to entanglement in trap gear for the Dungeness fishery at this time. Findings may later be investigated and applied to other trap fisheries.
Sarah Abramson Sikich and Dana Roeber Murray	Heal the Bay	Letter	C-50 1/28/2016	FMP (Bycatch)	Bycatch information within the FMP should be regularly updated.	Noted.
Sarah Abramson	Heal the Bay	Letter	C-51 1/28/2016	Fishery Data (whale	Information on trap density should be collected and shared.	This would be useful information when resources allow. The

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Sikich and Dana Roeber Murray				Entanglement)		Department will seek to develop partnerships to expand capacity for collection of essential fisheries information as noted in sections 5.1 and 5.4 of the FMP.
Cody Campbell	City of Vista	Verbal Testimony	C-52 2/10/2016	Regulations (Trap Limit)	Would like the Commission to consider the negative and deleterious impact that the proposed 300 trap limit will have on larger, long-term commercial lobster operators that rely on a larger trap number than the proposed 300 in order to maintain an economically viable business model. Those larger, long-term operators who had been in the business for 15 plus years fish between 700 and 800 traps, and would require some modification initially to stay in business. Unfortunately, there has not been a lot of willingness by the Commission to look at adopting or adapting the FMP to accommodate a sunset period for those senior fishermen which would allow them to conclude their business within the fishery without having a substantial negative economic impact.	See response to C-4.
Cody Campbell	City of Vista	Verbal Testimony	C-53 2/10/2016	Regulations (Trap Limit)	The challenge with the 600 trap limit is that a second lobster operator permit would have to be acquired. Theoretically, that might work but those permits are not currently available for purchase and may or may not come on market at any time.	See response to C-4.

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					Would like the Department to consider allowing additional permits to come into the market, specifically for purchase by those larger scale operators at an annual renewal or some mechanism that would allow them to purchase permits that are not currently on the market.	
Rodger Healy	California Lobster and Trap Fishermen's Association	Verbal Testimony	C-54 2/10/2016	Regulations (Hole-punching)	The original intent of the hole-punching recommendation from the LAC was to provide enforcement with a method to distinguish between a commercial and sport caught lobster. However, there is concern about the potential for sport caught undersized lobsters to be hole-punched, released, and then subsequently retained as legal size catch in the commercial fishery . Would like the Commission to consider adopting the hole-punching regulation without the market restriction to keep with the original intent of the LAC consensus recommendation.	See response to C-4.

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John Duffy	Retired California Department of Fish and Game Marine Biologist	Verbal Testimony	C-55 2/10/2016	Regulations (Hoop Net)	Concern about the interaction between recreational lobster divers and hoop netters. Would like to see a separation generated between divers and hoop netters for safety, especially in the San Diego area. Recommend that the Commission consider a requirement that hoop nets cannot be set within 50 yards of Zuniga jetty. Note there is precedent in the commercial fishery where traps may not be set within certain distances of both private and public piers and jetties.	Noted.
Greg Helms	Ocean Conservancy	Verbal Testimony	C-56 2/10/2016	FMP	Although the stock assessment finds the fishery is stable, it is one where there is clear potential for trouble in the future. Trouble spots include ongoing excessive effort, exceedance of maximum economic yield, and some intractability in terms of the recreational sector. The FMP, in combination with better recreational monitoring, is able to address those problems area; and, the HCR is the foundation of a workable, modernized approach to fisheries management.	Noted.

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Chris Voss	Commercial Lobster Fisherman from Santa Barbara	Verbal Testimony	C-57 2/10/2016	Regulations (HCR)	Concern that, under the FMP, the commercial fishery has a trap limit operating within the limited-entry policy as oppose to the recreational fishery that has a bag limit with an open-ended number of participants. Note that while the FMP considers lowering the recreational bag limit, an increase in the number of participants would have the same impact on recreational take. Suggest that the FMP consider the potential for a cap on recreational participants to balance between recreational and commercial take.	Controls on the number of participants in a recreational fishery, similar to a deer tag system, are highly unusual for the Department. The Department considers maintaining recreational opportunities to be a very high priority and would consider placement of effort controls such as bag, season, size, sex or district limitations on recreational fisherman before limiting the number of participants.
Bill Barnard	California Coalition of Diving Advocates	Verbal Testimony	C-58 2/10/2016	Regulations (Hole-punching)	At the end of the 2014 season, experimented with the tail-clipping lobsters and found that is a relatively easy thing to do on a boat when lobsters are landed.	Noted.
Bill Barnard	California Coalition of Diving Advocates	Verbal Testimony	C-59 2/10/2016	Regulations (HCR)	Discussed action taken by the state of Washington in the Dungeness crab fishery to increase recreational allocation by cutting commercial allocation; hope that California will not follow that path in future considerations of a TAC fishery allocation.	Noted.
Bill Barnard	California Coalition of Diving Advocates	Verbal Testimony	C-60 2/10/2016	Regulations (Hoop Nets)	Expressed support for Comment C-56.	Noted.

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Shad Catarius	Commercial Lobster Fisherman	Verbal Testimony	C-61 2/10/2016	Fishery Model	Concern about how the fishery model will be monitored over time; would like to see a mechanism in place that would provide timely responses to issues as they arise and not years down the road.	Noted. Reference point calculations will be made annually and the Department will be responsive to these stock indicators. Model revisions will be considered when new data indicates a need. The timing of relevant CA lobster research and availability of new data is uncertain.
Shad Catarius	Commercial Lobster Fisherman	Verbal Testimony	C-62 2/10/2016	Regulations (Hole-punching)	Commercial fishermen need to be able to retain and sell tail-clipped lobsters, otherwise, it will defeat the purpose for them financially.	Noted. See response to C-4.
Dana Murray	Heal the Bay	Verbal Testimony	C-63 2/10/2016	Regulations (Hoop Nets)	Comment similar to C-11.	See responses to C-5 and C-43.
Dana Murray	Heal the Bay	Verbal Testimony	C-64 2/10/2016	Fishery-Dependent Data	Comment similar to C-39. Would like to see data gaps in the recreational fishery addressed in the adaptive management process.	See responses to C-40, 41 & 42.
Dana Murray	Heal the Bay	Verbal Testimony	C-65 2/10/2016	Regulations (Lost gear)	Supports the Department's regulatory recommendations on lost gear.	See response to C-4
Dana Murray	Heal the Bay	Verbal Testimony	C-66 2/10/2016	Regulations (Buoys)	Would like to see the labeling of buoys in the recreational sector as well as the commercial.	Noted. This is included in current regulatory proposals.
Dana Murray	Heal the Bay	Verbal Testimony	C-67 2/10/2016	Bycatch Gear Loss Entanglement	Other environmental NGOs have expressed concern to Heal the Bay regarding issues of bycatch, lost fishing gear, and entanglement. Would like to see future management decisions made, as needed, looking at the best and most recent available data.	See response to C-32, C-35 and C-39.

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A. Talib Wahab	Avicena Network, Inc.	Letter	C-68 3/6/2016	LAC Process	Commercial buyers should have been included in the LAC process.	See response to C-44.
A. Talib Wahab	Avicena Network, Inc.	Letter	C-69 3/6/2016	Regulations / (HCR)	Supportive of a trap limit. A limit of 300 is a good starting point and can be refined further as needed.	Noted.
A. Talib Wahab	Avicena Network, Inc.	Letter	C-70 3/6/2016	Regulations / (HCR)	Changing the timing and length of the lobster season as a control measure should be done in conjunction with input from the market and buyers.	The Department will take this recommendation into consideration if prompted by the HCR to implement a management measure and season length is considered.
A. Talib Wahab	Avicena Network, Inc.	Letter	C-71 3/6/2016	Regulations / (HCR)	The commercial season should not open until November because 1) lobsters are less likely to be freshly molted and will consequently have greater survival in transport, and 2) the CA opening should be farther from the opening date for the Mexican fishery and therefore not flood the export market.	See response to C-69.
A. Talib Wahab	Avicena Network, Inc.	Letter	C-72 3/6/2016	Regulations	At-sea sampling should be performed prior to opening the commercial fishery to ensure lobsters are not freshly molted.	The Department would work with commercial fishermen if they chose to institute an at-sea sampling criterion for opening the season, but that would be an industry responsibility.
A. Talib Wahab	Avicena Network, Inc.	Letter	C-73 3/6/2016	Regulations / (HCR)	The commercial fishery should be subject to a maximum size limit. Large lobsters sell for a lower price and therefore reduce economic efficiency. Retaining them in the stock would also benefit the stock's spawning potential ratio. Large lobsters in the commercial catch are an unintended consequence of MPAs.	The Department will take this recommendation into consideration if prompted by the HCR to implement a management measure and imposition of a maximum size limit is considered.

Table 2. This table describes edits to the Draft California Spiny Lobster Fishery Management Plan made in advance of the Fish and Game Commission's adoption decision at the April 2016 meeting. Edits include changes in response to public comment as well as minor corrections. Additions are underlined and deletions are in strikeout.

Document Section	Page Number	Change
Title page	i	The date was changed to the month and year of potential adoption [April, 2016]. "Draft" was removed.
Acknowledgements	x	4th sentence: "The Sacramento State University Center for Collaborative Policy served the essential role of impartial facilitator of the LAC meetings and assisted with development of the LAC process." The addition was made to correct an earlier omission of acknowledgement of this important contribution.
2.3.3	12	2nd paragraph, 2nd sentence: Changed from "However, the number of whales observed entangled in trap gear on the California coast has been increasing in recent years (National Marine Fisheries Service stranding database)" to "However, the number of reported whale entanglements on the west coast of the United States has been increasing in recent years (National Marine Fisheries Service stranding database) and reached a peak of approximately 35 in 2014 with a total of 231 for the period between 2000 and 2015 (Lawson, 2015). The majority of confirmed entanglements are attributed to categories for trap or pot fisheries and unknown gear with relatively few attributed to nets (Lawson, 2015). Among those with a confirmed gear type from a trap fishery, the large majority are due to the Dungeness crab fishery and relatively few to the lobster, rock crab and spot prawn fisheries (Lawson, 2015). However, it should be recognized that some portion of entanglements due to an unknown gear type may be attributable to the lobster fishery." The change is intended to provide additional context on the scope of the entanglement issue, what is known about the fisheries involved, and recognize the large number of unknown gear types and the potential for some of those unknown occurrences to involve lobster gear.
2.3.3	12	2nd paragraph, 3rd sentence: "Since the year 2000, there have been four reported incidences of gray whales, two ~~one~~ humpback whales, and one unidentified whale entangled in lobster gear (Carretta et al., 2014; Carretta, et al., 2015; National Marine Fisheries Service stranding database) and one ~~recorded~~ incidence of bottlenose dolphin entanglement in 2008 (Carretta et al., 2014)." The change was made to recognize one additional humpback whale entanglement noted in Carretta et al., 2015.
2.3.3	12	2nd paragraph, 4th sentence: "Mortality due to entanglement was confirmed for ~~only~~ the unidentified whale, and one humpback whale and one gray whale were reported as seriously injured." The change was made to recognize serious injuries in addition to known mortalities. The National Marine Fisheries Service defines serious injuries as more likely than not to result in mortality.
3.10	25	References to ~~(Yaeger et al., in prep)~~ throughout the section were updated to (Yaeger et al., 2015).

4.3.1.1	40	1st paragraph, sentences 6-9: "Commercial landings of ~~The~~ CA lobster ~~stock status~~ appear to be influenced by warm and cold water regimes driven by the Pacific Decadal Oscillation (PDO) and this has been observed using fisheries dependent (Neilson, 2011). F ~~and f~~isheries-independent ~~(Miller, 2014)~~ data on lobster abundance based on entrainment in power plant systems does not show a correlation between young of the year or slightly sub-legal lobsters and environmental indices including the PDO (Miller, 2014a). However, increases in abundance and decreases in average size at some power plants after the 1989 regime shift do indicate the potential for recruitment success to be driven by changes in environmental factors at longer time scales (Miller, 2014a). Moreover, the abundance of phylosomal larvae in oceanographic samples from the SCB is significantly correlated with El Nino events, mean sea-surface temperature, and the PDO (Koslow et al., 2012)." The change was made to clarify that the relationship between stock status and environmental conditions is complex. Commercial landings appear related to PDO but this may not be an indicator of stock health. Additionally, fisheries-independent data analyzed by Miller (2014) do not show a relationship between the abundance of young lobster and PDO as was originally quoted. However, Miller's analyses do suggest important environmental influences.
5.1	63	1st paragraph, 3rd sentence: "In particular, improving information on the recreational fishery has been a priority with implementation of the recreational report card requirements. Further improvements to that system are needed. CDFW is also increasingly interested in development of reliable and regularly collected fisheries-independent data streams." The text was added to emphasize CDFW's recognition of the need for improvements to recreational fishery and fisheries-independent data streams.
5.1.1	64	Subsection *Correlating Commercial Logbooks and Landing Receipts*, 4th paragraph, 3rd sentence: "CDFW ~~is proposing to~~ will seek ways to address this issue such as amending landing receipts to record the total number of lobster landed as part of an up-coming revision process for all logs and landing receipts." CDFW had intended to include this change in the regulatory package associated with the FMP but due to limitations on internal processes, will include the change in a later revision of commercial fishing data streams, data entry procedures, and databases.
5.1.1	65	Subsection *Recreational Lobster Report Cards*, last paragraph: "Accurate estimates of annual catch for the recreational fishery is critical for management and cannot be made when report card return rates are low. One method for improving catch estimates is to implement a telephone survey of report card holders who did not return their card, as is performed by CDFW for the red abalone recreational fishery. Combined report card and telephone survey data would also be necessary for accurate estimation of the proportion of trips employing different gear types." The addition emphasizes the need for improvement in existing recreational fishery data streams and identifies a telephone survey as a useful tool.
5.1.1	66	Subsection *Research Trapping*, last sentence: "These programs have been employed in California to support MPA monitoring efforts as well as lobster tag recovering efforts in the northern Channel Islands (Kay et al.,

		2011) and in the southern portion of the SCB ~~San Diego~~ (Hovel et al., 2015; Hovel and Neilson, 2011)." Research trapping was used both in San Diego by Hovel and Neilson (2011) and by a broader study by Hovel et al. (2015).
5.1.1	66	Subsection *Dive Surveys*, last sentence: "While recognizing these challenges, SCUBA surveys may also be used to assess fishery impacts and fisherman behavior. Eggleston et al. (2003) performed SCUBA surveys of Caribbean spiny lobsters (*P. argus*) in the Florida Keys immediately before and after a recreational "mini-season" to demonstrate the magnitude of removal rates and their relationship to initial density. Similar surveys of CA lobster before the recreational season, immediately before the opening of the commercial season, and at the end of the season could provide information on the relative impacts of the fisheries and help optimize management responses. However this would involve a great deal of effort within a short time frame." Text was added to recognize the potential use of methods described by Eggleston et al. (2003) as recommended by Eric Miller.
5.1.1	67	Subsection *Larval Collectors*, sentences 6-10 and 12: "Koslow et al. (2012) used this time series to identify a relationship between environmental conditions and phyllosoma abundance which were positively correlated. CA lobster landings were also correlated with phyllosoma abundance across much of the time series but the relationship breaks down during recent years under high exploitation rates. This may indicate that recent high removal rates of reproductive individuals is having a negative impact on larval production and potential recruitment. Further work is required to better understand the relationship between phyllosoma abundance and spawning stock abundance before phyllosoma could be confidently used as the basis for a reference point within the HCR. However, the phyllosoma data will be extremely valuable when managers are prompted by the HCR to investigate the underlying causes for the existing reference points crossing their thresholds. The positive correlation between phyllosoma abundance and environmental indicators will help managers to distinguish between fishery and environmental processes impacting the stock and craft appropriate responses. ~~The project is ongoing and may contribute to the management of the CA lobster fishery in the future.~~" And "CDFW will continue to track the CalCOFI data on phyllosoma and will seek to develop collaborations to model larval transport in the SCB and California Current, which can help determine the sources and the destinations of the lobster larvae across southern California." The additions were made to provide more information on the CalCOFI phyllosoma data, its value, and how CDFW intends to use it in the future in response to comments by Julian Koslow.
5.2	72	Subsection Other EFI-Stock Composition, 2nd paragraph, last sentences: "Length frequency data from the recreational fishery would be similarly valuable and is not well represented by lengths in the commercial fishery because recreational fishermen are able to target larger individuals. CDFW does not expect that size

		information could be accurately collected on recreational report cards and creel surveys would be most effective." The addition emphasizes that length-frequency information for the recreational fishery would be valuable, in addition to the already noted commercial fishery. It also identifies that creel surveys would be more effective than report cards for collection of this information in response to comments by Heal the Bay.
5.2	74	Table 5-1: Added a row for larval abundance as a data type that may be used for estimating abundance of the spawning stock in response to comments by Julian Koslow.
5.2	74	Table 5-1: Creel sampling was added as a data collection method for the length frequency data type within the stock composition category. This corrects an omission.
6.3	80	Number four in the list of five statutes to be made inoperative as applied only to the CA lobster fishery was changed from ~~FGC § 8104~~ to FGC § 8103. FGC § 8104 was listed in error and applies only to the herring fishery.
References	91	Carretta, J.V., E.M. Oleson, D.W. Weller, A.R. Lang, K.A. Forney, J. Baker, M.M. Muto, B. Hanson, A.J. Orr, H. Huber, M.S. Lowry, J. Barlow, J.E. Moore, D. Lynch, L. Carswell, R.L. Brownell Jr. 2015. U.S. Pacific Marine Mammal Stock Assessments; 2014. U.S. Department of Commerce, NOAA Technical Memorandum, NOAA-TM-NMFS-SWFSC-549. 414 p.
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CALIFORNIA SPINY LOBSTER FISHERY MANAGEMENT PLAN

April, 2016

DRAFT FINAL

California Department of Fish and Wildlife

Marine Region

Executive Summary

The California Spiny Lobster (CA lobster) is an important natural resource managed by the state of California for over 100 years. The species supports a valuable commercial fishery and a significant recreational fishery. CA lobsters also act as important keystone predators within the southern California nearshore ecosystem. The commercial fishery in California extends from Point Conception south to the U.S.-Mexico border, and accounted for approximately 430.9 metric tons (mt) (950,000 pounds) in ex-vessel landings and $18.2 million in ex-vessel value during the 2014-15 fishing season. The California recreational fishery ranges from Central San Luis Obispo County south to the U.S.-Mexico border, and is estimated to contribute between $33-$40 million in consumer spending to the California economy each year.

The 2011 California Department of Fish and Wildlife (CDFW) stock assessment indicates that the CA lobster stock is stable under the current management measures. The current minimum size limit allows many lobsters to reproduce for one to two years before reaching the legal size limit. The seasonal closure (March-October) protects individuals from harvest during the sensitive spawning period of the species. The limited-entry nature of the commercial fishery restricts the number of commercial participants.

A substantial increase in average landing price ($/pound) has occurred within the commercial fishery during recent years. Around the same time, overall commercial trap effort as measured by the amount of trap pulls recorded on CDFW-issued daily lobster fishing logs has also increased. The increase in commercial fishing effort has raised questions about the long-term sustainability of the fishery, the negative consequences on the fishing grounds and associated ecosystems from increased gear usage, and the economic health of the commercial fishery.

The recent rise in commercial effort is also accompanied by changes in the dynamics of the recreational fishery. The recreational sector has traditionally been dominated by divers, but in the early 2000s, the popularity of boat-based hoop nets began to rise. Starting in 2008, recreational lobster fishermen were required by CDFW to record their daily fishing activity and catch on standardized report cards.

Report card sales have increased over the last seven years, suggesting that participation has increased. However, card sales do not necessarily reflect actual fishing effort or catch. Report card return rates have steadily increased since the program was first implemented due to proactive CDFW effort to educate the public and the establishment of a non-reporting fee in 2013. Based on the returned cards, CDFW estimates that recreational fishermen harvested 31% of the total catch (commercial + recreational) during 2014-15 fishing season. As return rate continues to improve from new public outreach and reporting requirements, CDFW will be better able to estimate recreational effort and catch.

In 2012, the state implemented a set of new marine protected areas (MPAs) under the **Marine Life Protection Act** (MLPA) in southern California. The 50 MPAs and two special closures in this region are designed to serve a myriad of objectives including conservation of valuable fishery resources. These MPAs create safe zones for species such as CA lobsters to reproduce without fishing pressure, but at the same time shift and compress fishing effort to the remaining non-MPA areas.

Marine Life Protection Act (MLPA) - The MLPA, enacted in 1999, required the California Department of Fish and Wildlife to develop a Marine Life Protection Program, including a Master Plan for a network of Marine Protected Areas (MPAs) within state waters. The network of MPAs includes an improved State Marine Reserve (complete no-take areas) component and other classifications of MPAs (State Marine Parks and State Marine Conservation Areas). The goals of the MLPA are varied and include protecting portions of ecosystems in a variety of habitats, preserving biodiversity, and helping to sustain and protect populations of fished species.

In light of the dynamic nature of the fisheries, it is important for CDFW to adopt a cohesive management strategy for CA lobster. Accordingly, a key provision of this Fishery Management Plan (FMP) is a harvest control rule (HCR) for CA lobster. The HCR serves as the foundation for managing the fishery in the future as well as the primary mechanism to prevent, detect, and recover from overfishing as required by the **Marine Life Management Act** (MLMA). The HCR is a type of adaptive management framework that identifies potential conservation problems and prescribes appropriate management responses. It consists of three parts: 1) reference points, 2) a control rule toolbox, and 3) a control rule matrix. Reference points are the metrics used to gauge the status of the fishery. The three CA lobster reference points are: 1) Catch, 2) **Catch Per Unit Effort** (CPUE), and 3) **Spawning Potential Ratio** (SPR):

REFERENCE POINT	THRESHOLD	RATIONALE
Catch	$\frac{average\ catch\ for\ 3\ most\ recent\ seasons}{average\ catch\ for\ 10\ most\ recent\ seasons} \leq 0.9$	Identifies possible change in stock stability, particularly growth overfishing
CPUE	$\frac{CPUE\ for\ 3\ most\ recent\ seasons}{CPUE\ for\ 10\ most\ recent\ seasons} \leq 0.9$	Identifies potential adverse changes in the fishery, mainly economic overfishing
SPR	$SPR_{CURRENT} \leq SPR(Average\ 2000\text{-}2008)$	Detects biological sustainability, particularly recruitment overfishing

The reference points incorporate important information regarding the fisheries such as the effects of fishing and MPAs. New information is interpreted in relation to prescribed reference point thresholds that signal when changes within the fishery may warrant management responses. Once these changes are detected within the fishery, resource managers have flexibility to choose the appropriate management response from a toolbox of eight management tools. These consist of: 1) Change commercial trap limit, 2) Change recreational bag limit, 3) Establish a Total Allowable Catch (TAC), 4) Implement district closures, 5) Change season length, 6) Change minimum size limit, 7) Implement a maximum size, and 8) Establish a sex selective fishery (Male-only fishery or female-specific size restrictions). The control rule matrix links specific reference point results to the appropriate management response.

Marine Life Management Act (MLMA)- The Marine Life Management Act (MLMA), which became California law January 1, 1999, established goals of conserving entire ecosystems, recognizing non-consumptive values, sustainability, habitat conservation, restoring depressed fisheries, limiting bycatch, and recognizing fishing communities.

Catch Per Unit Effort (CPUE) - The rate at which fish are caught; typically a number or weight of fish captured per unit of effort. Units of effort can be assigned many ways, including the time spent fishing (hours or days), the amount of fishing gear deployed (number of vessels, traps, nets, etc.), the number of times that fishing gear is deployed and retrieved (e.g., net hauls, trap pulls), or a combination of these estimates. Because it is difficult and expensive to scientifically measure the number of fish in an area (abundance), CPUE is often used as an index for the relative abundance of organisms across time or space. For CA lobster, CPUE is typically defined as the number of legal (or sublegal-sized) lobsters per trap pull for the commercial fishery, and number of legal lobsters retained per fishing trip for the recreational fishery. Effort is most often described in terms of trap pulls, total traps, and number of active permits for the commercial fishery, and number of fishing trips for the recreational fishery.

Spawning potential ratio (SPR) – A ratio of the number of eggs produced during the lifetime of an average female in a fished population to the number of eggs produced during the lifetime of an average female in an unfished population; used to characterize the amount of impact fishing has on a population's ability to reproduce.

Lobster Advisory Committee – A committee composed of representatives from the recreational fishery, the commercial fishery, environmental interest groups, scientific experts, non-consumptive recreational interest groups, and federal resource managers. The committee was responsible for providing crucial constituent inputs during the drafting process of this FMP, in part through a consensus recommendation.

The scientific foundation for the HCR underwent an independent, external peer review (see Appendix VII and VII). In particular, reviewers focused on the choice of reference points, the model used to calculate SPR, and the decision to manage CA lobster as a single stock. The primary changes to the previous draft of this FMP in response to peer review include:

- A von Bertalanffy growth model was used to describe lobster age at a given size within the model used to calculate SPR.
- Catch and CPUE reference points were made more sensitive by setting the threshold levels at 0.9 rather than 0.8.
- Expanded discussion of possible reference points and associated models was added to the FMP along with increased explanation of the selected approach.
- Information on regional differences within the stock was added and better understanding of these differences was highlighted as an information need.

This FMP also describes various management tools considered during the stakeholder **Lobster Advisory Committee** (LAC) process. The LAC reached consensus on several regulatory recommendations that will assist future fishery management. These recommendations include, but are not limited to: 1) Commercial permit-based trap limit, 2) Tail clipping or hole punching of recreationally caught CA lobsters, 3) An additional grace period for commercial fishermen to deploy traps before the season and an additional period to retrieve traps after the season, 4) Changing the opening time for the recreational season, 5) Restrictions on mechanical pullers for the recreational fishery, 6) Allowance to carry SCUBA gear on commercial vessels, 7) Requirement to mark recreational hoop net floats, 8) Clarifying regulatory language on the take of lobster by hand, and 9) Increased soak time for commercial traps.

CDFW currently collects substantial fishery-dependent data on CA lobster through commercial logbooks, landing receipts, recreational lobster report cards, creel sampling, and at-sea sampling. However, better information on the species stock distribution, ecological role, and life history (e.g., movement, **recruitment**, reproduction, mortality) would allow CDFW to improve its future management activities. Pursuant to the MLMA mandates, CDFW will continue to work with its constituents to improve research and monitoring efforts in order to better maintain sustainable CA lobster populations and associated fisheries.

Recruitment - The process, event, or rate by which individuals enter new life stages or segments of a population. *Larval recruitment* refers to the process or event by which larvae of marine species exit the planktonic life stage. *Fishery recruitment* (or, recruitment to the fishery) refers to the moment that an animal becomes vulnerable to capture in a fishery – usually because it has attained some minimum size or age for harvest.

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Acronyms

CA lobster – California spiny lobster, *Panulirus interruptus*
CalCOFI – California Cooperative Oceanic Fisheries Investigations
CASP – Sea Grant Collaborative At-Sea Sampling Program
CC – Climate Change
CCR – California Code of Regulations
CDFW – California Department of Fish and Wildlife
CL – Carapace length
CFR – Collaborative Fisheries Research
CPUE – Catch per Unit Effort
EFI – Essential Fishery Information
FGC – California Fish and Game Code
FMP – Fishery Management Plan
GHG – Green House Gas
HCR – Harvest Control Rules
ITQ – Individual Transferrable Quota
LAC – Lobster Advisory Committee
LFMP – California Spiny Lobster Fishery Management Plan
Max LS – Maximum Legal Size
MEY – Maximum Economic Yield
Min LS – Minimum Legal Size
MLMA – Marine Life Management Act
MLPA – Marine Life Protection Act
MPA – Marine Protected Areas
MSE – Management Strategy Evaluation Model
MSY – Maximum Sustainable Yield
SAM – Size at Maturity
SCB – Southern California Bight
SPR – Spawning Potential Ratio
SST – Sea Surface Temperature
TAC – Total Allowable Catch
YPR – Yield per Recruit

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1. Introduction

The Marine Life Management Act (MLMA) establishes a policy for the State to ensure the conservation and **sustainable** use of California's living marine resources (FGC § 7050(b)). The MLMA states that Fishery Management Plans (FMP) "shall form the primary basis for managing California's sport and commercial marine fisheries" (FGC § 7072). FMPs are documents that consolidate available information under the statutorily prescribed frameworks (FGC §§ 7072, 7075, 7080-7088); their contents and any subsequent amendments form the basis for all **fishery** management decisions. The California Department of Fish and Wildlife (CDFW) is responsible for drafting FMPs and presenting them to the California Fish and Game Commission (Commission). FMPs become effective upon adoption by the Commission through a public process. Implementation is done through a separate Commission rulemaking process, and the implementing regulations are codified in Title 14 of the California Code of Regulations. This FMP is developed for the California spiny lobster (*Panulirus interruptus*; CA lobster) in U.S. waters.

1.1 The Goal of the FMP

The goal of this FMP is to formalize a management strategy that can respond effectively to changes in the CA lobster fisheries pursuant to the tenets of the MLMA. CA lobsters have long supported major **commercial** and **recreational fisheries**, and the species plays a key role in maintaining the health of the southern California kelp forest **ecosystem**. This ecosystem is important to a number of non-consumptive users such as divers, eco-tourists, researchers, educators, and the conservation community.

To achieve responsive and effective management, this fishery must be adaptable and sustainable. This FMP uses an **adaptive management** framework (Holling et al., 1978; Walters and Hilborn, 1978) based on a harvest control rule (Section 4.3). Section 90.1 of the Fish and Game Code (FGC) defines adaptive management as "a policy that seeks to improve management of biological resources, particularly in areas of scientific uncertainty, by viewing program actions as tools for learning."

Sustainable, Sustainable use, and Sustainability - With regard to a marine fishery, means both of the following: 1) continuous replenishment of resources, taking into account fluctuations; and 2) securing the highest possible present and long-term social and economic benefits, maintaining biological diversity, and managing fisheries in a way that does not exceed **optimum yield**. See also FGC § 7050(b).
Fishery - Fishing for, harvesting, or catching one or more populations of marine fish or marine plants that may be treated as a unit for purposes of conservation and management that are identified on the basis of geographical, scientific, technical, recreational, and economic characteristics.
Commercial fishery - Describes a group of enterprises and individuals as well as their actions associated with fishing for certain species with the intent of selling the catch.
Recreational fishery - Describes a fishery associated with taking of any fish for any purpose other than profit.
Ecosystem - The physical and climatic features and all the living and dead organisms in an area that are interrelated in the transfer of matter and energy, which together produce and maintain a characteristic type of biological community. Ecosystems can range in size.

1.2 Efforts Leading Up to the FMP – The Lobster Advisory Committee

This FMP incorporates input from the Lobster Advisory Committee (LAC). The LAC was formed in early 2012 following a call by CDFW for volunteers to represent various public stakeholder groups. The purpose of the LAC is to involve constituent representatives with the development of this FMP. The LAC provided guidance on FMP objectives and end-products as well as ideas for management options that addressed the key issues put forth by members of the public. The LAC consists of representatives from the marine science community, the recreational fishing sector, commercial fishing sector, the non-consumptive recreational sector, the environmental

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community, and the federal government.

A total of nine LAC meetings occurred between June 2012 and September 2013. All meetings were open to the public, and public input was encouraged. Meeting announcements were posted on the CDFW website, and the public was encouraged to sign up for the Lobster FMP news email service. Meeting summaries as well as various background documents are available on the CDFW website (www.wildlife.ca.gov/Conservation/Marine/Lobster-FMP). The LAC reached consensus on several management recommendations for CDFW and the Commission (Section 4.4.5, Appendix II, and Appendix IX).

2. Background of the Fishery

CA lobsters have been fished since the 1800s. U.S. fishermen target CA lobsters primarily from Point Conception south to the U.S. – Mexico border, and off southern California islands and banks (Barsky, 2001; Figure 1-1). Some fishing takes place north of Point Conception, but as of 2013 effort has not been significant. The commercial and recreational fisheries run from early October to mid-March, with the recreational fishery starting 4 days earlier than the commercial fishery (FGC § 8251; 14 CCR § 29.90). This results in a 24 week commercial fishing season and a 24.5 week recreational fishing season.

A 2011 **stock assessment** suggested that the post-2000 CA lobster **population** is at a sustainable level where surplus production provides the majority of the harvestable CA lobster each season (Neilson, 2011). This conclusion was based mostly on consistency in the size of captured lobsters, **harvest rates**, catch totals, and level of fishing effort since 2000.

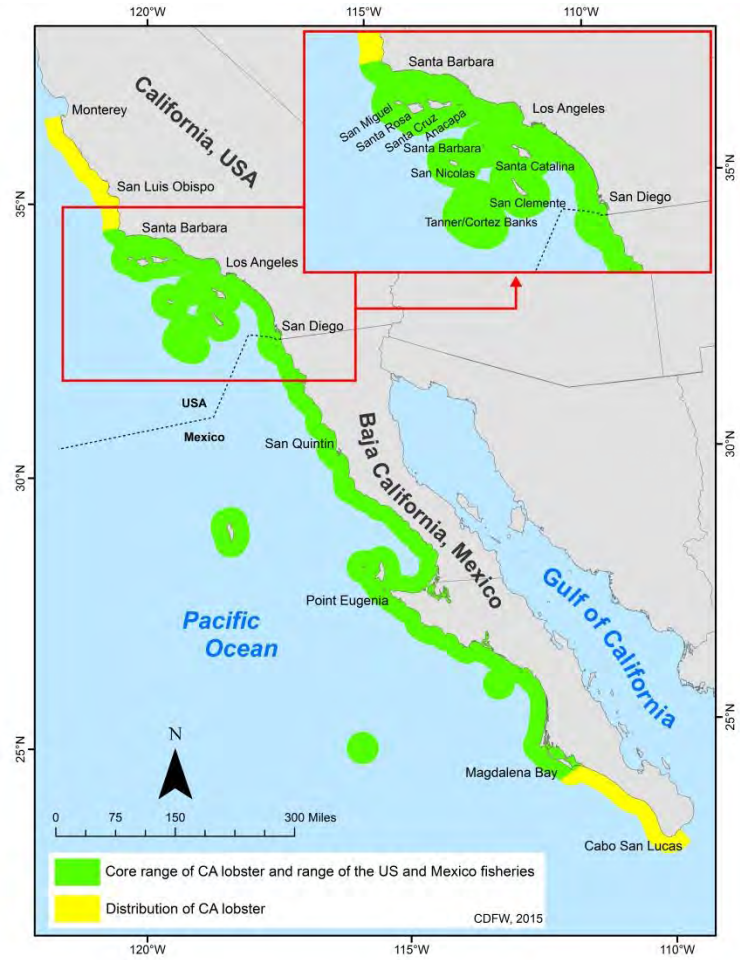

Figure 1-1: Geographic range of CA lobster (*P. interruptus*).
***A 20mi buffer from the coast was used to indicate the approximate range of the species, and does not represent fine-scale distribution**

Stock assessment - An evaluation of the status of a stock, including past and current stock levels and information to help guide future harvest. Assessments may integrate many different biological data, including growth rates of fish, mortality rates, age at first reproduction, fecundity, size classes present in the catch, and selectivity of fishing gear.
Population – All the individuals of a species that live in the same geographic area. A population may contain several discrete breeding groups or stocks.
Harvest rate (u) - The percentage of legally harvestable individuals in a population that are removed each year due to fishing.
Stock - A group of fish of the same species in a given management area. A single stock may be comprised of multiple populations or be a portion of a single larger population.

Biological sustainability of the **stock** is attributed to multiple factors. Chief among them is likely the minimum legal size for the CA lobster fisheries, which is larger than the size at which individuals reach sexual maturity (Section 3.3). The number of sublegal-size lobsters caught by commercial fishermen has increased in recent years, which suggests that the current size limit is effective, and that a sizable number of sublegal-size lobsters are present in the wild and contributing to reproduction (Neilson, 2011).

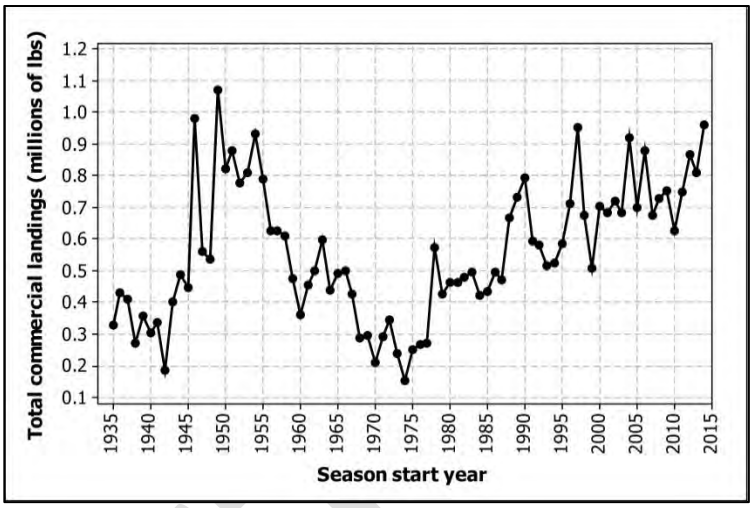

Figure 2-1: Commercial CA lobster (*P. interruptus*) landings from the 1936-37 to 2014-15 fishing seasons.

2.1 Commercial Fishery History and Description

The commercial CA lobster fishery can be characterized by several distinct periods. Commercial landings peaked at an all-time high of 485 mt (1.07 million pounds) during the 1949-50 fishing season, and declined to a record low of 69 mt (152,000 pounds) during the 1974-75 fishing season (Figure 2-1). The reason for this decline was thought to have been the illegal take of sublegal-size adults, and was corrected by the introduction of escape ports in 1976, which allowed sublegal-size individuals to exit

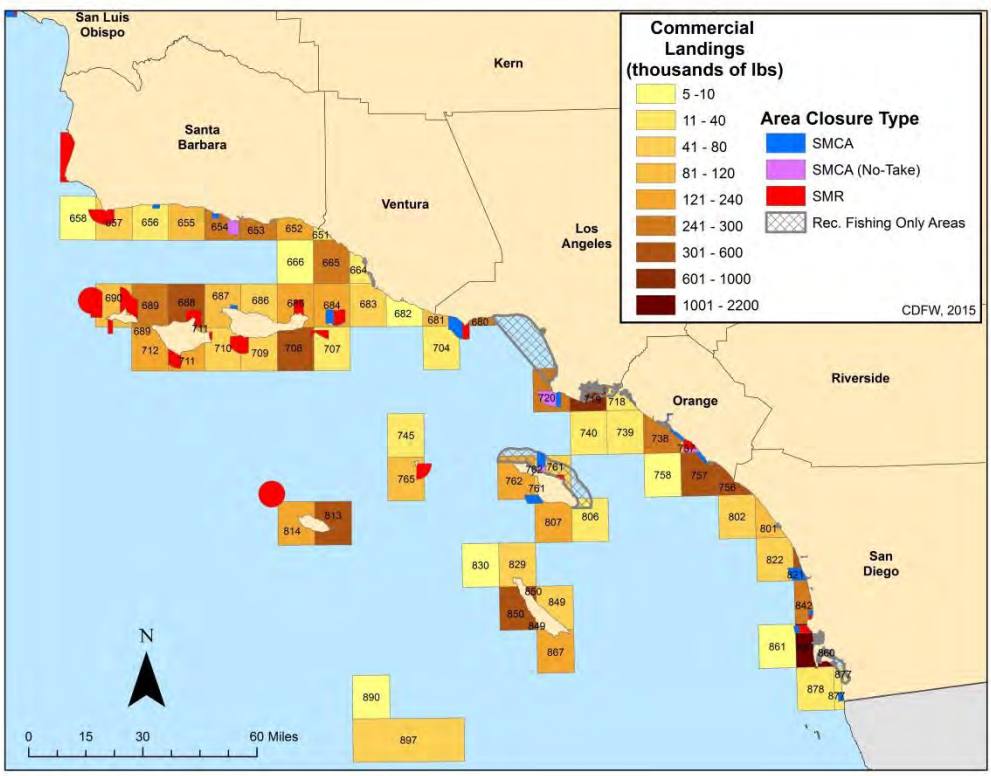

Figure 2-2: Commercial CA lobster (*P. interruptus*) landings by CDFW commercial fishing block between 2000-2014 fishing seasons overlayed with MPAs and recreational-only fishing areas.
***SMCA = State Marine Conservation Area**
****SMR = State Marine Reserve**

traps (Barsky, 2001). After 1976, the harvest increased and was stable for approximately a decade. Landings then showed further increases but volatility until the 2000-01 fishing season, when 319 mt (702,000 pounds) were landed. Since 2000, **landings** have fluctuated within a relatively narrow range, exceeding 300 mt (661,000 pounds) each season. Figure 2-2 provides a snap shot of CA lobster landings based on commercial fishing blocks between 2000 and 2013 along with marine protected areas (some of which prohibit the take of CA lobster). Since 2000, the number of active commercial participants has remained relatively consistent between 145 and 160.

Figure 2-3: CA lobster (*P. interruptus*) commercial fishing trap.

Commercial fishermen use wire box-like traps deployed from boats to catch CA lobsters (Figure 2-3). Properly placed and serviced traps do not generally cause significant physical disturbance to the environment (Eno et al., 2001). Traps are usually deployed in less than 31 m (100 ft) of water, but some are deployed as deep as approximately 93 m (300 ft). According to a 2013 CDFW commercial fishery survey, fishermen generally operate 75 to 1,000 traps each season, with a median of 300 traps. California law requires fishermen to service (pull and clean) each deployed trap at least once every 96 hours, weather conditions permitting (FGC § 9004).

Traps - Generally, a wire basket or cage used for trapping certain types of organisms.
Landings - The number or poundage of fish unloaded at a dock by commercial fishermen or brought to shore by recreational fishermen for personal use. Landings are reported at the points where fish are brought to shore. Note that landings, catch, and harvest define different things.

Commercial landings tend to be distributed evenly between San Diego County, Los Angeles/Orange Counties, and Santa Barbara/ Ventura Counties. However habitat area and fishing effort are not equally distributed. For example, in the last 10 years 20-30% of all trap pulls and a similar proportion of the total catch can be attributed to the single fishing block at Point Loma, San Diego. In general, 80% of a season's catch is landed within the first half of the commercial season by mid-January. The majority of CA lobsters caught by the commercial fishery have reached legal size within the last year, although larger lobsters are still landed (Neilson, 2011).

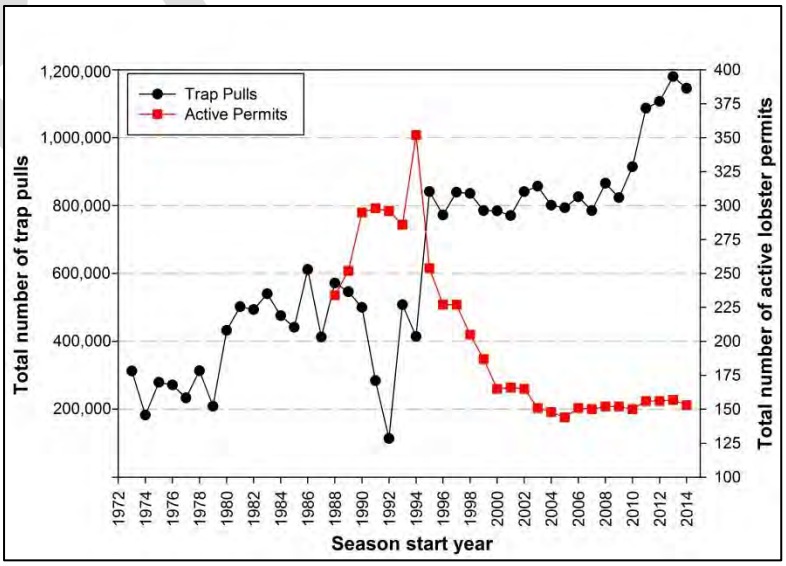

Figure 2-4: Total commercial trap pulls for CA lobster *(P. interruptus)* by year (black) compared to total number of active fishermen by year (red).

***Active Permits defined as individuals who made at least one landing during a particular fishing season**

Commercial fishing effort (i.e., number of trap pulls) has been increasing in recent years despite an overall decrease in the number of active fishermen since the late

1990s (Figure 2-4). Between 1995 and 2009, the annual total trap pulls of the commercial fleet hovered near 800,000 pulls. In 2012, the number increased to just over 1.1 million pulls, despite the number of active fishermen remaining stable at about 150 individuals since 2003. This effort increase could be driven by several factors. Permit transferability adopted in 2005 can create considerable debt for new entrants into the fishery. Transferable lobster operator permits sold for approximately $75-100K in the 2010s on the private market. This estimate is based on online permit exchange (e.g., http://www.permitmaster.com) and is consistent with testimonies from commercial fishermen during the Commission's Marine Resources Committee meetings. It is reasonable to expect the owners of this debt would have incentive to fish harder than unindebted permit holders.

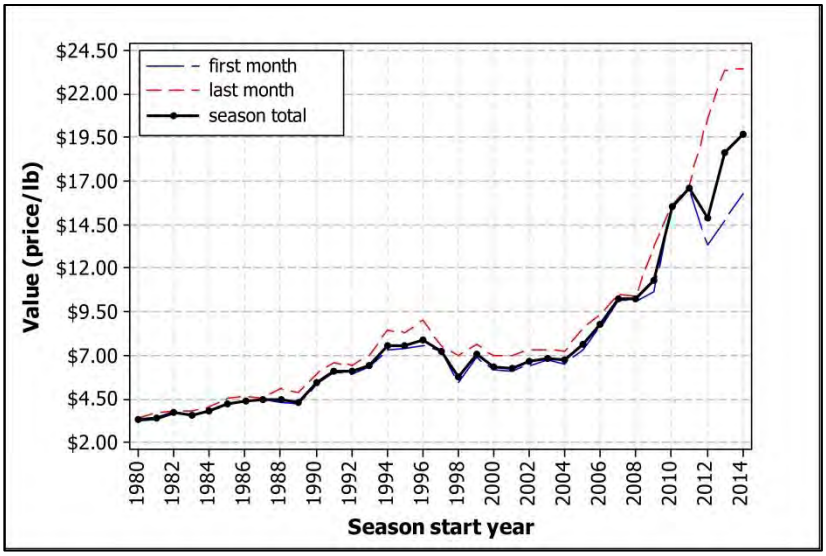

Figure 2-5: Mean commercial CA lobster (*P. interruptus*) landings value (price/pound (lb)) by fishing season. Lines indicate the total season, beginning (Sept+Oct) and ending (Feb+Mar) average value.

Ex-vessel price/Ex-vessel value - The value of fish at first sale by fishermen at the dock, distinguished from wholesale or retail value.
Yield per recruit (YPR) - A theoretical value that describes the yield to a fishery that is contributed by a given number of recruits (usually a single recruit).

Furthermore, some longtime permit holders who formerly contributed little effort to the fishery are becoming increasingly active because of the rapidly rising ex-vessel price of CA lobster in recent years. The average landing price of CA lobster has consistently increased over each season since the early 1990s (Figure 2-5). In the 2014-15 fishing season the fishery hit a record average seasonal landing price of $19.67/pound. The average landing price ($/pound) of CA lobster increased by approximately $8/pound between the 1980-81 and 2009-10 fishing seasons as domestic demand slowly grew. However, the average price increased by the same amount in just 5 years between the 2009-10 fishing season and the 2014-15 fishing season, as foreign markets expanded and export demand grew (Figure 2-5). Total **ex-vessel value** increased gradually between the late 1960s and 1990s, after which the value increased at a much faster rate and reached a record high of $18.7 million in the 2014-15 fishing season (Figure 2-6).

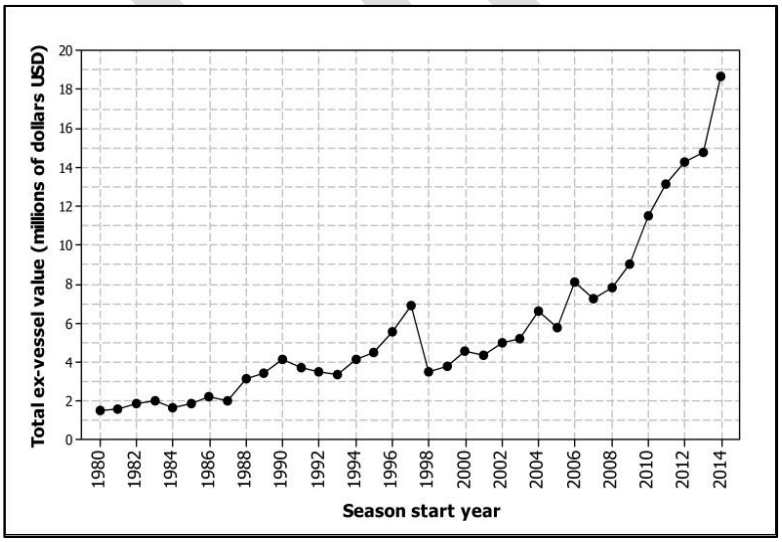

Figure 2-6: Total ex-vessel value of the CA lobster (*P. interruptus*) fishery from 1980 to 2014.

Figure 2-7 shows the cumulative percentage contribution of fishermen, ranked from highest to lowest catch, to the total catch of the fishery in the 2013-14 fishing season. If all fishermen land similar levels of catch, the cumulative catch will be a straight line. Here the slope is curved, which means that differences exist with some fishermen landing more than others. Furthermore, the curve is very gradual with no significant break, suggesting there is high competition within the fishery, and a fisherman can easily trade place with those immediately before or after him/her from one season to the next. However, this graph does not show the difference in operational costs between fishermen; a more efficient fisherman (e.g., loses less traps or running a more efficient boat) may generate more profit than a more highly ranked competitor.

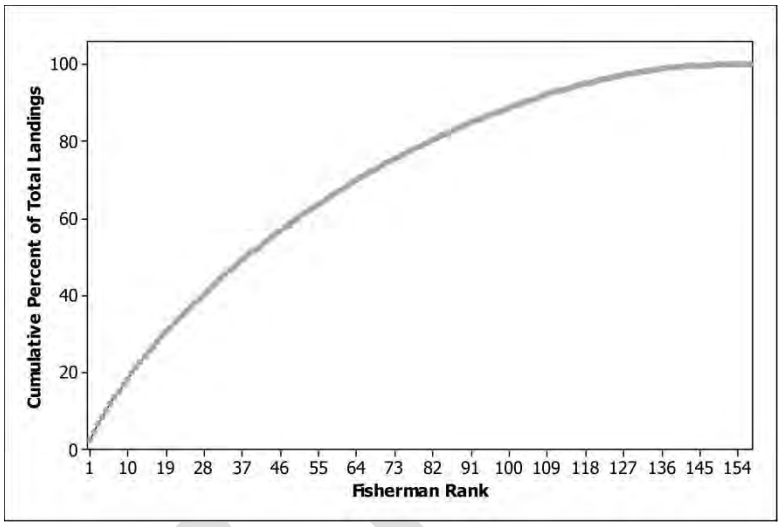

Figure 2-7: The cumulative percent contribution of fishermen to the 2013-14 CA lobster (*P. interruptus*) fishing season landings.
***The graph starts with the fisherman with the highest landings and incrementally adds the landings of the next highest-landing fisherman until all active fishermen are accounted for.**

High effort in the commercial fishery may present challenges to sustainability when it results in a high harvest rate. Instantaneous harvest rate (Section 4.1) in the San Diego region is estimated to be higher than Santa Barbara. For CA lobster, however, **yield per recruit** (YPR) increases very little when harvest rates are increased beyond a certain point, leading to **economic overfishing** (Kay, 2011; Section 4.1). This scenario is nearly universal among the world's lobster fisheries (Gardner et al., 2013). The economic inefficiency of high harvest rates is accompanied by other challenges to California's MLMA objectives (Section 4.1). These include a lower spawning potential, diminished non-consumptive user experiences, and greater risk of undesired ecological interactions (e.g., bycatch, lost gear, ghost fishing).

2.2 Recreational Fishery History and Description

The recreational fishery targets CA lobster using **hoop nets** (Figure 2-8) or by hand when diving (**SCUBA** or skin diving). Historically, diving has been more prevalent than hoop netting. Eighty percent of the interviewees in a 1992 CDFW recreational **creel survey** were composed of divers, with hoop netters accounting for 20%. This pattern has since changed with 80% of the recreational interviewees hoop netting in the more recent 2007 CDFW recreational creel survey.

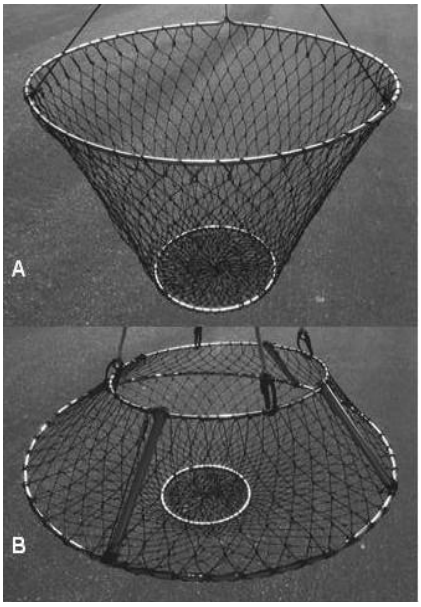

Figure 2-8: Traditional hoop net (A) and rigid conical hoop net (B).

CDFW was not able to quantify recreational catch until recent years through the recreational lobster **report card** (Section 5.1.1; Table 2-1). Low report card return rates cause uncertainty in recreational catch estimates, because returned cards may not reflect unreturned cards, and sample size is reduced for stratification. However, return rates have been improving and a non-reporting

fee of $20 was implemented to cover costs of CA lobster management in 2014. An anticipated effect of that fee is an improvement in return rates. Estimates for recreational catch range from 292,442 pounds in 2013 to 527,357 pounds in 2009 representing 27 to 43% of the total recreational and commercial catch. While the estimated 95% confidence intervals for recreational catch are narrow, they do not incorporate uncertainty due to poaching or the potential that catch on returned report cards is not representative of catch on un-returned report cards.

CDFW allows two types of hoop nets: traditional hoop nets and rigid **conical hoop nets** (14 CCR § 29.80). The traditional hoop nets lie flat on the seafloor and only take their three-dimensional shape when pulled to the surface. A slow or jerky pull can allow lobster to escape out the top or sides. Conical hoop nets, introduced in 2006, have rigid sides and do not lie flat on the seafloor. The lobster must climb up and into the net to reach the bait. When disturbed, lobsters fleeing sideways are blocked by the net regardless of how the hoop net is pulled. A 2009 CDFW study found that conical nets catch about 57% more lobster than traditional style nets over time (Neilson et al., 2009). Additionally, Miller (2014a) found that the size of lobsters entrapped within a power plant cooling system significantly decreased following the introduction of conical hoop nets and the increased use of hoop nets in the recreational fishery. The power plant is located within Santa Monica Bay where only recreational fishing is allowed. This suggests the recreational fishery may be having an impact on the local population and continued monitoring is warranted.

Statistical comparison between hoop net fishermen and divers has been particularly problematic. For example, in 2009, only 50.9% of all report cards returned were from hoop net fishermen, even though both the creel survey and the recreational industry representatives indicated that a large majority of the recreational fishermen at that point were hoop net fishermen. The most recent set of report card returns (2014-15 fishing season) was composed of 60% hoop net fishermen. However, this result may still be underrepresenting the overall fraction of hoop net fishermen. When the report card requirement was first implemented, report cards tracked the calendar years. Starting in 2013, CDFW adjusted report cards to track individual lobster fishing seasons which cross consecutive calendar years, following input from various constituent representatives. Data from the 2014-15 fishing season lobster report cards estimated the recreational catch to be 199.2 mt (439,151 pounds), or about 31% of the total (i.e., recreational plus commercial) catch. The report cards also indicate that most CA lobsters captured by the recreational fishery are caught in areas where the commercial fishery is prohibited (Figure 2-9; FGC § 8258). It is unclear whether this pattern is caused by ease of access from ports or better fishing conditions. Communication with hoop net retailer representatives suggests that public interest in hoop nets may have plateaued (J. Salazar, pers. comm.), but future recreational effort increases may be inevitable due to human population growth in California. CDFW will continue to improve its data collection on the recreational sector and remain adaptive towards any change.

Economic overfishing - Fishing levels that exceed maximum economic yield.
Hoop net - A round net used to catch lobster by the recreational lobster fishing sector in California; it traditionally lies flat on the seafloor and assumes a basket shape upon retrieval to the surface.
SCUBA - "Self-Contained Underwater Breathing Apparatus" utilized to catch lobster by hand by the recreational lobster fishing sector in California; proposed here as a way for commercial fishermen to retrieve lost traps or cut out of entanglement.
Creel survey - Catch information gathered from recreational fishermen.
Conical hoop net - A modified style of hoop net used to catch lobster by the recreational lobster fishing sector in California; it is basket shaped, does not collapse, and does not lie flat on the seafloor.
Report card - A means of collecting fishery-dependent data on the recreational lobster fishery in California. Lobster report cards collect information on the number of people recreationally fishing for lobster each year, the gear they use, and their harvest and success rates. Required since 2008 to be filled out by all persons fishing recreationally for lobster in California.

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Table 2-1: Estimate of Total Recreational CA Lobster (*P. interruptus*) Fishing Effort and Catch from 2008 to 2015 based on recreational report card data.

Estimates of Total Recreational Lobster Fishing Effort and Catch

Calendar Year	Number of Cards Sold	Return Rate	Estimated Number of Active Lobster Cards (Cards that recorded at least one trip)	Estimated Number of Fishing Trips	Average CPUE (# of Lobsters Kept Per Trip)	Estimated Weight of Landings in Metric Tons (mt) (pounds (lb))	Percent of Total (Recreational + Commercial) Landings	± 95% Confidence Intervals
2008*	27,472	22%	24,038	104,085	2.1	160.93 mt (354,792 lb)	32%	6.73 mt (14,837 lb)
2009	32,343	14%	27,847	147,868	2.2	239.21 mt (527,357 lb)	43%	13.02 mt (28,715 lb)
2010	29,108	12%	25,033	127,168	2.1	197.24 mt (434,848 lb)	38%	12.96 mt (28,570 lb)
2011	33,376	16%	28,870	154,743	2.0	195.02 mt (429,953 lb)	36%	9.85 mt (21,722 lb)
2012	37,193	33%	28,527	127,801	2.0	185.97 mt (409,984 lb)	32%	6.14 mt (13,532 lb)
2013	14,514**	49%	11,437	71,024	2.1	163.26 mt** (359,928 lb)	32%***	*****
2013-14	33,668	48%	26,295	88,351	1.6	174.53 mt*** (384,781 lb)	32%****	*****
2014-15	36,414	54%	28,530	111,552	1.9	155.39 mt (342,583 lb)	26%	3.24 mt (7,136 lb)

***Lobster report card was implemented in the fall of 2008; CDFW only has estimates for the latter half of calendar year 2008**
****Season-length report card was implemented for the 2013-14 fishing season. While some recreational fishermen still purchased 2013 calendar year lobster report cards along with 2013-14 season-length report cards, other fishermen only purchased 2013-14 season-length report cards.**
***** 2013 "Estimated Weight of Landings in Tons" and "Percent of Total Landings" includes landings from 2013 calendar year cards, PLUS landings from September, October, November, and December on 2013-2014 full season cards.**
****** 2013-2014 "Estimated Weight of Landings in Tons" and "Percent of Total Landings" includes landings from 2013-2014 full season cards, PLUS landings from September, October, November, and December on 2013 calendar year cards.**
*******Unable to calculate due to calendar to seasonal switch.**

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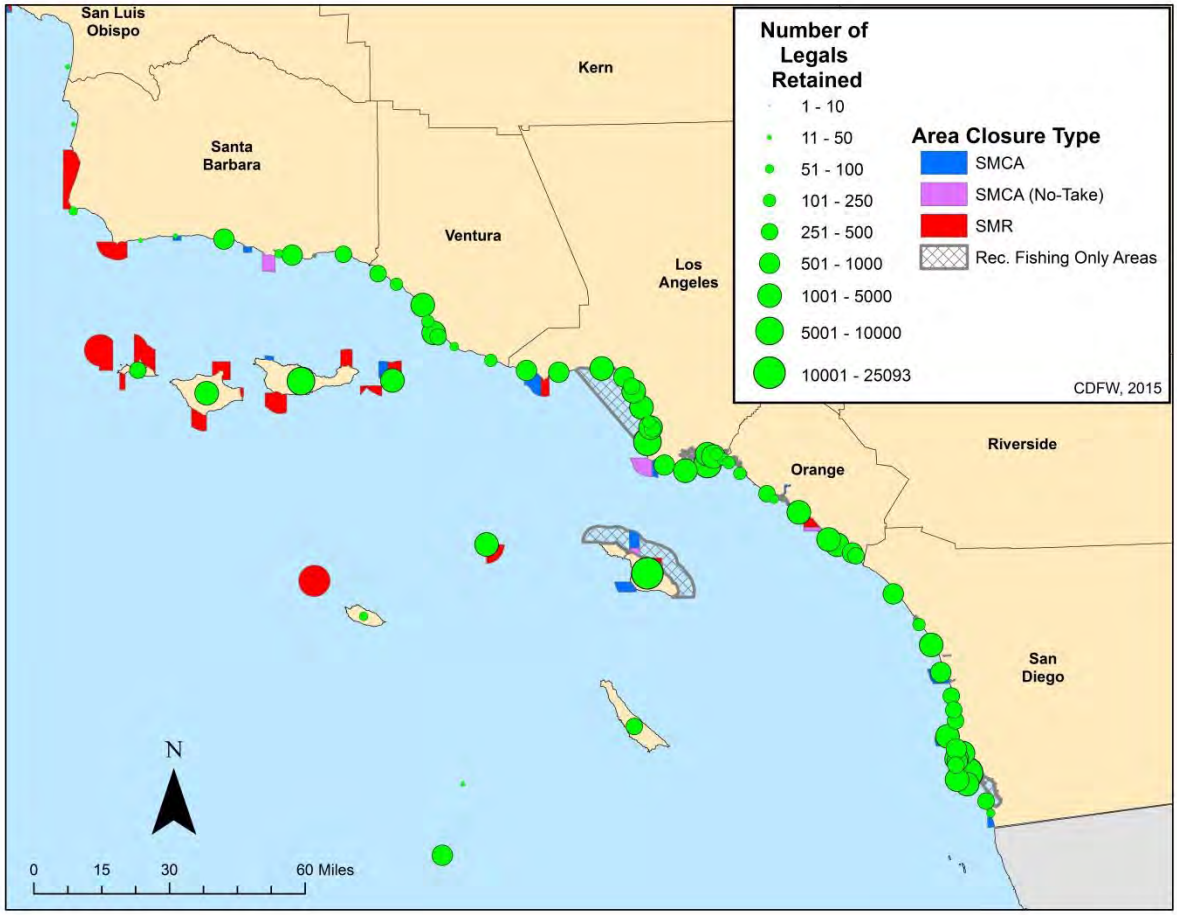

Figure 2-9: Number of legal CA lobsters (*P. interruptus*) reported retained from recreational lobster report cards in 2013 overlayed with area closures (MPAs and recreational-only fishing areas).
***SMCA = State Marine Conservation Area (may allow some commercial and/or recreational take)**
****SMR = State Marine Reserve (no take areas)**
*****Northern-most dot denotes total catch between San Luis Obispo up to CA-OR border**

2.3 Bycatch within the Fishery

Bycatch occurs in both the recreational and commercial CA lobster fisheries. There are generally two types of bycatch (FGC § 90.5) in the fisheries: 1) sublegal-size lobster; and 2) other non-targeted marine life. The MLMA calls for the minimization of bycatch when the amount or type is "unacceptable" (FGC § 7085(c)). Based on available data, CDFW concludes that there is no indication of unacceptable bycatch levels in either the commercial or recreational fisheries.

2.3.1 Commercial Fishing Bycatch

Trap fisheries generally have minimal bycatch of species other than invertebrates (Morgan and Chuenpagdee, 2003; Matthews et al., 2005). These traps are required to have both destruct devices (destruct clips/rings) to avoid ghost fishing as well as escape ports to minimize the catch of sublegal-size lobster. Traps are set on the bottom in rocky areas between approximately 3.05 to 91 m (10 to 300 ft) and are baited with whole or cut fish (CDFG, 2001). However, unattended traps can impact the marine ecosystem (e.g., increased chance of gear loss), and fishermen are required to raise and service them at intervals not exceeding 96 hours, weather permitting (FGC § 9004).

A Collaborative At-Sea Sampling Program made possible by Collaborative Fisheries Research West, California Sea Grant, and California Ocean Protection Council was initiated during the 2012-13 CA lobster fishing season. This program did not specifically focus on bycatch, however bycatch information was collected. Sampling was performed by fishermen throughout the **Southern California Bight** (SCB) with a total of 2,520 traps sampled. These data are reported in Table 2-2.

Table 2-2: Bycatch found in 2,520 commercial CA lobster (*P. interruptus*) fishing traps (Source: CASP unpublished data, Culver, 2013).

Common species name	Scientific name	% of total animals caught (5,284)
sublegal-sized CA Lobster	*Panulirus interruptus*	83.29%
Kellet's Whelk*	*Kelletia kelletii*	5.98%
Rock Crab*	*Cancer* spp.	4.20%
Wavy Top Snail	*Megastraea undosa*	0.47%
Sheep Crab*	*Loxorhynchus grandis*	1.29%
Cabezon	*Scorpaenichthys marmoratus*	0.45%
Lingcod	*Ophiodon elongates*	0.28%
CA. Scorpionfish (Sculpin)	*Scorpaena guttata*	0.04%
Swell Shark	*Cephaloscyllium ventriosum*	0.11%
Rockfish (Unidentified)	*Sebastes* spp.	0.02%
Goby (Unidentified)	Gobiidae spp.	0.02%
CA Sheephead	*Semicossyphus pulcher*	0.02%
Ocean Whitefish	*Caulolatilus princeps*	0.02%
Horn Shark	*Heterodontus francisci*	0.04%
Perch (Unidentified)	Embiotocidae spp.	0.04%
Skate (Unidentified)	Rajidae spp.	0.04%
Crab (Unidentified)	Decapoda spp.	0.02%
Sea Hare (Unidentified)	*Aplysia* spp.	0.09%
Sea Star (Unidentified)	Asteroidea spp.	2.44%
Kelp Crab (Unidentified)*	*Taliepus nuttallii / Pugettia producta*	0.09%
Octopus (Unidentified)*	Octopodidae spp.	0.23%
Urchin (Unidentified)	Echinoidea spp.	0.74%
Barred Sand Bass	*Paralabrax nebulifer*	0.02%
Snail (Unidentified)	Gastropoda spp.	0.06%

***Species that are legal to sell**

Available information shows that a majority of CA lobster commercial fishing bycatch consists of invertebrates, with sublegal-size lobsters making up a great majority of the total bycatch. The other most common bycatch in the CA lobster commercial fishery are Kellet's whelk, rock crabs, starfish, sheep crabs, urchins, and wavy top snails (Culver unpublished data, 2013). Data from CDFW commercial fishing logs suggest that the amount of sublegal-size lobster bycatch has increased in recent years.

Southern California Bight (SCB) – The coastal and its immediate offshore areas between Point Conception to the north and the U.S. – Mexico border to the south. The curvature of the coastline and the relatively shallow depth of the area lead to oceanographic and biological characteristics that are clearly distinguishable from the central California coast.
Fecundity - The reproductive capacity of an individual female animal during a reproductive event or breeding season, generally expressed as the number of eggs or larvae per unit weight or per individual.

Fishermen may unintentionally damage (break legs or antennae) sublegal-size lobsters when removing them from traps. One Australian study found that spiny

lobsters with broken appendages become less fecund due to extra energy being exerted for healing and repairing the broken appendages (Melville-Smith and de Lestang, 2007). Any similar impact on the **fecundity** of CA lobster and the survival rates of returned sublegal lobsters is currently unknown.

Commercial CA lobster fishermen can legally retain certain crabs, Kellet's whelks, and octopi (FGC § 8250.5). These bycatch are reported and included in the calculation of the total annual landings of each species. Since most bycatch that are not legally retained by fishermen can be returned to the ocean alive with proper handling, the ecosystem impact through bycatch for this fishery is limited (Hovel & Neilson, 2011; Miller, 1996). Data from Mexico reflect similar patterns in bycatch. While a 2004 study suggests that bycatch is practically non-existent in the Mexican lobster fishery (SCS, 2004), a more recent study found the weight of the bycatch in that fishery to be 15% of the total catch (Shester and Micheli, 2011). Most of the Mexican bycatch, excluding sublegal lobster, consists of crabs and other invertebrate species. Recent studies also observed sea bird (cormorant) bycatch in Mexico and Florida (Matthews et al., 2005; Shester and Micheli, 2011). However, there has not been any cormorant mortality attributed to lobster traps in California, which are all outfitted with escape ports.

2.3.2 Recreational Fishing Bycatch

Recreational fishing for CA lobster primarily occurs from Point Conception, CA to the U.S. – Mexico border, including **offshore** islands and reefs. Lobsters are caught by hand during dive trips, and divers are required to release sublegal-size individuals immediately after measuring. Certain other invertebrates may also be retained by divers targeting lobster. Hoop netters are primarily boat-based. They generally set the baited nets on the bottom in shallow waters < 30.5 m (100 ft), and raise them after a soak time of < 2 hours. Available information shows that most of the hoop net bycatch is invertebrates such as sublegal-size lobsters, rock crabs of the *Cancer* genus, and sheep crabs. Some **finfishes** are also caught, with round stingrays being the most common (Neilson et al., 2009). Live finfishes and invertebrates can usually be released from hoop nets safely (Hovel and Neilson, 2011). Survival is high when animals are quickly returned to the water (Miller, 1996).

Offshore - All oceanic waters outside state waters or deeper than 100 fathoms.
Finfish - Any species of bony fish or cartilaginous fish (sharks, skates and rays). Finfish do not include amphibians, invertebrates, plants or algae
Total allowable catch (TAC) - A specified numerical catch objective for each fishing season; the attainment (or expected attainment) of which may cause closure of the fishery.

Data on hoop net bycatch is limited, and no data on diving bycatch exists. An unknown number of crabs are retained by hoop netters every year. Available data come from a CDFW hoop net study at Zuniga Jetty near San Diego Bay, CDFW video observations of hoop netting at Indian Rock at Catalina Island, and recreational gear data from the California Lost Fishing Gear Recovery Project. CDFW also relies on information provided by its enforcement officers as well as anecdotal information provided through online fishing reports posted on recreational fishing websites.

2.3.3 Legality of Bycatch and Seabird and Marine Mammal Gear Interactions

Commercial and recreational fishermen are not allowed to retain sublegal-size lobsters under current California law (FGC § 8252; 14 CCR § 29.90). However, fishermen may retain legal-size crabs and octopi provided that they have the valid permits (14 CCR § 125; 14 CCR § 29.85; FGC § 8250). Commercial fishermen may also retain Kellet's whelk until the whelk's annual **total allowable catch** (TAC) is reached (14 CCR § 127; FGC § 8250).

Seabird and otter bycatch is not common within the CA lobster fisheries. Research conducted on sea otter entrapment and mortality in fish and shellfish traps suggests that the CA lobster fishery is not

expected to contribute to otter mortality if the current geographic extent of the fishery and the current otter range both remain unchanged (USGS, 2014). Of the 15 reported instances of trap-related sea otter mortalities during 1974-2007, 14 occurred in either Pacific cod or crab traps (Hatfield et al., 2011). One incidence of a sea otter mortality associated with lobster traps was recorded in 1987 (Carretta et al., 2014). The majority of California's southern sea otter mortalities on record were the result of shark attacks, boat strikes, mating trauma, diseases, parasites, infections, and biotoxins (CDFW-MWVCRC, 2013).

Marine mammal mortality as a result of entanglement in lobster fishing gear is rare in the CA lobster fishery. Lobster traps are generally deployed in less than 100 ft of water, a depth range where large marine mammals such as whales are not generally found. However, the number of reported whale entanglement on the west coast of the United States has been increasing in recent years (National Marine Fisheries Service stranding database) and reached a peak of approximately 35 in 2014 with a total of 231 for the period between 2000 and 2015 (Lawson, 2015). The majority of confirmed entanglements are attributed to categories for trap or pot fisheries and unknown gear with relatively few attributed to nets (Lawson, 2015). Among those with a confirmed gear type from a trap fishery, the large majority are due to the Dungeness crab fishery and relatively few to the lobster, rock crab and spot prawn fisheries (Lawson, 2015). However, it should be recognized that some portion of entanglements due to an unknown gear type may be attributable to the lobster fishery. Since the year 2000, there have been four reported incidences of gray whales, two humpback whales, and one unidentified whale entangled in lobster gear (Carretta et al., 2014; Carretta et al., 2015; National Marine Fisheries Service stranding database) and 1 incidence of bottlenose dolphin entanglement in 2008 (Carretta et al., 2014). Mortality due to entanglement was confirmed for the unidentified whale, and one humpback whale and one gray whale were reported as seriously injured.

The National Marine Fisheries Service classifies fisheries based on their level of interaction with marine mammals and guides when incidental take permits under MMPA are required. Under MMPA, a fishery would require an incidental take permit if it is classified as "Category I" or "Category II" (50 CFR § 229.2). The CA lobster fishery was classified as "Category III" in 2014 (79 FR 77934). Such fisheries "have a remote likelihood of, or no known incidental mortality and serious injury of marine mammals" (50 CFR § 229.2). The fishery should continue to remain in Category III as long as its annual take of any marine mammals continues to remain less than 1% of a given stock's potential biological removal level or, in combination with other mortality sources, is responsible for less than 10% of the stock's potential biological removal level (50 CFR § 229.2).

2.4 History of Conservation and Management Measures Affecting the Fishery

California has regulated the CA lobster fishery for over a hundred years. Current management measures include commercial fishing permits, recreational harvest report cards, gear restrictions, **size limits**, time and area closures, and a recreational possession limit. The Commission has complete management authority over the recreational fishery (14 CCR § 29.90) and significant management authority over the commercial CA lobster fishery (Table 2-3) (14 CCR § 121-122; FGC §§ 8254, 8259).

California law controls the commercial fishery's overall **fishery effort** with a **limited entry program** (FGC § 8259; 14 CCR § 122). Since 2005, fishermen with transferable permits are allowed to sell their permits under strict conditions.

Size limit - The minimum size a fish or other organism must be for it to be possessed.
Fishing Effort - A measure of some expenditure in pursuing a fishing activity. The measure in lobster fishing effort is usually in terms of number trap pulls (in commercial fishery), number of fishing trips, or time spent fishing.
Limited entry program - Regulatory program that restricts the total number of permitted fishing licenses or vessels.

Individuals wishing to enter the fishery have to purchase a permit from an existing permittee. The number of permittees actively fishing has been stable since 2008. During the 2013-14 fishing season, 141 transferable permits and 51 non-transferable permits were renewed; 157 of those permits were actually fished.

On the recreational side, all fishermen are required to purchase a CA lobster report card regardless of their age, and all fishermen 16 years or older must purchase a sport fishing license unless they are fishing during free fishing days or on public fishing piers. All recreational fishermen are restricted by a daily bag and possession limit of 7 lobsters and a 3.25 inch (82.6 mm) minimum carapace size. Hoop nets are restricted to 5 hoop nets per person (2 if fishing from a public pier) and 10 hoop nets per vessel. Fishermen are also required to pull and inspect the contents of their hoop nets every 2 hours.

In 1998, the MLMA was passed and required the state to manage all fisheries sustainably, in part through the use of FMPs. In 1999, the Marine Life Protection Act (MLPA) was passed in California, which led to the establishment of a statewide network of **marine protected areas** (MPAs) (Section 4.7).

2.5 Economic and Social Factors of the CA Lobster Fisheries

The economic status of the CA lobster fishery was evaluated by an independent panel of experts in April 2013. The report (Appendix VI) analyzes the expenditures of the commercial fishery and recreational

Table 2-3: Regulatory history of the CA lobster (*P. interruptus*) fishery.

Year	Regulatory Change Affecting the Commercial CA Lobster Fishery	Type of Change
1894	1 pound minimum size in Los Angeles, San Diego, and Ventura Counties	Size limit
1901	Berried Females Protected (repealed)	Management
1901	First minimum length implemented (9½“ total length)	Size limit
1913	First slot limit introduced (9” – 13½“)	Size limit
1917	Slot limit modified (10½” – 16“)	Size limit
1955	3.25 inch carapace length minimum size implemented	Size limit
1957	2x4 inch wire mesh required or 2 inch high openings along two sides of traps to allow escape of undersized lobsters	Gear restriction
1961	Implementation of the modern day open season: The first Wednesday in October through the first Wednesday after March 15	Season
1961	Fish and Game Commission given authority to manage the fishery	Management
1961	Lobster permits required. New permits issued by lottery with a capacity goal of 225 fishermen	Management/ Permitting
1973	Logbooks required by law to record essential fishery information. Also, permit applications require estimate of number of traps to be fished	Reporting
1976	Escape ports are required for commercial traps	Gear restriction
1986	Fish and Game Commission given authority to limit the number of permits	Management/ Permitting
1992	The recreational season opener is moved to the Saturday preceding the first Wednesday in October to provide the sport fishery with four days of fishing prior to the commercial opener	Season
1994	Fish and Game Commission places a moratorium on new permits for 2 years in preparation for a switch to a limited entry permit fishery	Management/ Permitting
1996	Limited entry permit program begins	Management/ Permitting
2003	Lobster permit lottery repealed	Management/ Permitting
2011	CDFW initiates a spiny lobster Fishery Management Plan as mandated by the 1998 Marine Life Management Act	Management
2012	A network of new marine protected areas go into effect in Southern California as mandated by the 1999 Marine Life Protection Act	Fishing area restriction

fishery, as well as the economic significance of the commercial fishery based on the 2009-10 to the 2011-12 fishing seasons. The report provides a statewide perspective on the economic significance of the fishery and establishes a foundation for future economic analysis.

Ten commercial lobster fishermen were surveyed with questions relating to the cost of participating in the fishery based on methodologies established in a 2009 study (Hackett et al., 2009). The commercial lobster fishery's total 2011 operational cost was estimated at approximately $10.5 million. Of this, over half (> $6 million) comes from a combination of bait (~$1.6 million), fuel (~$1.3 million), crew wages (~$1.8 million), and federal taxes (~$1.1 million) (see Appendix VI).

The economic impacts (**total economic value added, total economic output)** of the commercial fishery were calculated based on factors such as expenditures (e.g., trap costs, fuel cost) and revenue (e.g., fishing income, export and domestic sales). The gross ex-vessel value of the fishery from the 2011-12 season was $12.9 million, and the statewide total economic output was over $22 million, contributing a total of 323 full-time equivalent jobs. The total economic value added to the economy during this same period was just under $12 million, with $695,893 contributing towards employee compensation (wages and salaries plus benefits for deckhands, crew members). Licensed CA lobster fishermen took in an estimated income of $3.8 million (see Appendix VI, Table 3).

The amount of economic impact the commercial fishery has on coastal communities differs across the southern California region, but the amount of added value is on a similar order of magnitude for each region. The fishery adds roughly $2.1 million dollars of net economic output to the economy of Santa Barbara County, $1.4 million to Ventura County, $2 million to Los Angeles County, $1.6 million to Orange County, and $3.5 million to San Diego County (see Appendix VI, Table 4).

Total economic value added – Total economic output less the goods and services used up to create that output; for lobster fishery, it means the net value of the lobsters after costs like trap purchases are accounted for. Also known as Net Economic Output.
Total economic output – The total amount of economic output that does not take into account the amount of intermediate goods consumed during the harvest/production process; for lobsters, this means the amount of money sales generate before costs such as trap cost are considered. Also known as Gross Economic Output.

The 2013 Economic Report represents the most recent attempt at quantifying the economic impact of the commercial lobster fishery. However, several areas of the report could be improved and revised. The total net income for the fishery was only estimated to be $11,188,354 which is unexpectedly low given 151 active permit holders in 2011. Communication with active commercial lobster fishermen suggests that the cost of commercial lobster fishing may have been overestimated in the report, which likely led to the low estimate for net income. Estimating the true cost of the commercial fishery is complicated by fluctuations in fuel price and competition dynamic within the fishery over time. In addition, the ex-vessel price of CA lobsters has continued to increase significantly since the report was produced, which likely has changed the magnitude of the total economic impact from the commercial fishery.

State-wide expenditures on recreational lobster fishing were calculated based on a telephone survey conducted by CDFW in 2012. The survey targeted a random sample from all individuals who returned a calendar year 2011 lobster report card. The survey found that Californians spent between $33 - $40 million dollars on recreational lobster fishing in 2011 (see Appendix VI). Of this, roughly $7 million is attributed to residents who live in zip codes that border the coastline, $20 million is attributed to other residents living in zip codes that are at least partially within 50 miles of the coastline, while roughly $10 million is attributed to residents living further inland. The largest sources of expenditures were non-

coastal residents who live within 50 miles of the coast who fished CA lobster along the coast, and those who live more than 50 miles from the coast who dove for CA lobster offshore.

3. Natural History and Population Dynamics of the California Spiny Lobster

The California spiny lobster (*Panulirus interruptus*) is one of approximately 55 spiny lobster species found in tropical and temperate oceans worldwide, most of which are fished commercially and/or recreationally (Booth, 2011; Phillips and Kittaka, 2000). Spiny lobsters are named after the forward-pointing spiny projections that cover their bodies. The species lack the pincers found on clawed lobsters.

The body of *P. interruptus* has two readily identifiable parts: (1) a fused head and thorax (cephalothorax) enclosed in a carapace, and (2) the abdomen, or tail (Figure 3-1). The carapace protects most major organs and serves as the attachment point for the legs. In sexually mature males, the gonad pores (sperm ducts) are found at the base of the fifth pair of the legs. Females have enlarged swimmerettes, or pleopods, along each side of the tail and a small claw on the fifth legs.

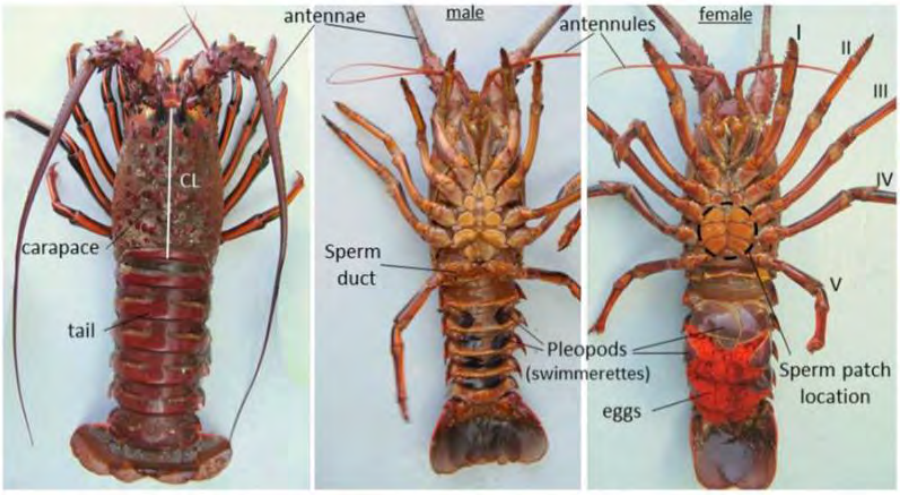

Figure 3-1: External anatomy of CA lobster (*P. interruptus*). CL = carapace length.

3.1 Critical Habitat and Known Threats to the Habitat

One of the primary objectives of the MLMA is to ensure that "the health of marine fishery habitat is maintained" (7056(b)). In order to accomplish this, an understanding of the spatial extent of habitats that support CA lobster throughout their **life history** is needed. The CA lobster is endemic to the North American west coast from Monterey, California southward to at least as far as Magdalena Bay, Baja California (Wilson, 1948; Schmitt, 1921). A small isolated population may have persisted in the northwestern corner of the Gulf of California (Kerstitch, 1989). Johnson and Snook (1927) reported its occurrence as far south as Manzanillo, Mexico. The core range, however, lies between Point Conception, CA and Magdalena Bay (Figure 1-1). The physical center of the range is within Mexico. Population density and fishery **productivity** within Mexico's border is the highest near Cedros Island and Vizcaino Peninsula in Baja California (Vega, 2003a).

Life history - The history of changes an organism passes through in its development from egg, spore, or other primary stage until its natural death.

Sub-adult and adult CA lobsters are commonly found on the seafloor at depths ranging from **intertidal** to 64 m (210 ft) (Mitchell et al., 1969; Robles et al., 1987; Allen, 1916; Lindberg, 1955), while the **planktonic**

Productivity - Describes the birth, growth, and death rates of a stock. A highly productive stock is characterized by high birth, growth and mortality rates, and as a consequence has a high turnover. Such stocks can usually sustain higher exploitation rates and, if depleted, could recover more rapidly than comparatively less productive stocks.
Settlement - In marine ecology, it means the process by which organisms change from an open ocean life history phase to assume a new mode of life as a member of a sea-floor community. In lobster, it is the stage at which juveniles move into the adult habitat where they become resident.
Substrate - The surface or medium on or in which an organism lives (i.e., mud, sand, rocks)

larvae have been found offshore as far as 530 km (329 mi.) and at depths to 137 m (449 ft) (Johnson, 1960a; CDFG, 2001). Rocky structures/reefs are important **habitat** for CA lobster, and high quality rocky habitat is often characterized by the presence of brown algae such as giant kelp (*Macrocystis pyrifera*), feather boa kelp (*Egregia menzesii*), and stalked kelp (*Pterygophora californica*), as well as surfgrass (*Phyllospadix* spp.) (Lindberg, 1955; Engle, 1979). CA lobster habitats are generally described in relation to their juvenile (approx. < 3 years old) and adult (approx. > 3 years old) life stages.

Juveniles range from individuals that have recently settled from the planktonic stage (carapace length (CL) 7-8 mm) to individuals in the range of 44-56 mm CL (Mitchell et al., 1969; Parker, 1972; Serfling, 1972; Engle, 1979). CA lobster larvae prefer to settle on common surfgrass and red algae that are abundant in rubble habitats (Parker 1972, Engle 1979, Castañeda-Fernández de Lara et al., 2005). These shallow rubble habitats are crucial for the CA lobster (Winget, 1968; Blecha, 1972; Parker, 1972; Serfling, 1972; Engle, 1979, Castañeda-Fernández de Lara et al., 2005). These structurally complex habitats also protect and conceal juveniles from predators (Parker, 1972; Engle, 1979). CA lobsters typically remain in these habitats for 2-3 years post-**settlement** until they become sub-adults (Parker, 1972; Engle, 1979; Castañeda-Fernández de Lara et al., 2005).

Adult and sub-adult CA lobster commonly occupy natural hollow spaces within rocky **substrate**. They may also occupy hollowed-out holdfasts of giant kelp created by sea urchin grazing (Mai and Hovel,2007) or burrows excavated (either by CA lobsters or sand scouring processes) near the base of colonies of the sandcastle tube worm (*Phragmatopoma californica*) (Zimmer-Faust and Spanier, 1987). Human structures such as pier pilings (Stull 1991), industrial debris (Lindberg, 1955), harbor jetties (Neilson et al., 2009), and artificial reefs (Barilotti et al., 2005; Reed et al., 2006) can also serve as habitats.

CDFW, working with outside researchers, has compiled all readily available data detailing the spatial coverage of surfgrass[1], eelgrass (*Zostera spp.*)[2], giant kelp[3], hard rocky reef (natural)[4], and artificial reefs[1]. For areas where the bottom substrate habitats have not been previously mapped, aerial multispectral survey data were used to estimate the locations of hard substrate based on the presence of giant kelp coverage recorded in 1989, 1999, 2002-2006, and 2008-2009. Since kelp requires hard rocky substrate to settle and establish, the presence of kelp was determined to serve as an appropriate proxy to estimate reef areas that may act as lobster habitat. Figure 3-2 provides a snap-shot of known area that each of these habitats occupies within the historical range of the CA lobster fishery. For a detailed, known account of these habitats at a regional level, see Appendix III. It is important to note that any artificial or natural hard substrate associated with the sea floor can serve as CA lobster habitat, not all of which are depicted on the map.

Activities such as beach nourishment and urban runoff can adversely affect these habitats (Peterson and Bishop, 2005). Coastal development can also pose a threat to estuarine habitats (Kennish, 2002). Lastly, global climate change will lead to sea level rise and may intensify the impact of El Niño and its associated storm events (Shaughnessy et al., 2012; Section 3.11). Rising sea level coupled with more intense storms can further erode and destroy existing seagrass beds and kelp beds.

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[1] Collected by Minerals Management Service and compiled by Tenera Environmental

[2] ERMA. 2015. Web Application: Southwest Environmental Response Management Application, National Oceanic and Atmospheric Administration. http://erma.noaa.gov/southwest

[3] Aerial surveys conducted by CDFW

[4] Collected by Seafloor Mapping Lab at California State University Monterey Bay, United States Geological Survey, Ocean Imaging, and the San Diego Association of Governments

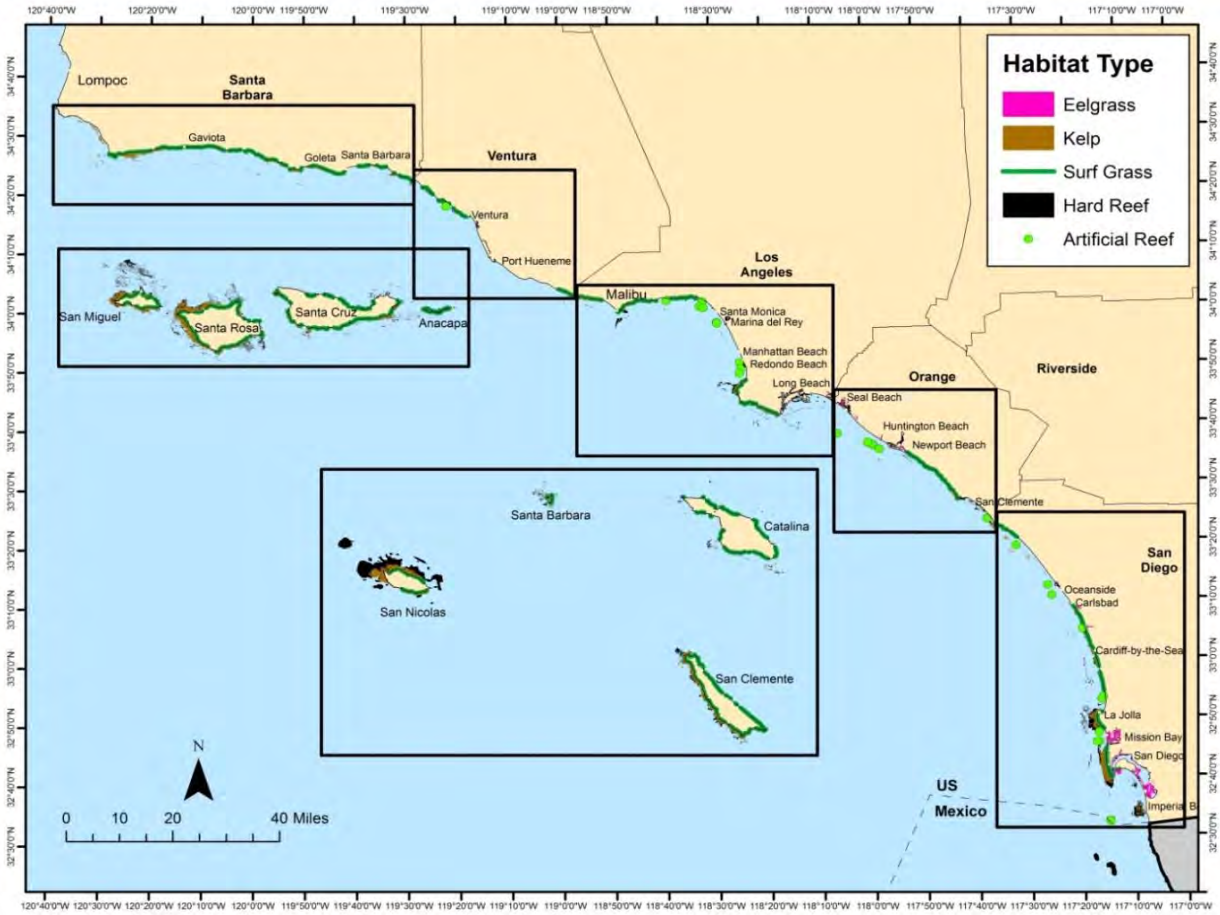

Figure 3-2: Locations of critical CA lobster (*P. interruptus*) habitat in the southern California Bight. Black boxes indicate insets provided in Appendix III: Habitat Maps by Area.

3.2 Growth

Like all crustaceans, CA lobsters have a rigid exoskeleton that covers the outer surface of their bodies. Once formed, this exoskeleton does not shrink or expand. In order to increase its body size, a CA lobster must shed its exoskeleton and replace it with a larger one (Mykles, 1980). The molt frequency and molt increment (size increase during each molt) of a CA lobster determines its growth rate. Rapidly growing young lobsters molt many times per year, but molt frequency decreases with age (Engle, 1979). Existing studies suggest that *P. interruptus* can usually reach a sexually mature size before reaching the minimum legal size of 82.5 mm CL (Table 3-1). However, how quickly or at what age individual CA lobsters can reach the **size at maturity** (SAM) is a complex scientific question. While a variety of modeling approaches allow estimation of growth rates and thus age at a given size, the von Bertalanffy growth equation may be most common (Chang et al., 2012). Currently CDFW uses the von Bertalanffy growth equation, which written as:

> **Size at maturity (SAM) -** The size at which 50% of animals in a population have reached sexual maturity and are capable of reproduction.

$$l_t = L\infty\left(1 - e^{-K(t-t_0)}\right). \qquad \textit{(Equation 3.1)}$$

Where l_t is the size at time t, $L\infty$ equals the average maximum achievable size, K is a growth constant that represents a rate, t is the time step, and t_0 is the size at age zero. Observations of maximum and minimum sizes of individuals can be used to estimate $L\infty$ and t_0 and then K can be calculated. The K

parameter may also be borrowed from comparable species. Parameters can also be derived by fitting the equation to annual growth increment data acquired from tag and recapture studies. Estimates for a CA lobster's lifespan, which is crucial for the calculation of the growth constant K (Chavez and Gorosteita, 2010), range from 30-50 years (Neilson, 2011). A species' asymptotic (maximum) size, $L\infty$, can also vary based on the methodology adopted (Mathews and Samuel, 1990). Choosing the appropriate parameters is important for the management of the fisheries, since the resulting growth curve will directly inform CDFW of the ability of the stock to replenish itself (Section 4.3). CDFW currently uses parameters derived by Vega (2003a) but is continuing to explore other methods for estimation of von Bertalanffy parameters as well as other types of growth models (see Appendix X).

Table 3-1: Size at which 50% of female of CA lobsters (*P. interruptus*) in various population samples were sexually mature (size at maturity: SAM).

♀ SAM (mm CL)	Location	Source	Method*
72.5	Baja (Sebastian Vizcaino bay	Ayala 1983	Ovary
72.6	Baja (Vizcaino Peninsula)	Vega 2003a	Sperm/Egg
70.0	California (Palos Verdes)	Lindberg 1955 (in Engle 1979. Converted using CL=0.31*TL)	Ovary
66.6 (215 mm TL)**	California (Palos Verdes)	Lindberg 1955 (215 mm TL converted to CL using: CL=0.31*TL)	Ovary
78.2 (215 mm TL)**	California (Palos Verdes)	Lindberg 1955 (215 mm TL converted to CL using: CL=0.3798*TL-0.342)	Ovary
63.5 (205 mm TL)**	California (La Jolla)	Fry 1928 (in Wilson 1948) (205 mm TL converted to CL using: CL=0.31*TL)	Not specified
74.4 (205 mm TL)**	California (La Jolla)	Fry 1928 (in Wilson 1948) (205 mm TL converted to CL using: CL=0.3798*TL-0.342)	Not specified
77.2	California (Palos Verdes, La Jolla)	Kay 2011 (Kay converted TL data of Fry 1928 and Lindberg 1955 using: CL=0.3798*TL-0.342)	Egg

Legal Size in California: 82.5 mm CL
***Methods used to measure SAM include analysis of dissected ovaries ("Ovary"), or the proportion of females with a spermatophore and/or eggs ("Sperm/Egg" or "Egg").**
**** SAM reported as total length (TL) by original researchers; TL's were converted to CL in preparation of this document or in other reports, as indicated in the "Source" column. Estimates 3a vs 3b and 4a vs 4b are from same data and differ only in the conversion factor from TL to CL. Although the large range of values for California (63.6-78.3 mm CL) may reflect some degree of natural variation, it may also be caused by differences in how total lengths (TL) were measured in early studies (i.e, Wilson 1948, Lindberg 1955, Backus 1960) and different methods used to convert these total lengths to carapace length (CL) by Engle (1979) and Kay (2011). Due to these inconsistencies, and the time elapsed since initial SAM observations, renewed estimates of SAM in California may be prudent. (Note: 3 ¼ inch legal size = 82.5 mm).**

3.3 Reproduction

Mating in *P. interruptus* occurs when a male places a putty-like spermatophore on the sternum of a female (Figure 3-1). These females are termed "plastered." The spermatophore is durable and can remain in place for months, which allows females to store sperm until eggs in their gonads are fully developed and ready to be fertilized (Ayala, 1983). Plastered females are common from January-May, but are most abundant from February-April (Figure 3-3; Mitchell et al., 1969; Bodkin and Browne, 1992). Females use their hind walking legs to scratch open the spermatophore, which fertilizes eggs as they are extruded. These females then attach the eggs under the pleopods.

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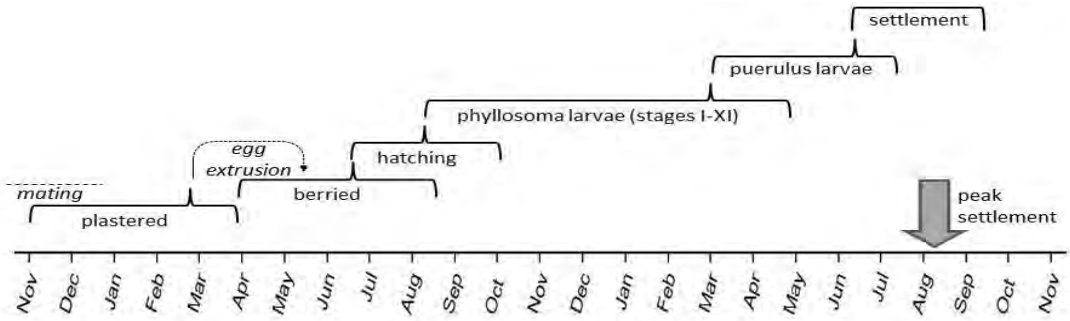

Figure 3-3: Timing of reproduction, larval development, and settlement for CA lobster (*P. interruptus*).

Females with eggs on their tails are referred to as "berried", and are commonly found in California from late April-August and are most abundant June-July (Figure 3-3, Mitchell et al., 1969; Bodkin and Browne, 1992). The time of year at which CA lobster can be found berried depends on factors such as latitude (Pineda-Barrera et al., 1981) and temperature (Vega, 2003b). Females produce one brood of eggs per year (Mitchell et al., 1969; Ayala, 1983; George, 2005).

Pelagic - Of or relating to aquatic organisms that live in the ocean without direct dependence on the shore or bottom.
Plankton - Very small organisms that passively drift with tide and current.
Nearshore - All oceanic state waters within 0-3 miles from shore or less than 100 fathoms deep, whichever is greater.

The total number of eggs carried by individual females (fecundity) increases with female carapace length (Figure 3-4). Lobsters in California carry fewer eggs than individuals in Baja, and this north-south increase in the number of eggs carried was also observed within Baja (Pineda-Barrera et al., 1981). The size at which 50% of female *P. interruptus* in a population are capable of reproduction has been estimated at a number of sites throughout Baja and California. In California, SAM estimates range from 63.5 – 78.2 mm CL, and Baja range from 72.5 mm - 72.6 mm (Figure 3-4; Table 3-1; Table 3-2). Egg- bearing females in the 55 – 60 mm CL size range have been encountered (although not common) during the current CDFW MPA Baseline study in southern California, with the smallest observed size being 53mm CL (Hovel et al., 2015).

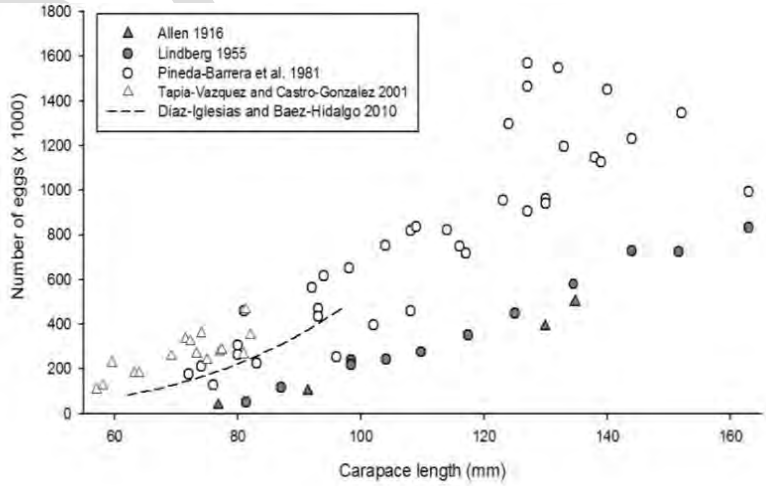

Figure 3-4: Fecundity of CA lobster (*P. interruptus*) from a number of studies throughout its range. Taken from Kay, 2011. *Observations of Lindberg (1955) and Allen (1916) are from California. Pineda-Barrera et al. (1981) and Tapia-Vazquez and Castro-Gonzalez (2001) sampled in Baja. Diaz-Iglesias and Baez-Hidalgo (2010) report an equation (but no raw data) of the relative fecundity, which is the number of eggs that produce healthy swimming larvae, for ovigerous females collected from multiple sites in Baja. (note: legal size = 82.5 mm CL)

3.4 Larval Biology and Dispersal

After an incubation period of approximately 8-9 weeks, developing embryos hatch from the eggs on the female's tail and enter the water column as free swimming (**pelagic**) larvae called phyllosoma (Johnson, 1956). Phyllosoma are flattened, transparent, and 1-2 mm long (4-5 mm including appendages) when they hatch. They then pass through 11 different stages of development and attain a body length of 26-32 mm (Johnson, 1956; Mitchell, 1971). Phyllosoma spend 7-8

months drifting with ocean currents and feeding on **plankton** (Mitchell, 1971; Dexter, 1972) then transform into a puerulus stage that closely resembles adults (Johnson, 1960a). The pueruli settle on **nearshore** reefs then molt into juvenile lobsters (Parker, 1972). The duration of the puerulus stage is estimated at 2-3 months, and settlement in California occurs from June-October with a strong peak in August (Figure 3-3; Parker, 1972; Serfling, 1972; Serfling and Ford, 1975a). The same general timing has been observed in Baja (Guzman del Proo et al., 1996). The arrival and "landing" of pueruli upon a potential habitat surface is referred to as settlement. Because peak hatching and settlement in California both occur in August, newly settled lobsters are assumed to be 1 year old upon settlement (Parker, 1972; Engle, 1979).

Table 3-2: Age at sexual maturity and legal size for CA lobster (*P. interruptus*).

Age at maturity*		Age at legal size		Source	Region	Method
M	F	M	F			
4-5	5-6	7-8		Lindberg 1955	California	lab, LF, molt
5	7	11	10	Mitchell et al. 1969	California	LF
3-4	5-6			Serfling 1972	California	lab, LF
5-6	8-9	11	13	Odemar et al. 1975	California	Tag
		8		Ford and Ferris 1977	California	lab, tag
		8-10		Bodkin and Browne 1992	California	Molt
3	5	4	7	Ayala 1976	Baja	unknown
4.5	6	6.5	8.5	Guzman del Proo and Pineda 1992	Baja	unknown

As reported from previous studies and adapted from Engle (1979). Methods used to determine ages include: laboratory study of captive individuals (lab), analysis of length-frequency data (LF), tag-recapture studies (tag), and molting frequency x molt increment (molt).
***sexual maturity for CA studies = 58 mm CL (M), and 70 mm CL (F); (Lindberg 1955, in Engel 1979); sexual maturity for Ayala (1976) = 65 mm CL**

While the center of the geographic distribution of the CA lobster is located around central Baja California, the SCB population is currently managed as an independent stock. The strong southward California Current usually prevents a large number of larvae from being transported north of Point Conception (Pringle, 1986). Other features within the SCB such as the Southern California Eddy and the deep Davidson current can help retain the larvae within the U.S. border (Johnson, 1960a; Mitarai et al., 2009; Figure 3-5). Features such as the Ensenada Front and the Baja California upwelling maximum tend to block the northward transport of larvae from the geographic center of CA lobster's distribution (Parrish et al., 1981; Selkoe et al., 2007).

Studies of CA lobster genetic population structure generally find high gene flow suggesting well mixed larvae. Iacchei et al. (2009) sampled the mitochondrial DNA of CA lobsters in California and Baja Mexico and found high gene flow and some significant structure but with little relationship to spatial pattern. Their results suggest a well-mixed population with the potential for some areas to self-recruit and they propose that the California lobster population is less reliant on larvae from Mexico than previously thought. Later Iacchei et al. (2013) used microsatellite markers and again found high gene flow and significant population structure but no correlation with distance among sample locations. However, higher kinship rates within sample sites than among sample sites suggested that larvae are not always mixed and may either self-recruit or remain in cohesive groups during the pelagic phase, particularly where currents are driven by high upwelling intensity. While this study provides evidence of some potential for self-recruitment, the frequency with which cohorts of larvae remain in cohesive groups until settlement and whether source and sink sites are consistent through time is unclear. Sites with the highest levels of kinship were within Baja.

Another study examined recruitment dynamics and genetics of two fish species (kelp bass (*Paralabrax clathratus*) and California sheephead (*Semicossyphus pulcher*)) that also have core ranges located within Baja California. Recruitment did not improve significantly in the SCB even when northward current flowing from Baja was particularly strong (Selkoe et al., 2007). The same study concluded that the genetic makeups of the SCB subpopulations of the two species suggest that they are not a sink population of the core Baja population (Selkoe et al., 2007). This information, coupled with records of phyllasoma being found hundreds of kilometers offshore (Koslow et al., 2012), suggest that recruits are kept within the SCB and are well-mixed between different parts of the SCB. While mixing across the US-Mexico border certainly occurs, it likely does not dominate CA population dynamics.

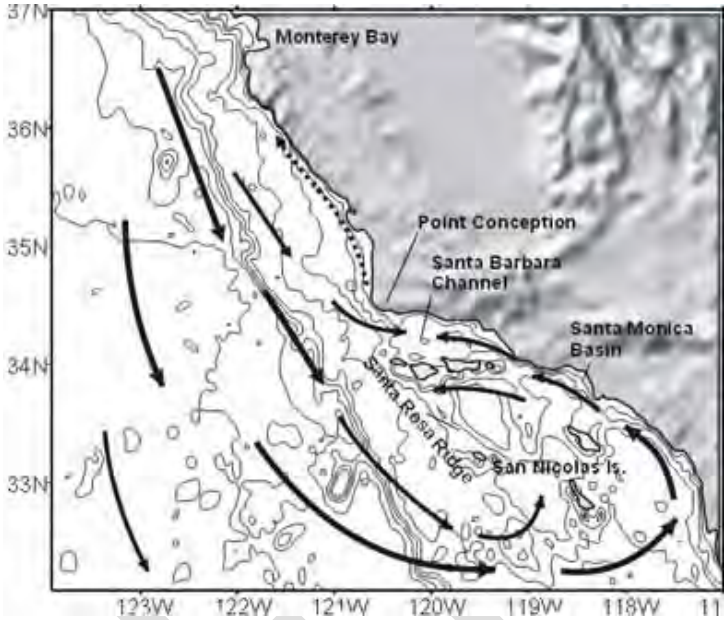

Figure 3-5: A simplified diagram of the North-South California Current, the South-North Seasonal Counter Current, and the resulting Southern California Eddy that help retain planktonic larvae of various marine species within the SCB. Credit: UCLA Nazlin lab.

3.5 Pathology

Spiny lobsters in the family Palinuridae do not harbor many naturally occurring diseases (Shields, 2011). However, a large diversity of disease-causing agents have been isolated from tissues of spiny lobsters held at artificially high densities (e.g., market pens) or from individuals subject to excessive handling or poor environmental conditions (Evans, 2000). Causative agents of these diseases include bacteria, viruses, fungi, and protozoans (Evans, 2000; Shields, 2011). The *Panulirus argus* virus 1 (PaV1) is one notable disease that is lethal to juvenile *P. argus* throughout the Caribbean (Behringer et al., 2010). Presently no disease epidemic, such as the withering foot syndrome found in abalones, is known to affect wild CA lobster.

Lobsters are known to accumulate the toxin domoic acid, which is produced by the diatom *Pseudo-nitzschia*. This microscopic alga is common and seasonally abundant in coastal waters. Domoic acid accumulates in the bodies of animals that filter diatoms and other food particles from seawater (e.g., mussels, scallops, etc.); these animals are preyed upon by CA lobster. Domoic acid can be concentrated in lobster and crab organs, but is typically less concentrated in the muscle tissue (e.g., meat of the tail, legs, and antennae). For this reason, it may at times be safe to eat lobster tails and not viscera when Pseudo-nitzschia blooms are present but consumers should check with authorities (https://www.cdph.ca.gov/healthinfo/environhealth/water/Pages/Shellfish.aspx).

3.6 Movement

CA lobsters exhibit two general types of movement: **nocturnal** foraging and seasonal inshore-offshore movements. Foraging involves nightly movements across spatial scales that range from 1-1,000 m (3.3 – 3,281 ft), with the average distances being closer to 10-250 m (33-820 ft) (Stull, 1991;

Nocturnal - Relating to, or occurring at night.
Physiological - Of or relating to the normal functioning of an organism.

Hovel and Lowe, 2007; Withy-Allen and Hovel, 2013). One study recorded an average nightly forage distance (±1 SE) of 143 ± 10 m (469 ± 32 ft) for an individual, with a maximum distance of 475 m (1,558 ft) and a minimum distance of 48 m (157 ft) per night (Withy-Allen & Hovel, 2013). Many recreational divers, hoop netters, and commercial fishermen target CA lobster during these nightly forays because they are often easier to find and capture.

The cumulative distances moved by CA lobsters making relatively short distance foraging movements could result in longer displacements across MPA boundaries with important implications for MPA effectiveness for CA lobster conservation. Measurement of CA lobster home ranges helps to indicate whether nightly movements are additive, resulting in long distance dispersal, or if lobsters move in a more circular pattern returning to a place of origin on subsequent nights. In the La Jolla Ecological Reserve, individuals were found to maintain small home ranges of between 651 m^2 (0.16 ac) and 5,912 m^2 (1.46 ac) per week, based on the area in which an individual had 50% and 95% chance of being found, respectively (Hovel & Lowe, 2007). Furthermore, individuals tend to retain site-fidelity after each forage trip, often returning to the same general geographic feature (i.e., a particular rock formation or kelp bed) as opposed to the same exact shelter (Hovel & Lowe, 2007). These results indicate that MPAs may result in increased survival rates for CA lobsters within their boundaries.

Seasonal inshore-offshore movement is characterized by occupancy of shallow reefs in summer and fall months, when surface waters are relatively warm and storm activity is low, followed by movement into deeper water with the arrival of winter swells, storms, or colder surface waters (Mitchell et al, 1969). The **physiological** advantages of moving into warm shallow water include faster growth (Engle, 1979) and accelerated egg development (Mitchell, 1971). The timing and intensity of cues that initiate movement out of shallow water have not been rigorously studied. Studies suggest that female CA lobsters tend to exhibit more seasonal movements, potentially due to the need to seek optimal spawning locations (Withy-Allen and Hovel, 2013; Kelly,2001).

3.7 Predation and Defense

Many predators prey on juvenile CA lobster (Table 3-3), the most common of which are California sheephead, cabezon (*Scorpaenichthys marmoratus*), rockfishes (*Sebastes* spp.), kelp bass, giant sea bass (*Stereolepis gigas*), and octopus (especially the two-spot octopus, *Octopus bimaculata*). Fish predators of adult lobsters tend to be the larger individuals such as male California sheephead and giant sea bass. Southern sea otter (*Enhydra lutris nereis*) may also become an important predator in the future, and continued range expansion of sea otters could have serious effects on the CA lobster fisheries (Odemar et al., 1975; USFW, 2005). As of 2014, the southern limit of the otter range has not expanded, and the most recent survey suggests that the southern boundary of the species' range may have retracted slightly (USGS, 2014).

Lobsters encountered in open areas (e.g., while feeding at night) often attempt to flee by repeatedly flapping their tails, which propels them backward and away from perceived threats (Nauen and Shadwick, 1999; Nauen and Shadwick, 2001). Spiny lobsters encountered in their shelters often withdraw to the interior of the shelter, or flee through exit holes at the rear of shelters. If escape is not possible, spiny lobsters may attempt to defend themselves by orienting their bodies and antennae directly towards the predator (Herrnkind et al., 1975; Zimmer-Faust and Spanier, 1987; Spanier and Zimmer-Faust, 1988, Loflen and Hovel, 2010; Figure 3-6). This is especially common at the entrance of shelters, where many individuals can block the entrance by forming a phalanx with this posture. Right after a molting event, a lobster's antennae and exoskeleton remain soft for about one week. During this time lobsters are especially susceptible to predation and tend to limit movements that increase the risk of being eaten (Mitchell et al., 1969).

Figure 3-6: CA lobsters (*P. interruptus*) inhabiting dens in the natural environment, displaying typical posture with antennae directed outwards and in gregarious groupings (left panel).

3.8 Prey

CA lobsters typically forage at night, when they exit the relative safety of their shelters and actively search for food (Allen, 1916; Lindberg, 1955; Roth, 1972; Engle, 1979; Zimmer-Faust et al., 1985; Stull, 1991). CA lobsters are often described as **scavengers**, but they also function as predators and grazers (Table 3-4). CA lobsters routinely attack live prey such as mussels (Robles 1987, 1997), snails (Engle, 1979; Schmitt, 1982; Schmitt, 1987), and sea urchins (Tegner and Dayton, 1981, Tegner and Levin, 1983, Eurich et al., 2014). Common food items routinely observed during field observations and laboratory experiments in gut and fecal contents include bivalves, echinoderms, small crustaceans, gastropods, and corraline algae (Table3-4).

Scavengers – Animals that feed on dead or decaying organisms.

Table 3-3: Predators of CA lobster (*P. interruptus*).

Predator	Predation event observed/studied	CA lobster in gut contents of predator	Anecdotal
CA Sheephead	1^{T}, 4	1, 4,6*	3, 4, 5, 6
Moray eel	1^{T}	4*	1, 4, 3, 6
Giant (black) sea bass		1*	3, 4
Octopus	2, 6, 7^{T}		1, 3, 4, 6
CA lobster			3
Southern sea otter			8, 9
Horned shark			5
Leopard shark		4*	4
Cabezon	6^{j}, 7*	4, 7*	4, 6
Rock fish (Sebastes)		4, 6^{j},*	4
CA scorpion fish (sculpin)	6^{j}	4	4
Kelp bass		4, 6*	6
Black surfperch		6^{p}	
Spotted kelpfish	6^{j}		
Smoothhound shark	7*		

Studies are divided into three categories: those in which predation was observed or studied in the field ("Predation event observed/studied"), those in which stomach contents of predators were examined ("*P. interruptus* in gut contents of predator"), and studies in which predation was mentioned from second-hand or anecdotal accounts ("Anecdotal").
X*= observations reported but were not first-hand
X^{T} = lobsters in traps mutilated when these predators co-occur in trap
6^{j} = very small juvenile lobsters preyed upon
6^{p} = newly settled pueruli preyed upon
([1]Allen 1916; [2]Maddox 1933; [3]Wilson 1948; [4]Lindberg 1955; [5]Mitchell et al. 1969; [6]Engle 1979; [7]Winget 1968; [8]Odemar 1975; [9]USFW 2005)

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CA lobster diets vary with age and size. Juveniles spend their early years in surfgrass while adults frequent habitats associated with hard-bottom. Habitats and food types can vary by locations, even for sites that are close to each other (Winget, 1968). Foraging distance increases as an individual grows (Tegner and Levin, 1983; Ling and Johnson, 2009) and therefore can also affect what prey items are available to a given lobster. A CA lobster's size is itself a limitation of what it can eat. For example, Eurich et al. (2014) found that smaller individuals had difficulty breaking through the test (external shell) of large urchins, whereas larger CA lobsters are more capable of consuming these prey. The interaction further depends on the population density (CA lobster and urchin) and the prey quality, as CA lobsters prefer healthy urchins from kelp-beds over urchins with limited gonad tissue found in urchin barrens (Tegner and Levin 1983, Ling and Johnson 2009, Eurich et al. 2014).

Table 3-4: Prey items of CA lobster (*P. interruptus*), categorized by three study types.

Prey Item	Gut/Fecal			Field			Lab		
Mollusca	C[4,5]								
Bivalves	C[7,8]								
mussels (*Mytilus)*	C[3,9]			C[2,9-12,14]		E[13]			E[20]
Gastropods	C[3,7,8,9]			C[6,14]		E[13]			E[17,18]
Echinoderms	C[4]	R[5,7]							
Sea urchins	C[3]			C[15]		E[13]	C[16]		E[21]
Sea cucumber									E[19]
Crustaceans	C[4,5,7,8,9]								
P. interruptus	C[3]		E[1]						
Crabs	C[3,9]								
Bryozoans		R[3,4,5,7,8]							
Polychaetes	C[3]	R[5,7,8]				E[13]			
Hydroids		R[3]							
Sponges		R[3,4,5,7]	E[1]						
Eggs	C[4,5]								
Fish	C[4,8]	R[3,4]	E[1]						
Squid									E[20]
Foraminiferans		R[5,8]							
Coralline algae	C[3,4,5,7]	R[8]							
Surf grass	C[4,7,8]	R[4,5]							
Other algae	C[4,9]	R[3,4,7,8]	E[1]						

("Gut/Fecal" = gut and/or fecal content analysis; "Field" = field observations; "Lab" = lab observations). For Gut/Fecal studies, prey are reported as common (C) or rare (R) in samples. For field observations, prey were indicated as commonly attacked (C) or rarely attacked (R). For lab experiments, prey that were preferred in choice experiments are noted as commonly (C) preferred or rarely eaten (R). Also reported are prey that were observed to be eaten (E) in situations for which there was no measure of preference or frequency.

([1]Allen 1916; [3]Lindberg 1955; [4]Winget 1968; [5]Engle 1979; [7]Castaneda-Fernandez de Lara et al. 2005; [8]Diaz-Arredondo and Guzman del Proo 1995; [2]Fry 1928 (in Wilson 1948); [6]MacGinite and MacGinite 1949; [9]Robles 1987, 1997; [10]Robles and Robb 1993; [11]Robles et al. 1990;[12]Robles et al. 2001; [13]Zimmer-Faust and Case 1982; [14]Schmitt 1982, 1987; [15]Tegner and Dayton 1981; [16]Tegner and Levin 1983; [17]Shabani et al. 2007; [18]Kicklighter et al. 2005; [19]Eckert 2007; [20]Diaz-Iglesias et al. 2011; [21]Eurich et al. 2014)

3.9 Ecosystem Role of CA Lobster

The interactions between CA lobsters and their prey are considered direct effects because the action of one species (i.e., predator) directly affects another species (i.e., prey). Through direct predation, CA lobsters have been found to limit the **abundance** of the top snails (*Tegula aureotincta* and *T. eisinia*) in cobble and rocky reef habitats (Schmitt, 1982; Schmitt, 1987). CA lobsters have also been found to limit

the density and size of mussels (*Mytilus californianus*, *M. galloprovincialis, Septifer bifurcatus*) and gastropods (snails) in rocky intertidal habitats at Catalina Island (Robles, 1987; Robles et al., 1990; Robles, 1997; Robles et al., 2001). In addition, CA lobsters are thought to limit the local abundance of red and purple sea urchins (*Strongylocentrotus franciscanus* and *S. purpuratus*) on reefs in southern California (Lafferty, 2004; Tegner and Levin, 1983).

CA lobster predation can also trigger indirect effects in marine ecosystems. The most clearly demonstrated indirect effect of lobster predation in marine ecosystems involved predation upon intertidal mussels. Robles and Robb (1993) observed that as CA lobsters preyed upon intertidal mussels, red algae were able to colonize and grow in the empty spaces previously occupied by the mussels. In this case, CA lobster predation upon mussels indirectly influenced the abundance of algae.

As previously stated, CA lobsters are thought to limit the local abundance of red and purple sea urchins on reefs in southern California. Urchins are herbivores that consume algae and kelp. In southern California, the **biomass** of giant kelp (*M. pyrifera*) can be inversely related to urchin abundance (Ebeling et al., 1985; Arkema et al., 2009) or the intensity of urchin grazing (Harrold and Reed, 1985). Therefore, CA lobster can impact giant kelp indirectly by releasing it from urchin grazing and thus enhancing the persistence and extent of kelp forests (Dayton and Tegner 1998; Jackson et al., 2001; Dayton, 2003; Graham, 2004; Lafferty, 2004; Halpern et al., 2006; Eurich et al., 2014).

Abundance - The total number of animals in a population. This is rarely known, but usually estimated from relative abundance although other methods may be used.
Biomass (B) - The total weight of organisms at a given point in time in a defined stock, area, population, or catch.

3.10 Regional differences in lobster biology and ecology

Both commercial log data and the collaborative at-sea sampling program (CASP) (Yaeger et al., 2015) demonstrate that the average size of CA lobsters increases along a south to north gradient within the SCB. There are likely multiple reasons for this relating to both fishery dynamics and biology. As noted in Section 2.1, fishing effort is not equally distributed. The particularly high fishing effort and catch off Point Loma in San Diego likely contributes to reduced average lobster size. Mean CPUE for legal-sized CA lobster across whole fishing seasons has generally not been significantly different among regions of the SCB during the last three fishing seasons (Yaeger et al., 2015). This suggests that fishing effort may be well matched to abundance. However, CPUE for legal-size lobsters declines more sharply across the season in the southern region of the SCB. Additionally, the northern Channel Islands are relatively difficult to access and local MPAs had been in place for almost 10 years at the time of CASP sampling, possibly contributing to lower fishing pressure and greater average size in the region.

Biological explanations for differences in average size include temperature, habitat quality, and recruitment patterns. Higher temperatures are known to increase lobster growth rates elsewhere (Pecl et al., 2009). This does not explain larger lobster sizes in the northern region of the SCB where temperatures are typically colder. However higher temperatures are known to increase lobster activity and catchability (Ziegler et al., 2003, 2004). Therefore larger sizes in the north may relate to decreased vulnerability to harvest, giving lobsters more time to grow before eventually being captured. Hovel et al. (2011) also observed generally increasing CA lobster sizes at southern sites within the SCB and measured a significantly higher growth rate at Laguna, CA where average size was highest. These findings suggest complex interactions between fishing effort and several environmental factors influencing growth and vulnerability. Abundance of sub-legal CA lobsters is greater in the southern regions (Yeager et al., 2015) indicating higher recruitment, as might be expected due to proximity to the center of the species geographic range.

There are potentially regional differences in reproductive dynamics across the SCB although differences are not well understood. Several aspects of CA lobster reproductive biology were found to correlate with environmental factors in Baja California, Mexico (Vega 2003b). Rates of spermatophore deposition on females were found to be correlated with low SST and strong upwelling while egg laying and hatching were accelerated in response to increasing summer temperatures. Variation in these environmental characteristics is likely to similarly influence reproduction in the SCB. SAM may also vary with latitudinal temperature gradients. Differences in sex ratio and/or trap vulnerability among regions may also affect regional reproductive output. CASP data did not find consistent differences among regions in the sex ratio of legal-size individuals in traps. However, significantly more female sub-legal CA lobsters were captured in all regions and all sampling years (Yaeger et al., 2015). This greater vulnerability of females to traps has important implications for the effects of fishing on reproduction. Areas with high fishing effort and thus repeated capture and release of sub-legal females will induce relatively more stress on those females. Melville-Smith and de Lestang (2007) demonstrated a reduction in Australian western rock lobster fecundity due to handling stress.

3.11 Climate Change Impacts on CA Lobsters

Climate Change (CC) is a shift in global climate pattern characterized by increasing global air and ocean temperatures in most regions, widespread melting of snow and ice, and rising global average sea level (IPCC, 2013). These widespread environmental changes have been attributed to the emission of greenhouse gases (GHG), such as carbon dioxide (CO_2), methane, and nitrous oxide brought on by industrialization. While atmospheric methane and nitrous oxide are significant contributors to climate change, CO_2 is currently considered to be the primary contributor. A more detailed discussion on CC background mechanisms are presented in Appendix V.

Various CC effects will likely impact the CA lobster fishery. Sea surface temperature (SST) in the SCB is predicted to rise (NOAA, 2012). Warmer atmospheric temperature may also change the **upwelling** and circulation pattern of the region (Bakun, 1990; Bakun et al., 2010; Rykaczewski and Dunne, 2010; Pisias et al., 2001; Snyder et al., 2003). CC can also lead to more intense storms and increased runoff along the southern California coast (IPCC, 2013). Lastly, it is widely believed that increasing atmospheric CO_2 concentration will continue to acidify the ocean (Caldeira and Wickett, 2003; Royal Society, 2005; Pecl et al, 2009). Figure 3-7 illustrates the various factors (A-F) and pathways that CC can impact the CA lobster fishery. It is important to note that CC is an incredibly complex phenomenon. While scientists can make reasonably accurate predictions on big picture changes, predicting on a smaller geographic scale (e.g., SCB) is still challenging (IPCC, 2013) (See also Appendix V).

Warmer SST in the pelagic environment may lead to better survivorship, and growth in the SCB. As for fishery effects of CC, warmer coastal environments may make adult CA lobsters more active and easier to capture (Pringle, 1986; Koslow et al., 2012). Furthermore, since California is at the northern edge of the lobster's current domain range, higher SST could extend the population northward. Conditions such as **El Niño** (see Appendix V), which leads to warmer water along the California coast, could provide episodic transport of larvae north from Mexico which could also increase harvest (Pringle, 1986).

Upwelling - On the California coast, upwelling is the upward movement of deep waters into the nearshore ecosystem due to springtime winds moving the topmost layers of water away from land.
El Niño - A periodic warming of the ocean surface waters in the eastern Pacific Ocean. It is characterized by a lack of upwelling of cold, nutrient-rich waters nearshore.

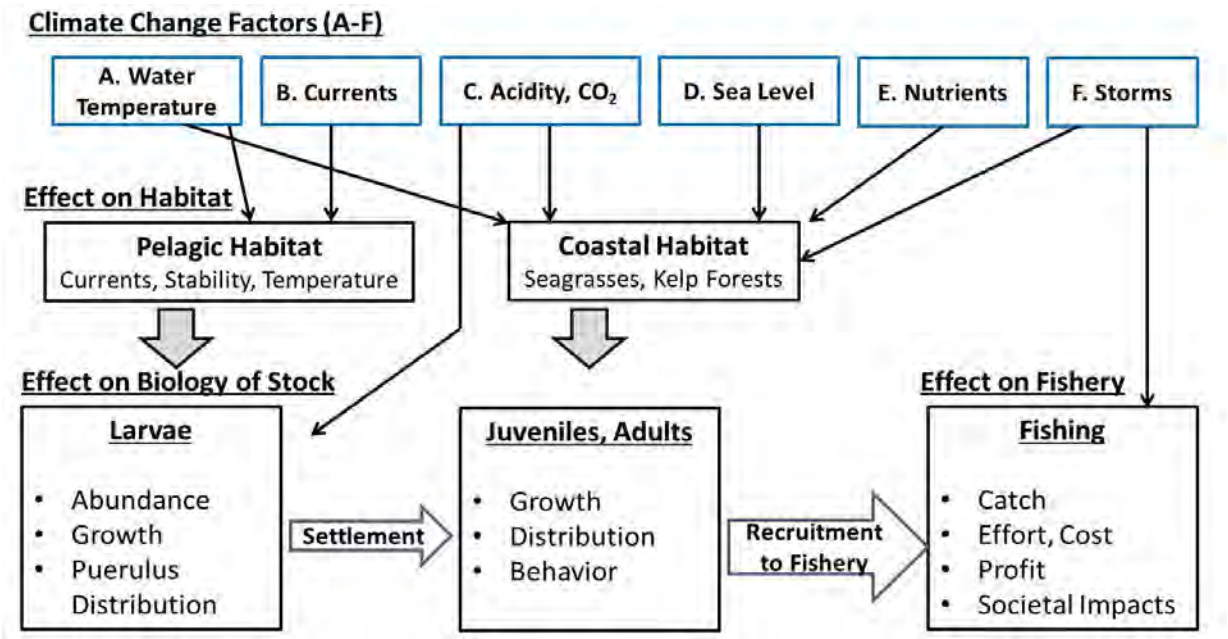

Figure 3-7: Schematic showing relationships between Climate Change variables (labeled A-F), habitat, lobster biology, and the fishery. Further topics listed within the individual boxes are specific variables that are expected to change under CC. Credit: Dr. K. Hovel, San Diego State University

As SST increases, species typically found off Baja California could begin to occur with greater frequency within the southern California kelp forests. Such changes have already been observed in some kelp forests (Field et al., 1999). Kelp itself may be impacted by increasing SST and reduced nutrients. It is unclear at this point exactly how kelp forests will respond to warming SST, but the effect is likely negative (Steneck et al., 2002). Likewise, CA lobster, being more subtropical, may or may not be directly (i.e., physiologically) affected by increasing SST. However, there may be an increased likelihood of disease with higher water temperatures. For example, the bacterial epizootic shell disease found in east coast lobster stocks has been linked to higher water temperature (Glenn and Pugh, 2006).

Whether CC would intensify upwelling in southern California or suppress it is still subject to ongoing scientific debate (B and E, Figure 3-7) (Bakun et al., 2010; Rykaczewski and Dunne, 2010). Weaker upwelling leads to declines in **zooplankton** abundance (Roemmich and McGowan, 1995) and a decrease in CA lobster larvae food sources. Stronger upwelling can increase the CA lobster larvae food sources, but it can also change the dispersal and recruitment pattern of the stock in the open ocean (Gaylord and Gaines, 2000; Connolly et al., 2001) (B, Figure 3-7). Harley et al. (2006) suggested that increased upwelling may decrease the populations of some **benthic** species such as lobsters by moving potential recruits offshore and away from suitable habitats. This is probably more applicable to regions north of Point Conception and would thus act to inhibit northward settlement of the lobster. Sea level rise will lead to coastal inundation and increased coastal erosion, especially during more intense storms and high tidal periods (D, Figure 3-7). Coastal erosion can lead to silting of coastal habitats, in particular seagrass beds used for settlement and adult foraging. Even in areas that will not experience intense silting, seagrass beds would still be sensitive to changing light wavelengths brought about by increased turbidity and changing water depth (Moore et al., 1997).

Zooplankton - Small animals passively carried along with water currents and other water movement.
Benthic - On or relating to the region at the bottom of a sea or ocean.

More intense storms combined with increased nutrient runoff (E and F, Figure 3-7) can also damage or completely destroy seagrass beds. This would reduce the amount of suitable habitat for lobster puerulus settlement, resulting in fewer successful recruits. Similarly, kelp beds could be damaged or destroyed at more frequent intervals, thereby disrupting adult lobster habitat and its immediate ecosystems (Pecl et al., 2009). In addition, more intense storms could also hinder fishing activities and damage deployed lobster traps.

Lastly, CC may also lead to a more acidic ocean (C, Figure 3-7). Water corrosive enough to dissolve seashells has been observed off California and is expected to become more frequent (Feely, 2008). The types of organisms potentially affected include snails and mussels, corals, and many phytoplankton species. It is unclear if there will be any direct adverse effects on lobster (Pecl et al., 2009). Many crustaceans, including the American Lobsters on the east coast, are able to resist acidifying ocean water (Ries et al., 2009). However, even if CA lobsters can maintain their protective shells in a more acidic environment, there would still be adverse impacts. Compensating for the corrosive effect of carbonates requires significant energy that would otherwise be used for reproduction and growth (Long, 2013). Additionally, calcified CA lobster prey such as urchins and bivalves could be impacted leading to cascading effects on CA lobster growth and survival.

4. Measures for Conservation and Management of the CA Lobster Fishery

The primary goal of fishery management under the MLMA is sustainability (FGC § 7050(b), § 7056). The MLMA and the Master Plan define sustainability as:

a) Continuous replacement of resources, taking into account fluctuations in abundance and environmental variability.

b) Securing the fullest possible range of present and long-term economic, social, and ecological benefits, maintaining biological diversity, and, in the case of fishery management based on maximum sustainable yield, taking in a fishery that does not exceed optimum yield (FGC § 99.5).

CDFW aims to sustainably manage the CA lobster fishery through a **harvest control rule** (HCR) that consists of 3 reference points, an HCR matrix, and a toolbox of 8 regulatory options.

4.1 Overfishing, Sustainable Yield, and Overfished

The MLMA's mandates for sustainability are closely tied to the concept of **overfishing** as defined by the Fish and Game Code. Fish and Game Code section 98 defines overfishing as "a rate or level of taking that the best available scientific information, and other relevant information that the commission or department possess or receives, indicates is not *sustainable* or that jeopardize the capacity of a marine fishery to produce the maximum sustainable yield on a continuing basis [emphasis added]." Other types of overfishing refer to economic and ecosystem effects of harvest in addition to more specific effects on a stock. These include:

Harvest control rules (HCR) -Harvest control rules are plans of action that prescribe adjustments in harvest regulations (e.g. fishing effort, total allowable catch, minimum legal size) and are activated ("triggered") when the calculated amount of a resource that can be taken (the defined upper limit, also known as "threshold reference point") is reached or surpassed.
Yield per recruit (YPR) - A theoretical value that describes the yield to a fishery that is contributed by a given number of recruits (usually a single recruit).

Recruitment overfishing: Fishing that depletes the mature adult population (spawning stock) to a level at which reproduction is inadequate to replenish the population (Sissenwine et al., 1987).

Growth overfishing: Fishing in which **yield per recruit** is lower than theoretical maximum values due to the harvesting of small and rapidly growing fish (Diekert, 2012).

Economic overfishing: Level of fishing effort that exceeds **maximum economic yield (MEY)** (Flaaten, 2010).

Ecosystem overfishing: Level of fishing that creates significant adverse impact to the species diversity, trophic composition, and productivity of an ecosystem (Murawski, 2000).

These different types of overfishing each present their own threats to sustainability. **Recruitment overfishing** is a threat to the biological sustainability of a fishery; this type of fishing activity is most commonly linked to collapse of fish stocks. In contrast, economic and **growth overfishing** can be biologically sustainable, but reduce the economic and social sustainability of a fishery. Finally, ecosystem overfishing threatens the integrity of the larger ecosystem, which is ultimately essential for the conservation of the stock as well.

Maximum economic yield (MEY) - The maximum possible revenue after accounting for the costs of fishing that may be achieved in a fishery. MEY typically is reached at smaller catches than MSY.
Instantaneous Fishing mortality (F) - The rate at which organisms are harvested or killed due to fishing; F is an instantaneous rate that reflects the rate at which a proportion of a population is being lost, whereas the harvest rate (*u*) is an annual rate that reflects the rate at which a number of fish from a population is being lost.
Maximum sustainable yield (MSY) - In a marine fishery, means the largest catch that can be taken from a stock continuously over time that does not result in a continuing reduction in stock abundance, assuming constant environmental conditions. MSY is generally presented as a maximum annual catch that can be maintained indefinitely; however, MSY can change with fluctuations in abundance and environmental variability (e.g. shifts in ocean regimes), requiring adjustments in allowable harvest.

Each type of overfishing is associated with a particular harvest rate. Fishery scientists usually describe the rates at which fish are removed from a stock with two types of measurements. The first and more intuitive measurement is the *harvest rate* (*u*), which is the proportion of all legally harvestable fish that are taken in a fishing season. Values for harvest rates can range from 0-1. For example, harvest rates of 0, 0.5, and 1 indicate that none, half, and all of the harvestable fish are taken every season, respectively. The second measurement is the **instantaneous fishing mortality rate** (*F*), which can be calculated directly from the harvest rates (and vice-versa). Unlike *u*, *F* is described in the less intuitive log space and comports better with complex scientific calculations used in fisheries models.

The total harvest from each season is considered the fishery yield, and together with harvest rates and sustainability objectives form interrelated metrics for evaluating the fishery (Figure 4-1). An extremely low harvest rate will result in a low

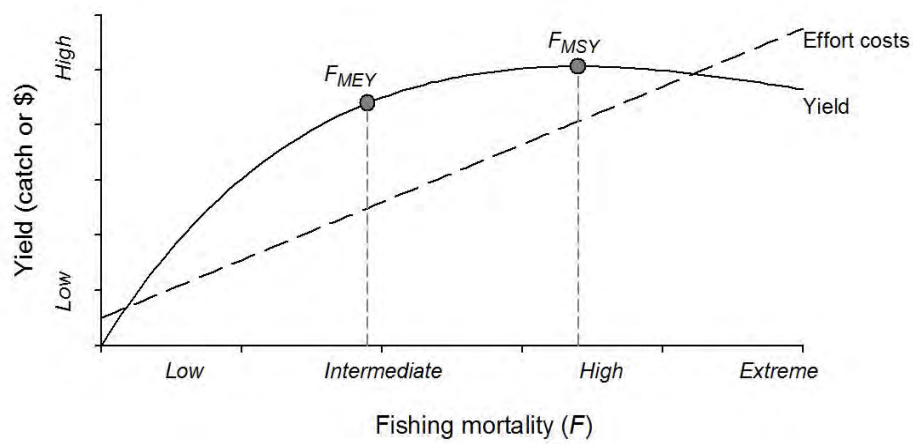

Figure 4-1: The general relationship between fishing mortality (or harvest rate) and fishery yield (solid curved line). Also shown is hypothetical effort cost (diagonal dashed line). The fishing mortality that produces maximum economic yield (F_{MEY}) can be visualized as the fishing mortality at which the distance between the yield curve and the effort cost line is greatest.

fishery yield which may not satisfy the economic and social sustainability objectives of the fishery. As harvest rates increase, fishery yield also increases. But once the harvest rates increase beyond a stock's ability to regenerate itself, growth and recruitment overfishing may occur which would drive down the yield of the fishery. For a fishery under equilibrium conditions, the total harvest that equals the stock's ability to regenerate is called the **maximum sustainable yield** (MSY), and the fishing mortality rate associated with this yield is referred to as F_{MSY}.

Any fishery would also have an MEY. Any amount of fishing effort (e.g., # of traps fished, days at sea) has costs associated with a number of factors (e.g., additional fishing gear, bait, fuel, crew days). Consequently, the cost of fishing increases as effort and harvest rate increase (diagonal dashed line in Figure 4-1). Due to this increase and the dome-shaped relationship between harvest rate and fishery yield, there is usually a mortality rate (F) at which a fishery achieves MEY, or F_{MEY}. A fishing mortality rate that exceeds F_{MEY} represents economic overfishing. F_{MEY} is almost always lower than F_{MSY} (Flaaten, 2010). Thus, a harvest rate that is biologically sustainable may still lead to economic overfishing and undermine the economic objectives of a fishery.

A high harvest rate can also undermine the environmental objectives set forth by MLMA if fishing leads to habitat damage, unacceptable bycatch levels, and/or trophic disturbance. For example, if CA lobsters are fished to an extent that they are no longer able to control the urchin population, overgrazing of kelp forests by the urchins may occur. The loss of kelp may then negatively impact the resilience of the CA lobster stock (Section 3.9). Academic researchers have begun to tackle the task of quantifying ecosystem overfishing over the past several years (Murawski, 2000; Methot et al., 2013).

In addition to overfishing, the MLMA also requires CDFW to define the criteria for when a fishery is considered "**overfished**" (FGC § 7086). Under the MLMA, "[if] a fish population is depressed, and the principle means for rebuilding the population is reduction of take, then the fishery is to be classified as overfished" (FGC §97.5). A fishery is "**depressed**" when "a declining population trend has occurred over a period of time appropriate to that fishery" (FGC § 90.7).

It is important to note that the term overfished refers to the status of a fish stock, while overfishing refers to the activity of fishing and describes fishing practices in which too many fish are removed. When only a relatively small proportion of an available stock is being harvested (low harvest rates), overfishing is unlikely and **stock size** typically remains high (not overfished). When a relatively high proportion of an available stock is being harvested (high harvest rates), the risk of overfishing increases, and the stock is more likely to drop below a level that would classify it as being overfished.

Overfished - A stock that is at unacceptably low levels because it has experienced overfishing and has not been rebuilt.
Depressed fisheries - The condition of a fishery for which the best available scientific information and other relevant information that the Commission or Department possesses or receives, indicates that a declining population trend has occurred over a period of time appropriate to that fishery. With regard to fisheries for which management is based on maximum sustainable yield, or in which a natural mortality rate is available, "depressed" means the condition of a fishery that exhibits declining fish population abundance levels below those consistent with maximum sustainable yield.
Stock Size – Total estimated number or biomass of fish within a stock.

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Furthermore, an overfished stock is not always being subjected to overfishing, and vice-versa. Consider, for example, a **depleted** stock that is closed to fishing. After fishing stops, the harvest rate falls to zero, but until stock biomass rebuilds, the stock remains overfished. This condition would be represented by the lower left-hand region of Figure 4-2 (low harvest rate and low biomass). Paradoxically, during the period when a newly emerging fishery is fished down to levels associated with the MSY the fishing rate appears to be unsustainable, because there is no surplus production in an unfished stock. However, surplus production increases as biomass approaches MSY, and sustainability is achieved if the harvest rate matches surplus production, despite that same harvest rate being responsible for fishing the stock down from unfished biomass. A stock would not be considered "overfished" until the stock size suffers a dramatic decline (upper right-hand portion of Figure 4-2), to levels significantly below the biomass associated with MSY. The designations of overfishing and overfished ultimately depend on the sustainability objectives of the society.

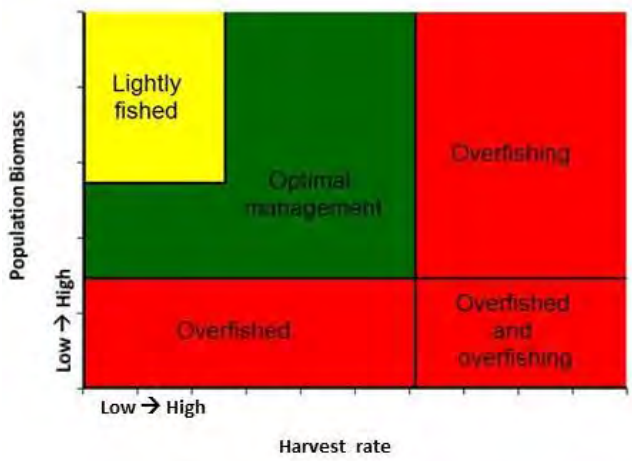

Figure 4-2: The general relationship between harvest rate and stock size.

4.2 Introduction to Harvest Control Rules

Many fishery managers around the world are moving towards adopting dynamic HCRs as their means of achieving MEY and MSY as well as avoiding overfishing and facing overfished stocks. HCRs are a type of management framework that "formulate[s] a procedure for making harvest policy decision[s]." It does so by "identify[ing] a pre-agreed course of management action as a function of identified stock status and other economic environmental conditions" (WCPFC, 2012). The HCR framework here is comprised of five fundamental components (Figure 4-3):

1) Harvest regulations
2) Data collection
3) Data Analysis
4) Reference point(s)
5) HCR matrix

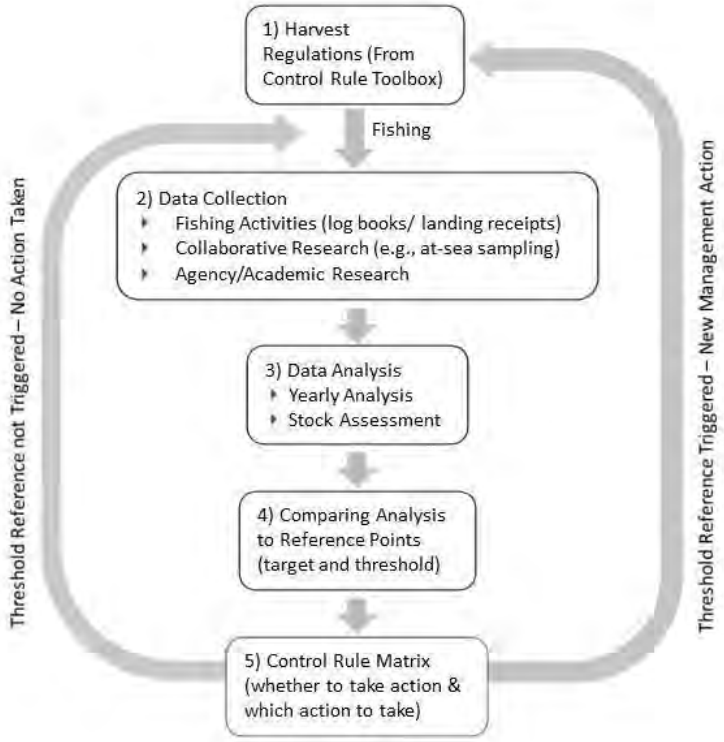

Figure 4-3: The relationship among the five elements of a general fishery management framework.

4.2.1 Harvest regulations

Harvest regulations are the rules that define how fishermen are allowed to harvest fish. These regulations typically take one of three specific approaches for ensuring sustainability: (I) managed escapement (used exclusively in salmon fisheries); (II) use of a dynamic time scenario (e.g., common when a stock is tied to extremely variable environmental conditions or when high bycatch is a problem), and; (III) manage for a sustainable harvest rate (Figure 4-4, modified from NRC 1998). The goals of these approaches are the same: to ensure fishery sustainability by avoiding overfishing and to achieve recovery when a stock is overfished.

For most fisheries, management with escapement goals or a dynamic time scenario is inappropriate or logistically impossible (NRC, 1998). The more practical alternative is to manage for a harvest rate that maintains relatively high fishery yield without causing overfishing. Broadly speaking, there are three types of harvest regulations: biological regulations, effort-based harvest regulations, and catch-based harvest regulations (items IIIa-c in Figure 4-4).

> **Harvest regulations -** The rules that define how fishermen are allowed to harvest fish. Harvest regulations are diverse and include restrictions on size of animals harvested, effort, total catch, gear types, season, or location where fishing is permitted.

4.2.1.1 Biological harvest regulations

Biological harvest regulations directly protect some portion of a stock and buffer it against recruitment overfishing and growth overfishing. Common biological regulations include legal size limits (minimum and maximum), sex-based regulations, seasonal closures, and spatial restrictions (e.g., MPAs) (Figure 4-4, item IIIa).

Minimum legal size (Min LS) protects rapidly growing young fish, some of which may be reproductive. A Min LS can prevent recruitment overfishing only if it is larger than the size at which fish first start reproducing. A Min LS can prevent growth overfishing only if it protects rapidly growing young animals.

Maximum legal size (Max LS) is intended to protect large animals that have high fecundity and buffers against recruitment overfishing. Max LS may also have ecological and/or market benefits. A management framework that employs both a Min LS and Max LS is often referred to as having a "slot" or "over/under" size limit.

Sex-based regulations are designed to safeguard the reproductive output of females with the assumption that remaining males present in a fished population can successfully fertilize all the available eggs. Fishermen may only be allowed to harvest male animals (male only fishery) larger than the size at sexual maturity, as is the case for the US west coast Dungeness crab fishery.

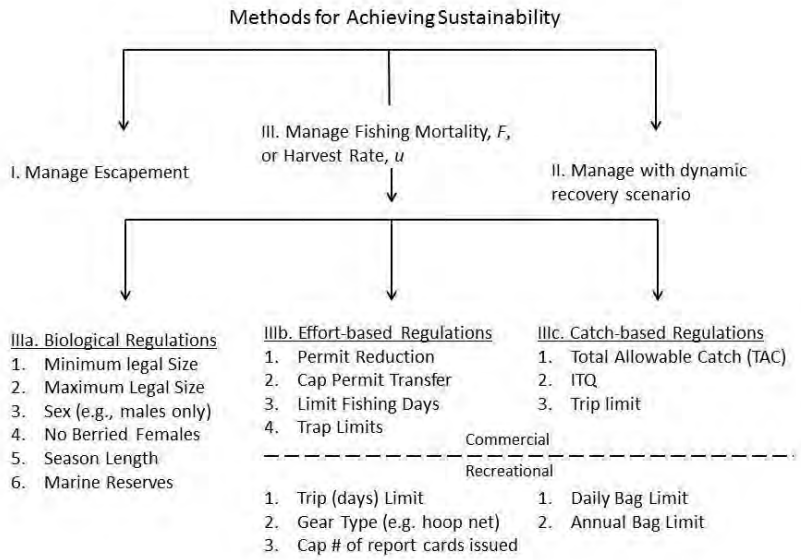

Figure 4-4: Methods for achieving fishery sustainability, including the three types of harvest regulations for harvest rates.

Alternatively, a fishery can prohibit the landing of berried females (females that are carrying eggs), as in the Atlantic USA/Canada fishery for American lobster *Homarus americanus*. These two examples serve to mitigate the impact of fishing on the **spawning potential** of the stock.

Area closures prohibit all or some fishing activities in prescribed areas. Heavily fished lobster populations around the world tend to show rapid increases in biomass, average size of individuals, and abundance inside closed areas (Diaz et al., 2011; Moland et al., 2013.

Spawning Potential – The reproductive output (# of eggs) that may be produced during the lifetime of an average female.

Seasonal closures act as biological regulations when they protect animals during the reproductive phase of their life cycle – such as the closure of the CA lobster fishery during summer in California. Seasonal closures also reduce total annual effort (see *Effort-based regulations*).

4.2.1.2 Effort-based harvest regulations

Whereas biological regulations serve to lessen the impact of fishing on the population dynamics of a stock, effort-based regulations protect the portion of the stock that is vulnerable to harvest (legally harvestable). This can help prevent recruitment overfishing and growth overfishing, but can also prevent economic overfishing when increases in effort (and harvest rate) begin to provide diminishing return in terms of yield (i.e., the flattened part of a yield curve, Figure 4-1).

Limited Entry programs limit the total number of participants in a fishery.

Capping permit transfers (e.g., an annual limit) can limit the activation of latent **capacity** in a fishery, thereby avoiding abrupt increases in effort.

Seasonal closure does not have to correspond to a targeted species' life cycle; instead, it can serve to only control fishing effort by defining a maximum number of days per year that an individual can fish.

Gear limits define a maximum amount of gear (i.e., traps or hoop nets) a fisherman can use.

Gear type regulations generally restrict the use of gears that destroy habitat or catch portions of the stock protected with biological harvest regulations. They may also protect immature individuals (i.e., escape ports) or reduce bycatch mortality (i.e., excluder devices in trawls, or barbless hooks for salmon). These regulations can also control the harvest rate by prohibiting new gear types that increase harvest efficiency. However, it is important to note that gear type restriction can impose economic inefficiency on fishermen.

Capacity - The potential ability of a vessel or a fleet of vessels to capture organisms. This ability is based on the number of fishing vessels in the fleet, the size and technical efficiency of each vessel, time spent fishing, and management regulations.
Bag limits - The total amount of fish or other species that may be captured per person per day by law.
Individual transferable quota (ITQ) - A program which limits the catch allowed per license or individual as well as the number of individuals who participate.

4.2.1.3 Catch-based regulations

As with effort-based regulations, catch-based harvest regulations serve to protect the portion of the stock that is vulnerable to harvest (legally harvestable).

Daily **bag limit** is a daily limit on the number or weight of fish that a recreational fisherman may legally retain.

Annual bag limit is an annual limit on the number or weight of fish that a recreational fisherman may legally retain.

Total allowable catch (TAC) is the total catch that can be taken during each fishing season. A TAC works by protecting a fraction of the stock

that is large enough to ensure sustainable reproduction, which stabilizes catches and associated economic output of the fishery from year to year. In TAC fisheries, catch is often monitored during the season, and managers usually close the fishery once the TAC is reached, although in-season catch projections may allow the use of less disruptive regulatory measures if taken before reaching the TAC. In some fisheries, the TAC for an upcoming season is adjusted in response to recent trends in some reference indicator such as catch per unit effort (CPUE) or recruitment. Adjustment can also occur in response to going over or under the TAC in the previous season. Federal fishery management plans are required to establish a mechanism for specifying an annual catch limit, which is a form of a TAC (16 USC § 1853(a)(15)). Federal managers are required to take actions whenever an annual catch limit is exceeded (50 CFR §§ 600.310(f)(2)(iv), (g)(3)).

One limitation of TAC is that it does not prevent the "race to fish", a dynamic in which fishermen competitively attempt to catch fish before other fishermen catch them. In fact, a TAC can accelerate the race to fish because it shrinks the portion of fish available for harvest. In response, fishermen often invest in tools that provide a competitive advantage such as faster boats, more traps, and better technology – an effect known as "capital stuffing" (Copes, 1986).

Individual transferrable quota (ITQ) is a dedicated portion of a TAC. In TAC fisheries, the race to fish and capital stuffing can be addressed with a quota system like ITQ (Costello et al., 2008). Quotas grant fishermen exclusive access to some fraction of a TAC. A quota system can also lead to additional economic benefits by allowing fishermen to focus fishing during periods of peak market price or spread fishing activities out over a longer period of time to avoid market gluts. The key incentive with quota management is that fishermen can wait to harvest their "share" of the catch. Individual transferable quotas (ITQs) are a common form of quota that may be transferred among fishermen. Transferable quota systems are designed to balance fleet dynamics by allowing for more flexible fishing operations. ITQs require focused monitoring and enforcement, which can add to management costs.

4.2.2 Data collection

Data collection gathers information that directly informs the stock assessments and management decisions (Figure 4-3). The MLMA stipulates that FMPs employ the best available scientific information (FGC § 7050(b)(5)). This is referred to as **essential fishery information** (EFI), which includes information about species life history, habitat requirements, status and trend of the population, fishing effort, catch level, fishery's effect on the fish population, and "any other information related to the biology of a fish species […] in the fishery that is necessary to permit fisheries to be managed [sustainably]" (FGC § 93; Section 5.2, 5.3).

EFI is gathered by CDFW from a number of fishery-dependent (e.g., commercial logbooks and recreational report cards) and fishery-independent sources (e.g., research programs conducted by agency staff, academic staff, or NGOs). Information from logbooks, landing receipts, and report cards are confidential (FGC §§ 1050.6, 8022(a)). CDFW is increasingly interested in developing collaborative programs bringing fishermen together with scientists associated with academic institutions or NGOs to increase the quality and quantity of data collected (NRC, 2004; Section 5.3).

Essential fishery information (EFI) - With regard to a marine fishery, means information about fish life history and habitat requirements; the status and trends of fish populations, fishing effort, and catch levels; fishery effects on fish age structure and on other marine living resources and users; and any other information related to the biology of a fish species or fishery that is necessary to inform management.
Thresholds (reference point thresholds) – For the purpose of this FMP, the levels of stock size or reproductive potential, or fishing mortality rates that are not sustainable.

4.2.3 Data Analysis

Raw data have limited management value until they are analyzed, which may be a formal stock assessment or a less formal analysis. A stock assessment integrates a diverse range of EFI to evaluate the status of a fish stock, including past and current stock levels, and includes information to help guide future harvest rate. A stock assessment can provide a clear picture of the present condition of a stock (i.e., is it *overfished*?) and the impacts of current harvest practices (i.e., is *overfishing* occurring?). CDFW will determine how often, or when, to perform stock assessments for the CA lobster based on availability of new data or updates, and response time of the stock to changes in the environment or the fishery.

4.2.4 Fishery Management Reference Points

Analyzed data must be placed into the context of policy/value judgment. For example, a drop in catch level should trigger management actions only if a relevant statutory/regulatory mandate or a manager deems it important. This is where a **threshold reference point** comes in. Threshold reference points signal when a stock would require management attention. Many HCRs used for other fisheries use a single reference point (e.g. biomass) but distinguish three levels or threshold types termed target, trigger and limit reference points. These divide the range in stock status into healthy, overfishing, and overfished zones. This "precautionary approach" was outlined by the United Nations Fish Stock Agreement of 1999 and was adopted by the Canadian government (DFO, 2006) among others.

Frequently reference points are based on the concept of MSY. They are specified relative to the fishing mortality level that produces MSY (F_{MSY}) or the stock biomass level at MSY (B_{MSY}). MSY may be calculated using dynamic models with detailed stock-recruitment information when it is known. Examples include the non-parametric production model developed by Sissenwine and Shepherd (1987) and dynamic pool models used by Shepherd (1982) and Mace (1994). Many fisheries do not have the data resources required for these models and therefore MSY proxies are used. For example, the Canadian precautionary approach suggests that B_{MSY} may be replaced with the average biomass (or index of biomass such as catch or CPUE) over a productive period. This may be considered a B_{MSY} proxy or simply an alternative fishery indicator as suggested by Sainsbury (2008).

Alternatively, "empirical reference points" are not model based and are based on directly observable properties of a stock (Sainsbury 2008). Unconventional empirical reference points that need not be based on MSY include a desirable recruitment level (Shepherd et al. 2001), particular size or weight distributions (Punt et al. 2001), or presence/absence within portions of the stock's range (Hobday et al. 2004). While these measures do not require a model for their derivation, it may be advisable to use complex modeling for identification of appropriate targets and limits (Sainsbury et al. 2000). This will be an ideal use for the CA lobster Management Strategy Evaluation (MSE) model once fully developed (see Section 4.6).

Whenever a stock reaches a reference point threshold, resource managers must investigate the cause and potentially provide a response. A number of specific reference points are used in spiny lobster fisheries around the world and are described below: i) stock size; ii) total catch each season; iii) CPUE; iv) harvest rate (fishing mortality); v) YPR/SPR; and vi) recruitment indices.

<u>i) Stock size</u>

Estimates of stock size measure how a stock has been impacted through fishing and whether or not the stock is overfished or is at risk of becoming overfished. A common metric for stock size is B/B_0, which is the current biomass (B) divided by the virgin stock biomass (B_0). Other measures of stock

size may refer to the number of fish present, the total spawning biomass, or the biomass that is available to the fishery.

ii) Catch (total catch per season)

Since stock assessments are costly to conduct, catch trend over time can instead serve as a tentative proxy for relative stock size. A significant change in catch can always be susceptible to multiple interpretations. However, the fact that a significant change in catch appears is itself a clear indicator that, at a minimum, an impact at a biological, ecological, or anthropogenic level is occurring.

Using total catch as a proxy for stock size can be misleading when factors other than stock size influence the number of fish captured. For example, changes in water temperature in southern California may influence the activity level of lobsters on the seafloor, and in turn alter their catchability (the probability that an individual will be captured in fishing gear). Such behavioral changes are not necessarily accompanied by changes in stock size, but they may influence total catch and therefore the perception of stock size. Regulatory changes that alter the access or efficiency of fishermen (and therefore catch rates) can similarly impact total catch.

iii) Catch per unit effort (CPUE)

CPUE is used by fishery managers in two important ways. First, it serves as a proxy for the relative abundance of fish in an area. This proxy assumes that there is a relationship, though not necessarily a linear one, between the condition of a stock and the rate at which they are captured under any given unit of effort (e.g., time spent fishing, amount of gear deployed). As with total catch, long-term trends in CPUE can provide insight into changes in the stock, which will influence management decisions.

In addition, CPUE is also very useful for tracking the optimal effort level and detecting economic overfishing. An example of this is found in management zone "CRA8" of the New Zealand fishery for *J. edwarsii* (Bentley et al., 2005). The lobster stock in this zone was classified as overfished, and a CPUE-based rebuilding plan was proposed. The objectives of this CPUE-based plan were (among others) the restoration of spawning biomass as well as the maintenance of high catch rates that ensure economic viability (Bentley et al., 2005).

CPUE data are relatively inexpensive and easy to collect, but they can be influenced by factors other than fish abundance (e.g., new regulations, environmental variability, catchability, and selectivity). CPUE-based reference points can also be misleading when advances in technology (e.g., gear construction, vessel electronics) make the fishermen more efficient and the gain in efficiency is not reflected by adjusting the reported unit of effort (e.g., trap pulls, number of traps fished). In such a scenario, fishermen may be perceived to have maintained the same level of effort while in reality their effective effort may have increased substantially. This phenomenon is known as **effort creep**, and is thought to have been an important contributor to the catch/stock declines in fisheries for *Panulirus cygnus* in Western Australia and *J. edwarsii* in South Australia (Bentley et al. 2005; Section 4.4).

Effort Creep - A phenomenon where technology advancements in a fishery are able to mask the declining efficiency of a fishery caused by stock declines

iv) Harvest rate/ fishing mortality

Estimates of current harvest rates (or, fishing mortality) provide information that helps managers maintain fishery yield while avoiding recruitment overfishing and economic overfishing (Figure 4-1).

v) Yield per recruit (YPR)
The yield that a fishery can achieve (i.e., pounds of fish caught; monetary value of fish sold) changes as a function of the harvest rate, and is often expressed in terms of YPR. YPR is the theoretical yield that is produced from a single recruit (or some fixed number of recruits) that is subjected to different harvest rates.

vi) Spawning potential ratio (SPR)
In addition to yield, harvest rate also affects the ability of a stock to replace itself. Because fishing tends to reduce the number and the size of individuals, it has the potential to negatively impact the reproductive output of a population, or spawning potential. The SPR is usually a ratio of the number of eggs produced by a fished population divided by the number of eggs produced by an unfished population. SPR values range from 1-0. For example, SPR values of 1, 0.5, and 0 correspond to harvest rates at which a population can produce all, half, or none of the eggs produced when the stock is unfished, respectively (Figure 4-5). At low harvest rates, SPR values are high because many large animals remain in the population (Figure 4-5). At higher harvest rates, SPR declines and may ultimately reach zero if no size limit is in place to protect at least some portion of the breeding stock. It is important to note that SPR assumes that an unfished population would produce a relatively constant amount of eggs or maintain a relatively constant spawning stock biomass (Rochet, 2000).

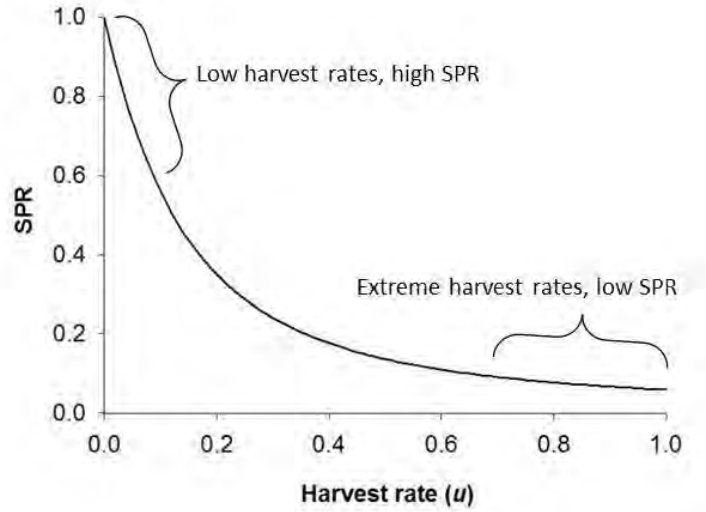

Figure 4-5: The general relationship between fishing mortality (or, harvest rate) and spawning potential ratio (SPR).

Depending on the amount of scientific information available to resource managers, various methods can be used to calculate a stock's current spawning potential, the unfished spawning potential, and an SPR level that is sustainable (Table 4-1). A model is required for calculation of spawning potential, but complexity can range from the simplest methods that scale up from an average weight (as the Cable-CDFW model does), to more complex models utilizing size frequency data, stochasticity and stock-recruitment data. Methods for calculating the egg production or yield of an unfished population in particular vary greatly. For example, the SPR of a hypothetically unfished stock for the Cuban spiny lobster fishery was calculated based on egg production of a theoretical unfished population with the assumption that growth rate and fecundity would be the same whether the individual is in a fished or unfished population (Puga et al., 2005). On the other hand, the SPR of a theoretical unfished Western Australia lobster stock was calculated based on spawning stock biomass with density dependent variables (Hall and Chubb, 2001). Others have empirically measured the egg production of current unfished stocks existing within marine reserves. Although the methods for calculating SPR can vary among different fisheries, the underlying purpose is generally the same: to gauge a fished stock's ability to replenish itself.

vii) Abundance of larvae or recruits
When measured over many years, trends in the abundance of larvae (or very young recruits) returning to a fishing ground can provide indirect evidence of a stock's relative spawning biomass. The abundance of larvae/recruits often varies year-to-year due to environmental conditions, and

therefore may not be related to fishing mortality. However, long term trends (e.g., increasing, decreasing, or stable abundance) can inform managers about the reproductive potential of a stock. In some cases, levels of recruitment can be used to forecast future catches (Phillips, 1986) or estimate spawning stock biomass (Lasker, 1985).

Table 4-1: Spawning potential ratio (SPR) used around the world.

Species	Location	$SPR_{THRESHOLD}$	Source	Rationale / Derivation
Panulirus argus	Cuba	0.143	Puga et al. 2005	Replacement line analysis
	USA: Atlantic and Gulf of Mexico	0.20	FMP	Theoretical (Goodyear 1993); empirical (Mace and Sissenwine 1993)
	USA: Atlantic and Gulf of Mexico	0.05	Addison 1997	Not specified; proposed for use in conjunction with recruitment (to the fishery) observations
	USA: Florida	0.05	Bohnsack et al. 1990	Historical levels associated with catch: proposed in FMP
	USA: Caribbean	0.20	Bohnsack et al. 1990	Theoretical (Goodyear 1993)
	USA: Caribbean	0.20	FMP	Not specified, "committee recommendation"
Panulirus cygnus	Western Australia	0.20	Hall and Chubb 2001	Historical performance of fishery
Jasus edwardsii	Victoria, Australia	0.20	FMP	Not specified
	New Zealand	0.20	NRLMG Report 2010	Not specified
Homarus americanus	USA – NE Atlantic	0.10	Addison 1997 Rosenberg et al. 1994	Historical performance of fishery

4.2.5 Harvest Control Rule Matrix

An HCR prescribes management actions (e.g., continue monitoring or implement regulatory changes to the fishery) when a certain reference point is triggered. Responses are required when reference points thresholds are reached or surpassed (Section 4.3). An HCR can consist of a simple relationship between one reference point threshold and one response (e.g., fishery closes when catch drops below a certain level). The precautionary approach prescribes three types of response to three different threshold levels of a reference point. Drastic measures would be taken when the reference point drops below the limit level, more measured responses would be implemented when below the upper stock reference point, and management might be reduced when above the target level. A single regulatory response option might be used such as changes to a TAC. Another HCR approach uses multiple reference points (e.g., Catch, CPUE, SPR, YPR, Fishing Mortality). One form of this approach, termed "traffic light", monitors multiple reference points and the number above or below thresholds leads to different levels of management response (Caddy 2002). The benefits of approaches using multiple reference points and/or a blend of model-based and empirical reference points have been noted by several researchers (Fogarty 2004, Hilborn 2002, Halliday 2001 Caddy 2004). Additionally, multiple harvest regulatory options (e.g., Seasonal Closure, Size Limit, Gear Restriction, TAC) can provide the necessary management flexibility to address specific fishery issues. In these types of HCRs, the relationship between triggers and responses (i.e., Harvest Regulations) is complex and interconnected.

A clearly detailed decision matrix is a formal mechanism that guides the appropriate management responses based on the triggering of different reference points. This mechanism provides managers

with a pre-determined and transparent decision-making process that preserves scientific and policy decision-making prerogatives.

4.3 HCR for the CA Lobster Fishery

An HCR was developed by CDFW with substantial input from the LAC and independent scientific experts. The associated reference points were also peer reviewed by an external committee of scientific experts (Appendix VII). The CA lobster HCR applies adaptive management by gauging the status of the fishery with specific reference points and tailoring responses when management actions are needed to ensure sustainability and prevent overfishing. It also fulfills the MLMA mandate that requires "each fishery management plan or plan amendment prepared by CDFW shall specify criteria for identifying when the fishery is overfished" (e.g. FGC § 7086(a)).

The HCR is composed of three components. Three specific reference points serve as the metrics to assess the state of the fishery and the CA lobster stock. A Control Rule Matrix details how the reference points will work together to identify an emerging issue within the fishery and its underlying causes. Lastly, a tool box of eight regulatory options gives CDFW and the Commission flexibility to address emerging and ongoing issues. The HCR is not guaranteed to capture every possible issue the fishery will face, and like any other management tool, resource managers will need to exercise independent judgment when using the HCR. In the future, CDFW will explore ways to improve the HCR, such as modifying reference points, or methods for their calculation, to more accurately reflect the status of the fishery and meet the MLMA management objectives. Future improvements may or may not (depending on the type of change) be subject to an amendment process (Section 6.2.2).

Landing receipt - A document provided by the Department to commercial fish markets for recording landing information. Information required includes date, port of landing, species or market category of fish, pounds landed, and price paid.

4.3.1 Reference Points for CA Lobster Fishery

The three reference points chosen for the CA lobster HCR are based upon:

1) Catch (the total catch in a single season)
2) CPUE (the number of legal lobsters caught per trap pull)
3) SPR (# eggs produced by current fished population / # eggs produced by unfished population)

These make use of both model-based and empirical data streams. Total catch ($CATCH_{CURRENT}$) and CPUE ($CPUE_{CURRENT}$) can be calculated directly from landing receipts and commercial logbooks without any change to current CDFW data collection. SPR can be calculated by inputting data from landing receipts and logbooks through computer models such as the Cable-CDFW Model. A single limit threshold separates desirable and undesirable states for each reference point. Designation of the threshold levels for each of the reference points uses an empirical (not model-based) approach by referencing a stable and productive period for the stock. Different combinations of position relative to these reference points can develop a nuanced picture of stock status. For example, decline in catch alone can be caused by decline in stock size, but can also be caused by unrelated factors (e.g., policy change, lower catchability of animals). However, an increase in catch accompanied by a decrease in CPUE may suggest that economic overfishing is occurring. This multiple reference point approach is similar in function to the traffic light fisheries management approach and can result in multiple divisions of stock state (overfished, overfishing, healthy) akin to the precautionary approach. Moreover, the varied information content of the three reference points allows for more tailored management responses than could be justified by a single reference point with multiple levels.

4.3.1.1 Catch-based reference point

The catch-based reference point for a particular season is calculated as follows:

$$CATCH_{CURRENT} = \frac{average\ catch\ for\ 3\ most\ recent\ seasons}{average\ catch\ for\ 10\ most\ recent\ seasons} \qquad (Equation\ 4.1)$$

The catch-based threshold reference point is any value for $CATCH_{CURRENT}$ that is equal to or less than **0.9:** $\boldsymbol{CATCH_{THRESHOLD} = CATCH_{CURRENT} \leq 0.9}$**, (*Equation 4.2)***

It is important to note that this reference point is primarily designed to detect trend. Catch can fluctuate drastically from year to year due to socioeconomic, environmental, and biological factors. These annual fluctuations often do not reflect problems that warrant management responses (Figure 4-6). Averaging the catch from the three most recent seasons for the reference point numerator serves to smooth those fluctuations. The 10-year running average in the denominator of the reference point was chosen because long-term environmental changes might alter our expectations for sustainable catch levels (upwards or downwards). Commercial landings of CA lobster appear to be influenced by warm and cold water regimes driven by the Pacific Decadal Oscillation (PDO) (Neilson, 2011). Fisheries-independent data on lobster abundance based on entrainment in power plant systems does not show a correlation between young of the year or slightly sub-legal lobsters and environmental indices including the PDO (Miller, 2014a). However, increases in abundance and decreases in average size at some power plants after the 1989 regime shift do indicate the potential for recruitment success to be driven by changes in environmental factors at longer time scales (Miller, 2014a). Moreover, the abundance of phylosomal larvae in oceanographic samples from the SCB is significantly correlated with El Nino events, mean sea-surface temperature, and the PDO (Koslow et al., 2012).

In addition to detecting noteworthy trends, initiation of the moving average in the present implicitly values the healthy stock status within the last 10 years. A $CATCH_{CURRENT}$ value of 1.0 would indicate that

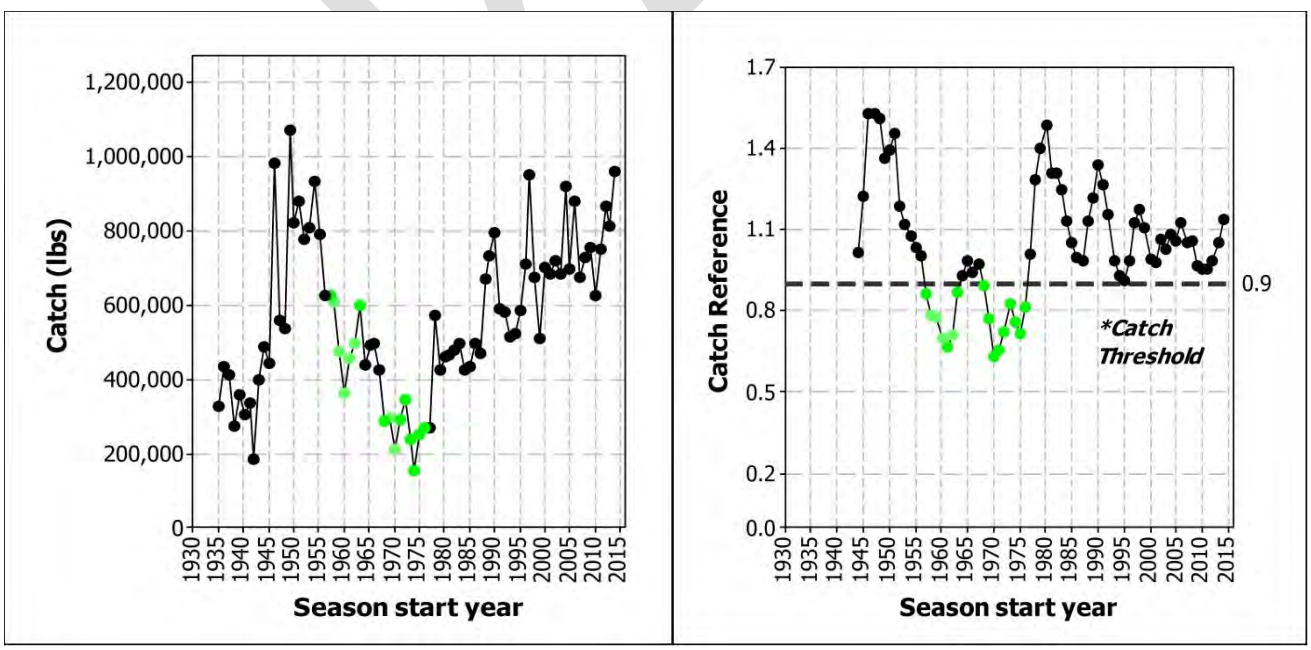

Figure 4-6: Annual catch (left panel) and catch reference values based upon Equation 4.1. With a threshold reference point (CATCHTHRESHOLD) of CATCHCURRENT = 0.9, CATCHTHRESHOLD is exceeded (i.e., catch is conisdered to be low and triggers management consideration) in years where values the right-hand panel fall below the 0.9 value line (represented by green dots). Values at or near 1.0 in the right-hand panel indicate stable catches. Individual years listed (x-axis) are the year in which an individual lobster season began (e.g., 1935 = 1935-36 season).

catches are stable, i.e. catches over the last three years are similar to the last 10 years. Setting the reference point threshold at 1.0 would indicate that the fishery does not want to tolerate any reduction in catch from the current state. However, ideal catch rates will fluctuate from year to year with recruitment variation and catches within 80% of an apparently high stable point (i.e., MSY) are a reasonable expectation for sound management (Hilborn 2010). Based on the independent science review committee recommendations to make the catch threshold more sensitive and responsive and CDFW analyses, the $CATCH_{CURRENT}$ value was modified from 0.8 to 0.9 resulting in a more sensitive threshold. Reaching this threshold would indicate that catches for the three most recent seasons are less than 90% of the average catch from the 10 most recent seasons, suggesting both a declining trend that warrants consideration and a separation from the high, stable catches of the last 10 years. However, because a reference point based on a moving average may not detect small gradual changes, CDFW will initiate further analysis whenever $CATCH_{CURRENT}$ drops for 6 seasons in a row. $CATCH_{CURRENT}$ declined for 10 seasons in a row during the steep decline of the 1950s and 60s. While the $CATCH_{THRESHOLD}$ of 0.9 would have already been triggered after 6 seasons of that period, future stock dynamics may show slower declines that warrant management action but would not otherwise be detected. CDFW developed the moving average approach through consultation with several lobster fishery experts during the LAC process (Dr. Ray Hilborn, Dr. Matthew Kay, Dr. Hunter Lenihan, Dr. Richard Parrish, and Dr. Jeremy Prince). An examination of California's catch history also indicates that a $CATCH_{THRESHOLD}$ of 0.9 would have provided warning of major declines in catch performance in the modern era of this fishery and appropriately, would not trigger management during rebuilding phases or catch levels likely reduced by environmental regime (Figure 4-6). The most recent $CATCH_{CURRENT}$ value for the 2014/15 season is above the 0.9 threshold.

4.3.1.2 CPUE-based reference point

The CPUE-based reference point for any season ($CPUE_{CURRENT}$) is calculated in the same manner as $CATCH_{CURRENT}$:

$$CPUE_{CURRENT} = \frac{average\ CPUE\ for\ 3\ most\ recent\ seasons}{average\ CPUE\ for\ 10\ most\ recent\ seasons} = 0.9 \qquad (Equation\ 4.3)$$

The CPUE-based threshold reference point is any value for $CPUE_{CURRENT}$ that is equal to or less than 0.9:

$$CPUE_{THRESHOLD} = CPUE_{CURRENT} \leq 0.9 \qquad (Equation\ 4.4)$$

The rationale for using the value of 0.9 (originally proposed at 0.8) is based on recommendations from the independent science review committee to make the CPUE threshold more sensitive. Using a moving average is based on input from experts and stakeholders through the collaborative LAC process, which determined that a moving average of CPUE would signal important adverse change (e.g., economic overfishing) within the fishery that may warrant management consideration. CPUE data has only been available since 1973 (Figure 4-7), but retrospective analysis of $CPUE_{CURRENT}$ (Figure 4-7) since that time indicates that this threshold is able to detect important changes in the fishery. $CPUE_{THRESHOLD}$ would have been crossed seven times; three sequential seasons in the mid-1990s and the last four fishing seasons on record. Both catch and the number of trap pulls dipped sharply in 1991 and remained depressed for a series of years leading to the $CPUE_{THRESHOLD}$ being crossed. Alternatively, low CPUE and $CPUE_{CURRENT}$ values since 2010 have been the result of a sharp increase in the number of trap pulls while catch has maintained consistently high levels. Effort increase in the 2010/11 season was likely driven by an increase in the price/pound for CA lobster and both have remained high. These instances below $CPUE_{THRESHOLD}$ point to verifiable changes in the dynamics of this fishery relating to fisherman behavior and economics. Different years are below the $CPUE_{THRESHOLD}$ than those that are below the

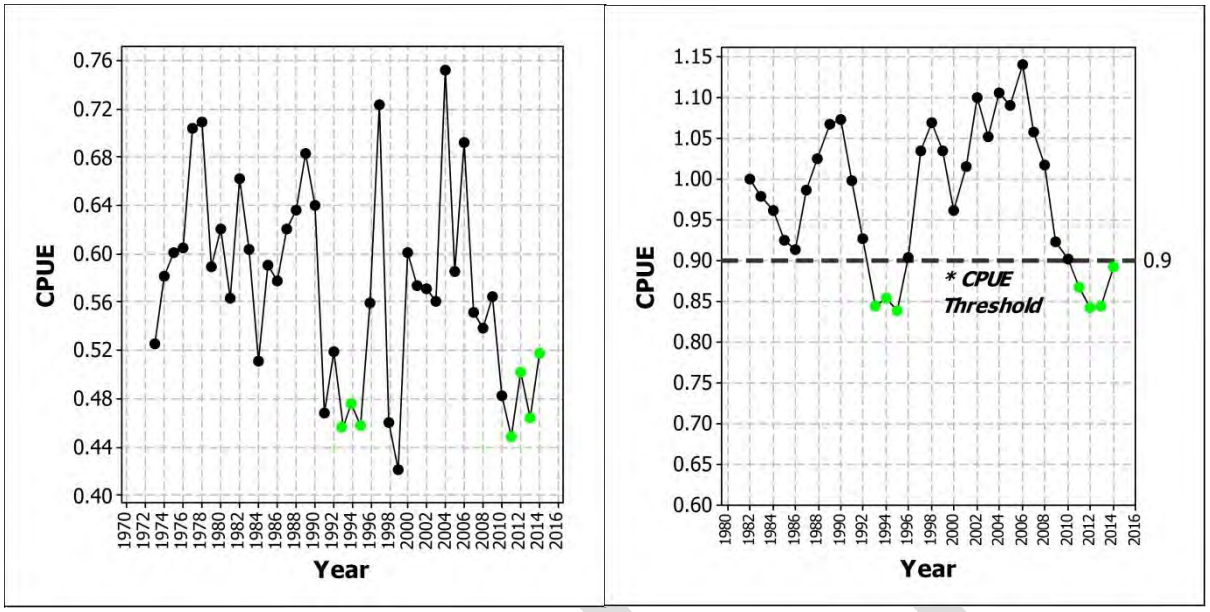

Figure 4-7: Annual CPUE (left panel) and CPUE reference values based upon Equation 4.3. With a threshold reference point (CPUETHRESHOLD) of CPUECURRENT = 0.9, CPUETHRESHOLD is exceeded (i.e., catch is conisdered to be low and triggers management consideration) in years where values the right-hand panel fall below the 0.9 value line. Values at or near 1.0 in the right-hand panel indicate stable catches. Individual years listed (x-axis) are the year in which an individual season began (e.g., 1970 = 1970-71 season).

$CATCH_{THRESHOLD}$, suggesting that these two reference points are complementary and not redundant. As is the case with the catch reference point, CDFW will initiate an investigation if the $CPUE_{CURRENT}$ drops for 6 years in a row even if the $CPUE_{THRESHOLD}$ is not crossed.

4.3.1.3 SPR Reference Point

The SPR reference point has the most biological information content of the three reference points and thus is the best indicator of the potential for recruitment overfishing. SPR can be calculated in several ways. The method currently employed by CDFW utilizes data from commercial logbooks and commercial landing receipts to calculate the average weight of lobsters caught in a given year. CDFW then relates average weight to a corresponding fishing mortality (*F*) which allows estimation of SPR. This calculation is currently accomplished using the Cable-CDFW Model (Appendix X). SPR is a model **output** based on 46 user-specified inputs, each responsible for the calculation of various biological, economical, and operational characteristics of the fishery. The age-length relationship, for example, incorporates three inputs: $L\infty$, K, and t_0 (the maximum length a CA lobster can biologically attain, the growth rate, and a number that adjusts the initial size of a lobster for the calculation, respectively; Section 3.2). Average weight can be used to estimate the reproductive potential of a stock because it 1) expresses the age of lobsters when removed from the population and thus their number of reproductive seasons before death, and 2) the female size at reproduction dictates fecundity. Methods for calculating the spawning potential of an unfished stock (the denominator of the SPR ratio) vary, as described in Section 4.2.4. The Cable-CDFW uses a theoretical unfished stock without density dependence.

The threshold for the SPR reference point is any current value of SPR that is less than the average SPR calculated for the fishing seasons from 2000/01 to 2007/08. These years were deemed stable and productive by the 2011 CDFW stock assessment and are considered here as "reference" years for calculation of the threshold.

$SPR_{THRESHOLD} = SPR_{CURRENT} < SPR_{REFERENCE}$, (*Equation 4.5)*

A distinction should be made between the calculation of $SPR_{CURRENT}$ and $SPR_{THRESHOLD}$ values in this and other management contexts. Several types of models that allow calculation of $SPR_{CURRENT}$, like the Cable-CDFW model, do not require stock-recruitment data or model-based estimates of MSY. However, analysis of sustainable SPR levels and thus appropriate placement of an $SPR_{THRESHOLD}$ does require stock-recruitment relationship information. In the absence of this data, frequently fisheries managers set $SPR_{THRESHOLD}$ levels by looking to comparable taxa (Mace & Sissenwine 1993). For example, SPR thresholds used for many other lobster fisheries are based on the calculated value of 0.20 (i.e., 20% of unfished spawning biomass or egg production) commonly used for finfish fisheries (Table 4-1; Mace and Sissenwine, 1993; DiNardo, 1999; SAFMC, 1998; CFMC, 1990). Crustaceans such as lobster are thought to be able to persist at lower levels than many finfish and the calculations of $SPR_{THRESHOLD}$ for some lobster fisheries with the necessary stock-recruitment data are lower than for most finfish. For example, the $SPR_{THRESHOLD}$ values have been estimated to be 10% for the American lobster fishery off the northeast coast of the United States (Zhang et al., 2012), 14% for Caribbean spiny lobster in Cuba (Puga et al., 2005), and 2.5% for a Newfoundland stock of American lobster (Ennis and Fogarty, 1997).

The approach taken by this FMP is that the $SPR_{THRESHOLD}$ should not be based on calculations for other species or value judgements of other jurisdictions. In the absence of stock-recruitment information and associated production modeling, the reference years for the CA lobster fishery serve to set a threshold that is conservative, empirically based, and specific to a period when the stock and fishery were stable and productive (Neilson, 2011). While the $SPR_{CURRENT}$ and $SPR_{REFERENCE}$ values are model-based, the Cable-CDFW model is a non-dynamic equilibrium model, meaning it does not incorporate environmental variability or a stock-recruitment relationship. It assumes constant recruitment under any exploitation scenario and therefore that any level of exploitation is sustainable and will not lead to recruitment overfishing. Steneck and Wahle (2013) describe why equilibrium modeling was inappropriate for the American lobster fishery and may be inappropriate for other lobster fisheries as well. This draw-back is related to the fact that while the Cable-CDFW model does estimate F, it cannot incorporate stock-recruitment replacement information to estimate F_{MSY}. Therefore the $SPR_{THRESHOLD}$ in this FMP is $SPR_{REFERENCE}$ rather than SPR_{MSY}.

Other methods for calculation of F (and thus SPR) exist and some are capable of incorporating environmental stochasticity and/or variable recruitment including catch curve analysis (Kay and Wilson 2012, Groeneveld 2000, Sparre and Venema 1998), Leslie-Delury depletion models (Leslie and Davis 1939, Delury 1947, Restrepo 2001, Gonzalez-Yanez 2006) and length-based mortality estimators (Beverton and Holt 1956, Ault et al. 2005). Those that incorporate the distribution of individual lobster sizes, rather than an overall average size, add additional value and ability to distinguish processes effecting lobster life stages differentially (Puga 2013, Muller 1997). However annual length frequency data are not available for CA lobster. It should be noted that current genetic evidence (reviewed in Section 3.3) suggests that CA lobster are well mixed during the larval phase. This suggests that stock-recruitment relationships at sub-regions of the SCB are likely to be weak due to mixing among regions. If mixing between the California and Baja Mexico stocks also weakens the California stock-recruitment relationship, the SPR reference point described here will only serve to describe the effect of fishing on the adult stock and not its potential replenishment. Because of these larval dynamics and their consequences, the Cable-CDFW model equilibrium assumption of constant recruitment may be more reasonable for this stock than for many other invertebrate fisheries.

SPR is also the component in the HCR where the effects of MPAs are factored into the management of CA lobster fisheries. Through the Cable-CDFW Model, CDFW accounts for MPA effects on SPR through six different inputs. These are: 1) the total fraction of the species' habitat covered by the MPA, 2) migration rate into the MPAs, 3) migration rate out of the MPAs, 4) a reduced fishing mortality rate

experienced by individuals that cross the MPA boundaries, 5) average length of MPAs, and 6) average distance between MPAs. The model treats all MPAs as if they have reached full maturity and therefore increased survival within simulated MPAs has allowed for the number and size of lobsters inside to reach equilibrium. Only areas that prohibit both recreational and commercial take are considered MPAs. Although recreational-only areas do protect lobster from commerical traps, they receive disproportionately higher fishing effort from the recreational sector (Figure 2-9). Lobster report card data indicates that the majority of recreational fishing effort for lobster is taking place in recreational only areas.

CDFW currently estimates the percentage of lobster habitat protected by MPAs to be 14.6% based on mapped areas and proxies for hard bottom habitats and MPA area. Other habitats used by CA lobster were not included because 1) hard bottom is the CA lobster primary habitat, and 2) other habitat types were not mapped with equal reliability across the SCB. For example, surfgrass habitat mapping only delineates linear segments of coastline with and without surfgrass. The width in the offshore direction is unknown and will vary according to shoreline slope and patterns of water turbidity. Even the relatively well mapped hard bottom habitat is not equally available in all regions of the SCB, so proxy information must be used. Kelp canopy was used as an indication of hard bottom in unmapped areas. However, coverage of the canopy can be different from the extent of the reefs on which kelps are attached. Furthermore, the lack of kelp canopy in an area does not necessarily indicate the absence of reefs. Table 4-2 provides the habitat area known to be hard or soft substrate, the proportion of rocky habitat estimated using kelp as a proxy, and the area that is unknown. During the early 2000s there were only a small number of no-take MPAs (e.g., northern Channel Islands, La Jolla) and using the best available information, CDFW estimates approximately 4.5% of CA lobster habitat at that time was closed to both commercial and recreational fishing. CDFW will continue to incorporate better habitat information as they become available.

Table 4-2: Percentage of bottom area by region from shore to 300 m depth covered by hard, soft, or unknown habitat types and their data sources. North and south mainland regions are delineated by Dana Point.

Region	Substrate	Source	Percent Area
Mainland North	Hard	Coarse	0.2
	Hard	High Resolution	1.3
	Hard	Kelp	1.5
	Soft	Coarse	2.7
	Soft	High Resolution	54.2
	Unknown	N/A	40.2
Mainland South	Hard	High Resolution	9.0
	Hard	Kelp	0.2
	Soft	High Resolution	60.1
	Unknown	N/A	30.7
Northern Channel Islands	Hard	High Resolution	3.9
	Hard	Kelp	3.6
	Soft	High Resolution	43.9
	Unknown	N/A	48.9
Southern Channel Islands	Hard	Coarse	12.7
	Hard	High Resolution	2.6
	Hard	Kelp	4.5
	Soft	Coarse	25.1
	Soft	High Resolution	22.0
	Unknown	N/A	33.0

Because $SPR_{THRESHOLD}$ is calculated as the average of the reference years, annual SPR values fluctuated above and below that average during those years and to the present. The highest SPR value was associated with the highest average weight observed during the 2001-02 season. Average weight was at a minimum during the 2005-06 season but has since been rising and reached a value higher than 2001-02 during the most recent 2014-15 season. SPR has been rising, in part because of rising average weight, but also because of model simulated MPA benefits applied to the 2012-13 season and those that follow. Under current conditions with 14.6% MPA coverage the model provides an SPR enhancement of four to five percentage points over the SPR calculation at the same average weight with 4.5% MPA coverage (Figure 4-8). This improvement reflects the importance of the MPAs to the reproductive potential of the species as well as the insurance they provide against recruitment overfishing. The metric used to measure a stock's reproductive potential should reflect the effects of a management tool designed in part to protect that very stock's reproductive potential. However, it is unlikely that the MPAs, implemented in 2012 as a result of the south coast MLPA process, have actually achieved equilibrium and their full potential. Given that the average weight during the 2014-15 fishing season was above the average of the reference years, $SPR_{CURRENT}$ for 2014-15 was also above $SPR_{THRESHOLD}$ with or without the model benefit from MPAs. CDFW will monitor average weight and SPR closely until further research illustrates substantial benefit of MPAs to CA lobster and that the model-simulated enhancement to reproductive potential is warranted.

A current limitation of the Cable-CDFW model is its decreasing sensitivity in estimation of F and SPR as average weight decreases (see Appendix X). Figure 4-9 illustrates an aspect of this issue with the flattening of the curves with increasing F. As average weight declines and F increases, SPR changes little and cannot extend to zero. With MPAs in place, SPR asymptotes at a higher level. The current average weight corresponds to an F estimate where the SPR curve bends and accuracy of SPR estimation is good. The average weight where model accuracy declines depends on input parameters, particularly growth. Collection of age and growth information is a high priority and CDFW will seek to augment and validate existing information and improve the growth parameters and/or update the equations describing growth within the Cable-CDFW model. These refinements will not require amendments to the FMP as they represent improvements in accuracy and not a shift in the Cable-CDFW Model approach (see Section 6.2.2). Additionally, model refinements apply to calculation of both $SPR_{CURRENT}$ and $SPR_{THRESHOLD}$ and therefore represent concurrent improvements to both estimates (see Appendix X).

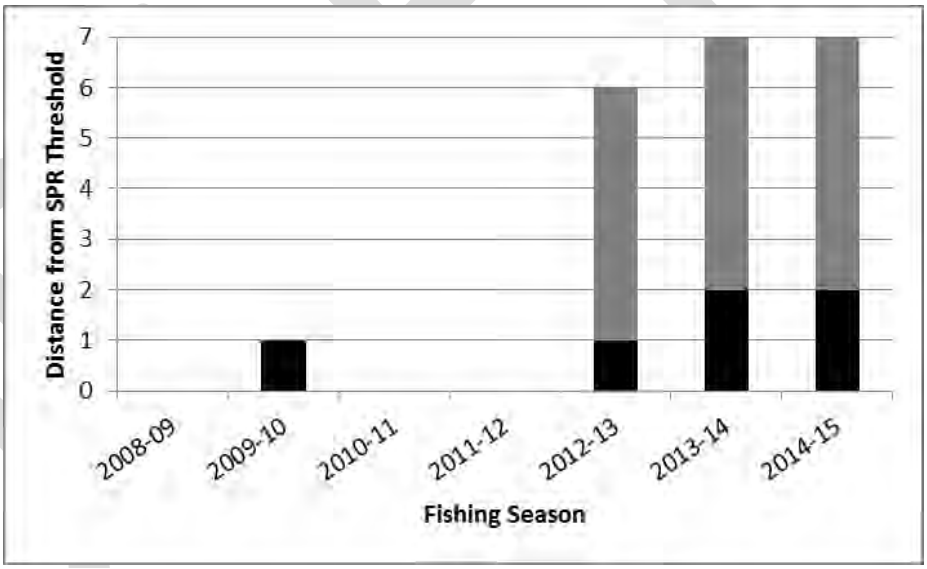

Figure 4-8: Percentage points above SPR threshold with 4.5% (black) and 14.6% (gray) CA lobster habitat within MPAs. Seasons with no bars are equal to SPR threshold.

Available CDFW data from logs and landing receipts show that individuals in the northern Channel Islands are notably larger than the minimum legal size, while lobsters in the south are generally caught very close to the legal size. Given equal fecundity and growth and recruitment rates the Cable-CDFW model indicates higher F in the south and lower SPR because southern CA lobsters would participate in fewer spawning seasons before capture. However higher abundance of small CA lobsters in the south may be due in part to higher recruitment and not only a product of higher F. Additionally, CA lobsters in the south may be sexually mature at a younger age and smaller size. Larger numbers of sub-legal CA lobster reproducing at a smaller size may increase SPR in the south and these dynamics would not be reflected in the Cable-CDFW model. Analysis of CAPS data indicates higher reproductive capacity in the south despite smaller average size due to the far greater abundance of sub-legal individuals (Yaeger et al., in prep.). This highlights that the Cable-CDFW model should not be used to compare regionally specific model outputs based on regionally specific average weight without also incorporating regionally specific growth, recruitment rates and reproductive characteristics. Considering that model parameters cannot currently be estimated at local scales and information on population mixing due to the species' protracted larval phase, treating the entire CA lobster stock within the U.S. border with one SPR value is appropriate. Information related to regional differences in the species' biological parameters and in fishery dynamics will need to be improved to better assess the adequacy of using a single SCB-wide SPR value (Section 5.2).

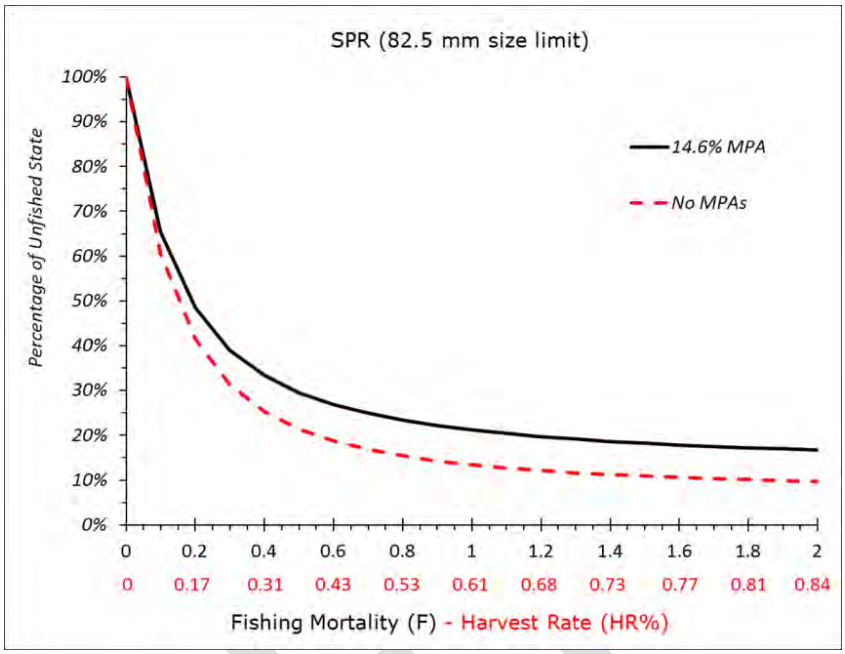

Figure 4-9: Relationship between spawning potential ratio (SPR) and fishing mortality (F) CDFW-Cable Model outputs under conditions with no MPA coverage and 14.6% MPA coverage.

4.3.2 Implementation: HCR Matrix

The three reference points selected to monitor and manage the CA lobster fishery (Catch, CPUE, and SPR) are incorporated into an HCR Matrix. This matrix provides a "dashboard" approach to assist managers in interpreting the status of Catch, CPUE, and SPR reference points in relation to their respective thresholds (Table 4-3). Based on these interpretations, the matrix would prescribe particular courses of action to address the current condition of the fishery. Depending on the respective trend and status of each measurement (i.e., have any of the threshold reference points been exceeded?), the matrix identifies various management strategies ranging from easing harvest regulations, to no regulatory action, to further restricting the fishery.

The HCR is discretionary and not every triggering event will necessarily lead to an immediate regulatory response. Additional evaluation is needed before taking action to determine if external factors (i.e. new regulations, market dynamics, or environmental changes) have caused or contributed to the reference point(s) being exceeded. This process will include consultations with the fishing communities and other

Table 4-3: Harvest Control Rule (HCR) Matrix. Interpretation of different scenarios in which threshold reference points are exceeded, and recommended management responses. Symbols for each reference point are: ↑("safe", does not exceed threshold), and ↓ (exceeds threshold). Note that once *$CATCH_{THRESHOLD}$* or *$CPUE_{THRESHOLD}$* are exceeded, monitoring CPUE and Catch trends provides valuable information that managers can use to "fine tune" the fishery or to detect overfishing early (i.e., before the stock becomes overfished).

Scenario	Reference Point			Interpretation/possible causes	Suggested management response sequence
	CATCH	*CPUE*	*SPR*		
1	↑	↑	↑	○ Stock productivity and fishery performance stable and/or increasing	a) Monitor reference point trends b) Make no change (if reference points are stable or just above thresholds) c) Ease effort regulations (if reference point trends are increasing)
2	↓	↑	↑	○ Fishery under-harvested (i.e., fishing effort and harvest rates are low, could be caused by drop in price or other economic factors)	a) Monitor reference point trends b) Make no change (if CPUE/SPR trends stable/just above threshold) c) Ease effort regulations (if explanations for decreasing catch are not biological and CPUE/SPR trends increasing)
3	↑	↓	↑	○ Catchability down ○ Potential economic overfishing ○ Potential early warning of recruitment overfishing	a) Monitor reference point trends b) No change (if SPR trends are stable/above threshold) c) Effort reduction (if SPR trends declining) d) No change, or ease catch restriction (if catchability is proven to be lower than usual and is causing CPUE decline)
4	↓	↓	↑	○ Catchability down ○ Potential economic overfishing ○ Potential early warning of recruitment overfishing (fewer recruits surviving to adulthood)	a) Monitor reference point trends b) Investigate underlying causes c) Confirm SPR trends and model inputs d) If action is needed, implement one or more of the eight regulatory options in the control rule toolbox as appropriate e) Effort reduction (if SPR trends declining)

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Table 4-3 Continued: Harvest Control Rule (HCR) Matrix.

Scenario	Reference Point			Interpretation/possible causes	Suggested management response sequence
	CATCH	*CPUE*	*SPR*		
5	↑	↑	↓	○ Stock overfished ○ Recruitment largely provided from Mexican stock	a) Investigate underlying causes b) Confirm SPR trends and model inputs c) If action is needed, implement one or more of the eight regulatory options in the control rule toolbox as appropriate
6	↓	↑	↓	○ Stock overfished, and ○ Possible catchability increase (effort creep due to technology, etc.)	a) Investigate underlying causes b) Confirm/monitor CPUE (misreporting?) c) Confirm SPR trends and model inputs d) If action is needed, implement one or more of the eight regulatory options in the control rule toolbox as appropriate
7	↑	↓	↓	○ Stock overfished ○ Overfishing indicated	a) Investigate underlying causes b) Confirm SPR trends and model inputs c) If action is needed, implement one or more of the eight regulatory options in the control rule toolbox as appropriate
8	↓	↓	↓	○ Stock overfished ○ Overfishing indicated ○ Disease	a) Investigate underlying causes b) Confirm SPR trends and model inputs c) If action is needed, implement one or more of the eight regulatory options in the control rule toolbox as appropriate

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stakeholders. For example, if the triggering of the catch-based reference point coincides with a new effort-based regulation, the first task would be to determine if the triggering event is caused by the new regulation. If it is determined that the triggering event is caused by the new regulation and not biological processes, no further management action may be necessary. In the event that management actions are warranted, the HCR calls for the implementation of one or more of the eight regulatory options provided in the control rule toolbox (Section 4.3.3).

4.3.3 Regulatory options linked to the control rule

This FMP prescribes a control rule toolbox of eight regulatory options (not in order of rank) that are available to decision makers (Table 4-4) when threshold reference points are triggered, and there is reason to either restrict or ease fishing opportunity. The specific actions in the toolbox are:

1) Change in commercial **trap limit**
2) Change in recreational bag limit
3) TAC
4) District Closures
5) Change in season length
6) Change minimum size limit
7) Impose a maximum size limit
8) Sex selective fishery (Male-only fishery or female-specific size restriction)

Trap limit – A type of regulatory measure that restricts the number of traps a fisherman may fish at any one time within a given season.
Allocation - In the LFMP allocation means a certain amount of lobster set aside for recreational, commercial, and ecosystem needs.

Each of the eight regulatory options in the control rule toolbox carries specific benefits and limitations (Table 4-4) that managers will need to carefully evaluate, including impacts to constituents, level of regulatory change, and duration of regulatory change (i.e., how long it will remain in place). CDFW will consult with the fishing communities and other stakeholders in order to better inform any management recommendation to the Commission on the proper regulatory response.

<u>1) Implementation and subsequent adjustments to commercial trap limit</u>

Relative to fisheries for finfish and other invertebrates, crustacean (crab and lobster) fisheries can sustain more intense harvest rates without rapidly collapsing (Zhang et al., 2012; Ennis and Fogarty, 1997). This resilience against fishing pressure often allows commercial lobster fisheries to remain at high effort levels that can be economically inefficient and unnecessary for maintaining high yield. Over time, such effort level can lead to economic overfishing, and if left unregulated, can lead to recruitment overfishing. Therefore, reducing effort when fishery performance (e.g., CPUE) or stock status (e.g., SPR) is in decline would likely address the root cause of such declines. As specified in Table 4-4, effort adjustment also allows for increases when reference indicators (e.g., Catch, CPUE, SPR) indicate that the fishery is underutilized. A trap limit would directly reduce the number of traps fishermen put in the water.

The CA lobster fishery is not currently regulated by a trap limit. However, recent rise in fishing effort has contributed to recent $CPUE_{CURRENT}$ values below the $CPUE_{THRESHOLD}$ (Section 4.3.1.2) and has led to possible economic inefficiency within the fishing sector (Sections 2.1). Furthermore, an excess of lost traps may create further environmental and social concerns. CDFW has worked closely with its constituents to resolve these issues, and as part of the implementing regulations for this FMP, the CDFW will propose a formal trap limit program that allows the Commission to adjust commercial sector fishing effort (Section 4.4.5). Once the limit is in place the Commission will be able to adjust it as needed based on the HCR.

2) Change in recreational bag limit

An adjustment to the recreational bag limit would serve to control effort in the recreational sector. Adjustment options may consist of daily, weekly, monthly, or annual limits. A bag limit would change the amount of lobsters a recreational fisherman can keep. The MLMA requires any type of **allocation** within an FMP to be equitably shared between the recreational and commercial sectors (FGC § 7072(c)). Any proposed change to the recreational bag limit is allocative by nature, and should be considered in conjunction with possible adjustments for the commercial sector.

3) TAC

A TAC or a TAC/ITQ management framework can prevent a stock from being overfished. However, management challenges in quota fisheries include, but are not limited to, allocation of catch among fishermen, consolidation of capacity when quota is transferable, accounting for natural fluctuations in stock size that may render the TAC too restrictive or aggressive from year to year (e.g., Johnston and Butterworth, 2005), access to the fishery if/when quota shares increase in price, and increased administrative and enforcement costs to regulatory agencies. Advocates of quota systems argue that the high cost of transferring quota shares should lead to increased stewardship among current fishermen because they have an incentive to protect their asset. This and other aspects of TAC/quota management are complex (e.g., Branch, 2009) and often contentious. While some studies emphasize the successes of TAC and quota approaches to management (Costello et al., 2008; Bonzon et al., 2010), others suggest that they should be considered cautiously on a per-case basis (del Valle and Astorkiza, 2007; Bromley, 2009; Ecotrust, 2009; Gardner et al., 2013).

If the SPR-based threshold reference point is exceeded, a TAC could be established for California. Approaches for determining a TAC for California include, but are not limited to: (a) accurately estimate the biomass of the stock, and then determine what fraction of the stock the fishery is allowed to harvest; (b) determine a conservative catch level (i.e., one that is historically low/modest) that is clearly sustainable and set that as the TAC, or; (c) identify a target CPUE and adjust the TAC through time until CPUE falls to within some range of the target value (e.g., New Zealand zone CRA8, see Bentley et al. 2005). Equitable distribution of the TAC between the commercial and recreational sectors will be necessary (FGC § 7072(c)). If a quota system is adopted, allocation between and within sectors (commercial and recreational) will need to be considered. Quota allocation is likely to be highly contentious.

4) District Closures

Some areas may be closed only to certain types of fishing, and areas closed to fishing tend to experience very low fishing mortality (although some fishing mortality can occur due to spillover and poaching). Population increase inside closed areas can increase the spawning output of the entire stock. However, closing areas off to fishing can also displace fishing effort to other areas, placing more pressure on the unprotected portion of the stock (Section 4.2.1.1). Furthermore, existing CDFW records show that most of the recreational take in the state occurs in locations where commercial fishing is prohibited (Santa Monica Bay, Long Beach Harbor, San Diego Bay, and the front side of Catalina; Figure 2-9).

A number of areas (Districts) are presently closed to commercial harvest. Prominent examples include the north side of Catalina Island, Santa Monica Bay, and harbor jetties. If the SPR-based reference point threshold is exceeded, these areas could be additionally closed to recreational harvest. Doing so would enhance the spawning output of populations in these areas. The FMP only accounts for the effect of

areas closed to both commercial and recreational fishing on SPR using the Cable-CDFW Model (Section 4.3.1.3).

5) Change in season length

Seasonal closures reduce fishing mortality by reducing the number of days that fishing is allowed each year. Closed seasons can protect stocks during important life events, such as spawning. A longer closed season could also improve survival of individuals that would have succumbed to fishing, which in turn increases SPR. The current closed season in California protects reproduction, and any extension of current seasonal closures is unlikely to provide substantial protection for reproductive behaviors or activities. However, it is possible that climate change may lead to a shift in the timing of reproduction or a change in the length of the reproductive season. Such changes could prompt a change in season length. If the SPR-based threshold reference point is exceeded, fishing season length could be shortened, either by delaying the opening date or by closing the season early. That said, most catch occurs during the first part of each season, therefore reducing the duration of the season would have a disproportionately small effect on fishing mortality.

6) Change minimum legal size

Increasing the Min LS would ensure that animals will, on average, reproduce more times before they are caught. Furthermore, females will be slightly larger and produce more eggs. Increasing the Min LS is a simple, effective, and direct way to increase SPR. However, it will lead to extra cost for the fishermen as they make adjustments to their gears (e.g., enlarge escape ports). If the SPR-based threshold reference point is exceeded, the Min LS could be increased to a size that ensures a target SPR within a specified time frame. A reduction in Min LS would have the opposite effect, if future conditions suggest that SPR could be reduced.

7) Establish maximum legal size

If the SPR-based threshold reference point is exceeded, a Max LS could be implemented to protect larger spawning females. As the communities inside MPAs mature, they will likely comprise more of these adults with higher fecundity, and a Max LS would be expected to protect these important spawners as they move outside of the boundaries of the MPAs. Trophy animals would not be available to the recreational community.

8) Sex selective fishery

A sex selective restriction allowing the harvesting of male lobsters (and consequently not allowing the harvesting of female lobsters) could be implemented for the CA lobster fishery. If the SPR-based threshold reference point is exceeded, changing sex regulation for females could be an efficient mean to increase SPR. As stated in Table 4-4, there are advantages and disadvantages to this system that should be carefully considered. Prohibition on the take of berried females is another sex selective provision that could be considered.

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Table 4-4: Control rule toolbox: The eight regulatory options available to decision makers if threshold reference points are triggered and their relative benefits vs. limitations

Regulatory options	Benefits	Challenges/Limitations
1) Change commercial trap limit	• Restores economic performance (CPUE) and stock status (SPR) • Directly addresses most common management problem in lobster fisheries (high harvest rates due to high effort) • Applicable when performance/stock increases (i.e., harvest rates can be scaled upwards in absence of crisis, or after recovery) • Accentuates the multiple benefits of trap limit for other MLMA objectives (i.e., Table 5.1)	• Mechanisms only applicable to commercial • Requires implementing a trap limit program • May disrupt established business/fishing practices
2) Change recreational bag limit	• Restores stock status (SPR) • Directly addresses most common management problem in lobster fisheries (high harvest rates due to high effort) • Applicable when performance/stock increases (i.e., harvest rates can be scaled upwards in absence of crisis, or after recovery)	• Mechanism only applicable to recreational
3) TAC	<u>Without individual quota system (e.g., ITQ)</u> • Can provide long term stability to catch and prevent overfishing • Adjustments and rebuilding measures are simple and efficient <u>With individual quota system (e.g., ITQ)</u> • Can provide long term stability to catch and prevent overfishing • Can ease "race to fish" • Can encourage fishing during high market value periods (unless cost of fishing is higher then), this is often later in the season for CA lobster – can have economic benefits • Can lead to effort reduction (but not guaranteed) • TAC/ITQ can be tuned to other fishery performance measures (e.g., CPUE); maximize efficiency	<u>Without individual quota system (e.g., ITQ)</u> • Encourages "derby" fishery, exacerbates high effort level, and compromise safety ("race to fish") • Allocation across sectors difficult (commercial vs. recreational) • Difficult to monitor recreational catch against a TAC (current system is not sufficient) • Recruitment/stock size variability problematic for setting optimal/appropriate TAC • Data-intensive; usually based upon stock assessment • Increased administrative and enforcement costs <u>With individual quota system (e.g., ITQ)</u> • Difficult to monitor recreational catch against a TAC (current system is not sufficient) • Allocation both across and within sectors difficult • Recruitment/stock size variability problematic for setting optimal/appropriate TAC/quota • Data-intensive; usually based upon stock assessment • Increased administrative and enforcement costs

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Table 4-4 Continued: Control rule toolbox.

Regulatory options	Benefits	Challenges/Limitations
4) District closures (e.g., Santa Monica Bay, jetties, Catalina)	• Directly protects stock and increases SPR • Protected areas can be directly incorporated into stock assessment • Streamlining management by prohibiting all lobster fishing in certain CDFW fishing districts • Can directly target localized issues	• If implemented alone, does not reduce high effort in fished areas (potential root of problem), thus does not improve economic performance • Increased congestion in open areas • Likely to reduce yield, reduce public access • May disrupt established business/fishing practices
5) Change season length	• Ease and immediacy of implementation and enforcement (applies both sectors in same manner) • Can estimate benefits from historical catch records	• If implemented alone, does not reduce high effort (potential root of problem) unless large change is made, thus does not improve economic performance • The timing of catches made within season varies regionally (high early season in south, more prolonged in north), thus impact will bear regional disadvantages. Not likely to be uniformly effective throughout range of fishery • Shortens and temporally eliminates access to market
6) Change minimum size limit	• Ease and immediacy of implementation and enforcement (applies to both sectors in same manner) • Directly protects stock and increases SPR • Easily incorporated into stock assessment	• Disproportional economic impacts in southern portions of range where most animals in catch are close to legal size • High cost to commercial fishermen needing to adjust trap openings • If implemented alone, does not reduce high effort, thus does not improve economic performance • Initial season could have major catch reduction
7) Impose a Maximum Size Limit	• Ease and immediacy of implementation and enforcement (applies to both sectors in same manner) • Directly protects stock and increases SPR • Impact easily incorporated into stock assessment • Enhances other MLMA objectives: (1) Ecological benefits of large animals in food chain, (2) non consumptive users	• Benefits (increases in SPR) are minimal at high harvest rates because few animals survive to large size • If implemented alone, does not reduce high effort (potential root of problem), thus does not improve economic performance • May disproportionally impact recreational sector
8) Sex Selective Fishery (male only or female-specific size restriction or condition)	• Ease and immediacy of implementation and enforcement (applies to both sectors in same manner) • Directly protects stock and increases SPR; similar method works in *H. americanus* fishery (V-notch program) and crab fisheries (i.e., Dungeness) • Enhances other MLMA objectives: (1) Ecological benefits of large animals in food chain, (2) non consumptive users	• If implemented alone, does not reduce high effort (potential root of problem), thus does not improve economic performance • Reduced yield to fishery, likely large effect • Mating dynamics unknown, small males might not fertilize eggs of larger protected females due to (1) sperm limitation and (2) antagonistic interaction between large females and small males during mating

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4.4 Management of Other Lobster Fisheries

Commercial lobster fisheries exist in many parts of the world. The lessons learned from these global lobster fisheries have played an important role in shaping this FMP. The following review of four select lobster fisheries from other parts of the world highlights the various tools used in lobster fishery management. A comprehensive list of fisheries is listed at the end of this section (Table 4-5).

4.4.1 Baja Mexico *Panulirus interruptus* Fishery

The Mexican lobster fishery operates through fishing cooperatives which are regional groups of fishermen with rights that were first allocated by the government in 1936 (SCS, 2011). Concessions granted to each cooperative define the allowable species, fishing zone boundaries, and effort levels for each cooperative. Adherence to these concessions and prevention of poaching is largely ensured by the cooperatives themselves. Lobster is harvested by 26 cooperatives from the border with the US to Margarita Island but only 10 of those cooperatives, located in the region from Punta Abreojos to Isla Cedros, catch approximately 80% of the catch. Nine of those cooperatives are jointly certified by the Marine Stewardship Council. Federal government control over stock assessment and management is held by the National Institute of Fisheries (Instituto Nacional de Pesca (INAPESCA)) and instituted through the Regional Center of Fisheries Research (CRIP) in La Paz and Ensenada. Co-management and collaboration (e.g. data collection) is required by law as a part of concessions and cooperatives are included in discussions of research results and management recommendations through workshops. Landings data on logs is collected by CRIP and compared to landings data recorded on receipts of sale submitted to the national aquaculture and fishing commission (CONAPESCA).

The fishery is managed using a combination of a minimum legal size (82.5 mm CL), a closed season, a prohibition on taking berried females, trap design requirements, and particular fishing areas and trap limits for each cooperative (SCS, 2011). Commercial landings in Mexico during 2000-10 were approximately 4 times those in CA. Very little lobster is taken recreationally. During the 2010-11 fishing season, approximately 1,250 fishermen operated 564 boats and 28,296 traps (Vega, pers. comm.). The stock has been assessed using a variety of models (Chavez and Gorostieta, 2010; SCS, 2011). INAPESCA used the results of a biomass dynamic model (Hilborn and Walters, 1992) applied by Vega et al. (2000) to set the biomass at maximum sustainable yield (BMSY) as a reference point. The stock is considered below optimum when B/BMSY is <1 and above optimum when the ratio is >1. Specific management responses to a ratio <1 are not prescribed. Investigations in 2014 found that B/BMSY is approximately 1.58 and therefore above optimum, but increased effort was not recommended due to a desire to avoid economic overfishing (SCS, 2014).

4.4.2 South Australia *Jasus edwarsii* Fishery

The South Australian lobster fishery has been regulated with limited entry, seasonal closure, minimum harvestable size, trap limit, trap design restrictions, and a prohibition against keeping berried females (SAFMR, 2006; SAFMR, 2007). A trap limitation was implemented in the 1980s when fishing capacity began to expand due to technological advances (Sloan and Crosthwaite, 2007). Each fishing license is restricted to fishing between 20-100 traps (SAFMR, 2006), but a fisherman or a holding company may own more than 1 fishing license (FAO, 2001). The recreational part of the fishery accounts for less than 5% of the fishery's annual harvest, and is further managed through daily limits and gear restrictions. In addition, recreational fishermen are required to clip the tails of each lobster they catch; the clipping helps identify recreationally caught lobsters and prevent them from entering the commercial markets.

In the early 2000s, landing and CPUE for the fishery dropped due to unfavorable environmental conditions (Linnane et al., 2013a). State managers then implemented a TAC of 625 mt (1.38 million

pounds) for the fishery in 2003 and a system of limited permit entry in 2007 (Sloan and Crosthwaite, 2007; Linnane et al., 2013a). The stock has since improved but has not fully recovered (Linnane et al., 2013a). The improvement may have been due to a more stringent TAC of 470 mt (1 million pounds) that was implemented in 2008 (Linnane et al., 2013a; Linnane et al, 2013b). The lower TAC may have prevented growth overfishing, but it could take years before recruitment improves (Phillips and McWilliam, 2009; McGarvey et al., 1999).

The fishery currently uses a formal HCR based on CPUE, measured as the weight of legal-sized lobster per trap lift, and recruitment abundance, measured as the number of sublegal-sized lobster per trap lift (Sloan and Crosthwaite, 2007). When both CPUE and recruitment decrease below specific reference points, managers must either decrease the TAC by 10%, introduce spatial management measures, or both. When CPUE and recruitment increase beyond specific reference points, managers are required to increase the TAC by 10%.

4.4.3 Florida *Panulirus argus* Fishery

The Florida lobster fishery contains a large recreational component (Sharp et al., 2005). The recreational fishery was estimated to account for 24% of the total lobster landings in the state during the 2009-10 fishing season (SAFMC, 2012). The fishery is managed in part through seasonal closure, minimum size restriction, trap/bag limit, trap design restrictions, TAC, and prohibition against keeping berried females for both recreational and commercial fishermen (Florida Administrative Code (FAC) § 68B-24.001 *et seq.*).

The fishery first experienced decline in the early 1990s in part from overfishing (Milon, 1999; Matthews, 2004). The state then implemented a tag-based trap limitation during the 1993-94 season, which would decrease the number of traps within the state through attrition until a target goal of 400,000 traps is reached (FAC § 68B-24.009). Fishermen may transfer their trap limits to immediate family or other lobster permitted fishermen, but transfer outside family would incur a fee of $2 per transferred trap as well as a 10% reduction on the number of tags transferred (FAC § 68B-24.009; Florida Statutes Annotated (FSA) § 379.3671(2)(a)1.). The trap limitation and other conservation measures have likely improved both the health of the stock and the efficiency of the fishery (Milon et al., 1999).

4.4.4 Western Australia *Panulirus cygnus* Fishery

The Western Australia lobster fishery has maintained a high sustainable yield for decades. Management measures for the commercial fishery include management by zones, seasonal closure, minimum size, limited entry, trap limit, trap design restrictions, TAC, a maximum size for females, and prohibition on keeping berried females (GWADF, 2014). Recreational fishermen are allowed to use traps or to dive for lobsters, but they are subject to daily bag limit, and may take lobsters only during the day (GWADF, 2013). The recreational fishery is small, accounting for only 2.6% of the total fishery landing in the 2010/2011 season (GWADF, 2012).

Harvest from this fishery increased substantially in the 1980s and 1990s due to technological advances which resulted in depressed recruitment, but was relieved through the implementation of biological (e.g., maximum female size limit) and effort-based measures (e.g., trap limit) (Hall, 2001). Recruitment dropped again in the mid-2000s. This recent decline was most likely caused by unfavorable oceanographic conditions (Brown, 2009). In response to the drop in recruitment, the fishery managers decided to implement a fishery-wide TAC (GWADF, 2014). The managers are currently implementing an ITQ system to divide the TAC into transferable components (Fletcher and Santoro, 2012).

Table 4-5: Global Lobster Fishery Overview.

Lobster Species (Jurisdiction)	Biology-based Management Tools							Catch-based Tools			Effort-based Management Tools							Co-Management by Regions	Main Source of Reference
	Minimum Size	Maximum size	Taking of Berried Females Restricted	Taking of Molting Lobsters Restricted	MPAs and Other Area Closures	Seasonal /Temporary Closure	Minimum Trap Service Interval	Bag/ Daily Limit	TAC	ITQ	Limited Entry	TAE (Total Allowable Effort)	Trap Limit	Gear Design Restrictions	Gear Type Restrictions	Tail Clipping for Recreational Fishery	No Fishing at Night		
Panulirus interruptus (California)	C R				C R	C R	C	R			C			C	C R				
Panulirus interruptus (Baja California, Mexico)	C		C		C	C					C			C	C			C	SCS, 2004
Panulirus argus (Cuba)[1]									C	C[2]					C			C	Muñoz-Núñez, 2009
Panulirus argus (Florida)	C R		C R			C R		C R	C				C	C	C[3] R				FAC § 68B-24.001
Panulirus cygnus (Western Australia)	C R	C R	C R		R	C R		R	C	C			C R	C R		R	R	C	GWADF, 2012
Panulirus japonicus (Japan)													C[4]	C	C			C	Nonaka et al., 2000; Phillips et al., 2000
Palinurus elephas (Spain)	C		C			C							C	C	C				Quetglas et al., 2004; Goñi and Latrouite, 2005
Palinurus gilchristi (South Africa)			C						C			C[5]							Reg. in Terms of the Marine Living Resources Act, 1998 C. 44
Jasus edwarsii (New Zealand)	C R		C R	C R	R			R	C	C			R	R				C	NZMPI, 2009; NZMPI, 2014
Jasus edwarsii (South Australia)	C R		C R			C		R	C		C		C	C		R		C	SAFMR, 2006; SAFMR, 2007
Jasus lalandii (South Africa)	C R		C		C	C			C	C				C	C R		R		Reg. in Terms of the Marine Living Resources Act, 1998 C. 44
Homarus americanus (Maine, USA)	C R	C R	C[6] R[7]					R			C[8] R[9]		C	C				C	13-188 CMR §§ 25.01 *et seq.*; 12 MRS §§ 6446 *et seq.*

1 Recreational fishery introduced in 1996, but no creational sector exists (Regulaciones Pesqueras de Cuba 164/1996d; but see Phillips et al., 2000)
2 Total catch quota shared between 10 management regions
3 Fishermen may dive or trap for lobsters, but not both
4 Fishery uses nets instead of traps; number of nets limited per boat
5 Days at sea limited
6 A V-shaped notch is fixed on a female before release
7 A V-shaped notch is fixed on a female before release
8 Not all management areas are limited entry, but Maine residency always required for license
9 Maine residency always required for license
C = Commercial and R = Recreational

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4.4.5 Maine *Homarus americanus* Fishery

In Maine, a combination of good management practice and favorable environmental conditions has resulted in historically high landings (Steneck, 2006). Both commercial and recreational fishermen are regulated with minimum and maximum size, trap limit, trap design restriction, and prohibition against taking of berried females (13-188 CMR §§ 25.01 *et seq.*). The commercial sector is further restricted with an area-based limited entry program (12 MRS §§ 6446-6447). Each management area may also further reduce the 800-per-fisherman trap limit required by the state through a voting process within the fishing community (12 MRS §§ 6446, 6447(5)(A); 13-188 CMR 25.10(2)). The stock is not considered to be overexploited, but concerns related to suboptimal economic performance, increases in territorial conflicts, trap entanglements (i.e. excess gear in the water), and harbor congestion have surfaced (Acheson and Acheson, 2010).

4.5 The LAC Process and the Resulting Regulatory Proposals

CDFW convened the LAC to facilitate communication and build consensus between various constituent groups and CDFW. The LAC is composed of representatives for the recreational fishermen, commercial fishermen, non-consumptive recreational users, conservation interests, and the various levels of government. The process included nine regular meetings between June 2012 and September 2013. The process also involved specific communications such as the 2013 Commercial Trap Survey, which allowed members of the commercial fishing community to provide input detailing the fishing practices and perspectives on the fishery.

During the LAC process, constituent representatives were able to reach consensus on a number of items pertaining to the CA lobster fisheries, such as recognizing the current distribution of catch between the commercial and recreational fisheries to be acceptable. The LAC also reached consensus on five objectives to guide future allocation considerations for the lobster fishery:

1. Identify current effort levels for each sector and establish controls to prevent unrestricted growth.
2. Identify the proportion of overall catch and/or effort from each sector, and if necessary, take corrective action to maintain those proportions if the percent of total catch and/or effort by sector deviates significantly from a pre-determined base period.
3. Recognize the current differences between sectors in traditional fishing grounds and time-of-day fished, and seek to maintain those differences.
4. If increases or decreases to the fishery are required due to application of the control rule, those changes should seek to maintain equitability and not give an advantage to either sector unless biological triggers require a change to allocation.
5. End illegal commercialization.

Most importantly, the LAC also formed consensus on several regulatory recommendations that would benefit the fisheries and/or the natural resources. These proposals were compiled into a finalized consensus recommendation on September 11, 2013. The LAC recommendations (described below) were submitted to the Commission for its consideration at the June 2015 Commission meeting along with Department recommendations.

<u>Commercial trap limit recommendation</u>

In 2013 CDFW mailed a focused commercial lobster trap survey to all lobster operator permit holders (141 transferable and 53 non-transferable permit holders). The survey asked specific questions regarding individual trap fishing effort and sought to assess the level of support for a commercial trap limit. A total of 111 permit holders responded; the majority of survey responses (62%) were submitted by fishermen who target lobster south of Santa Monica Bay (including Santa Barbara Island, Santa Catalina Island, San Clemente Island, and Cortez Bank). Over 76% of all respondents replied “yes” to the question “do you think

there needs to be a trap limit?" Of the respondents who favored a trap limit, 48% wanted a trap limit of 300 traps or less, and 34% wanted a trap limit of 350-400 traps. Other notable responses include a 78% "no" for regional trap limits (northern vs. southern parts of the fishery), 52% responding "yes" to being able to stack two permits to increase their trap numbers under a trap limit, and 67% responded "no" to stacking more than two permits.

The result of this survey was presented to the LAC during the development of the LAC Commercial Trap Limit Proposal. Through consensus, the LAC recommended a trap limit of 300 attached to each fishing permit. The LAC formalized this proposal in part to cap and potentially reduce current effort level. However, the proposal also aims to eventually cap the long-term effort capacity of the commercial fishing fleet at 42,300 traps (141 permits x 300 traps each). Furthermore, each fisherman may stack a maximum of two permits. The proposed mechanism will give fishermen the flexibility to fish up to 600 traps each. Fishermen may receive more tags during a season to replace tags lost during rare and unforeseen catastrophes. The LAC also proposed a phase-in trap limit approach to allow each fisherman to purchase a one-year temporary permit for 300 more traps when for the first three years after the trap limit goes into effect. The phase-in permits were proposed to give fishermen time to adjust their fishing practices during the initial implementation of the trap limit.

The LAC process acknowledged that even with the ability to hold two permits, some existing fishermen, especially those fishing between 600-1,200 traps, may need to extensively modify their fishing practices. However, the interest of these fishermen must be balanced with: the risk of pollution due to lost gears if trap intensity continues to escalate; the externalized economic inefficiency impacting the rest of the commercial fleet; and the desire of other fishermen and other stakeholders wishing to see fewer traps in the water. The CDFW considers the LAC trap limit proposal as an appropriate balance and will recommend it as part of the implementing regulations for this FMP. CDFW also considers the trap limit as an important substantive regulatory proposal from the FMP/LAC process. Unlike the other regulatory proposals listed in this section, the commercial trap limit is an integral part of the HCR. It is a pro-active initiative aimed to improve the biological, social, and economic sustainability of the CA lobster fisheries.

<u>Permission to carry SCUBA gear on commercial vessels</u>
Existing regulations do not explicitly prohibit SCUBA equipment on commercial lobster vessels. However, regulations do prohibit commercial fishermen from using SCBUA equipment "to assist in the take of lobsters" (14 CCR 122(g)). SCUBA gear is an important tool for recovery of lost traps that otherwise might remain in the marine environment. It can also be used for disentanglement in instances when trap lines are caught on a vessel's propeller. This proposal will clarify that commercial fishermen may use SCUBA for the purpose of securing traps, retrieving lost gear, or to unfoul a line from a vessel; it will remain illegal to use it for the take of lobster.

<u>More than one permittee may operate from the same vessel</u>
Neither the FGC nor the CCR prohibits two or more holders of lobster operator permits from operating from the same vessel. However, how liabilities are shared between these fishermen in the event of a violation is unclear. As such, the LAC proposes joint liability for operator permit holders operating from the same vessel in the event of a violation.

<u>Extend the trap service interval</u>
Federal regulations require fixed gear (includes traps) in federal waters to be serviced at least every seven days (50 CFR § 660.230(b)(3)). The desire to conform to federal regulation and to provide lobster fishermen with more flexibility in servicing their gear led the LAC to propose a longer soak time for lobster traps, extending it from four to seven days. This extended service requirement would only apply to lobster traps.

Formalize the use of notes in the commercial fishery

Lobster fishermen are allowed to authorize another lobster operator permit holder to pull his or her trap by assigning that permit holder a note. This system was designed to allow one permit holder to pull the traps of another in the event of an emergency, such as sudden illness or vessel breakdown. The LAC proposes to formalize the note system with more CDFW oversight through the submission of a waiver for CDFW approval in order to minimize potential abuse.

Additional grace period for deploying and retrieving traps

The LAC also proposes to extend the grace period for trap deployment before the commercial season opens and the grace period for trap retrieval after the commercial season closes. Commercial fishermen are currently allowed to deploy traps in the water 6 days before the season opens. They are also given 6 days to remove their traps from the water after the season closes. However, all traps left in the water during the grace periods must be unbaited with doors wired open. Fishermen may not bait the traps until 24 hours prior to the season opening, and traps must still be emptied of baits and wired open when season closes.

The LAC considers the current grace period length to be too short. Commercial fishermen tend to over-stack their decks with traps and create hazardous conditions. To decrease the chance of accidents and navigational hazards, the LAC proposes to extend the grace period for deploying and retrieving traps to 9 days. Fishermen are still prohibited from baiting the traps until 24 hours before the season opens, and traps must still be emptied and wired open when the season closes.

Branding of commercial buoys

Existing regulation requires lobster fishermen to have their respective fishing license numbers on their buoys in contrasting colors (14 CCR § 122(k)). Feedback from commercial representatives suggests that numbers that are branded onto the buoys are just as legible as the ones that are painted. Furthermore, branding does not erode as quickly as paint, which translates to less effort on the part of the fishermen to maintain legibility. For these reasons, LAC is proposing to explicitly allow fishermen to paint their license numbers in contrasting colors or to brand the numbers in a clearly legible form.

Tail clipping/hole-punching of retained recreational lobster

Tail-clipping/hole-punching is practiced in other recreational lobster fisheries. For example, Australia requires marking retained recreationally-caught lobsters, where enforcement officers can use clipping or hole-punching to distinguish recreationally-caught lobsters from commercially-caught lobsters. The same can be accomplished in California. This tool is relatively simple to implement and enforce and can help prevent recreationally-caught lobsters from entering the black market.

Prohibition on mechanical hoop net pullers

A prohibition on mechanical hoop net pullers has been proposed to deter poachers from using the pullers to poach commercial traps. The LAC has also proposed to incorporate an exemption for fishermen with disabilities.

Changing the opening time for recreational season

The midnight opening time for the recreational season has led to confusion amongst the recreational fishing community. Concerns over safety were also discussed by the LAC, due to fatalities routinely occurring on opening nights. Furthermore, a midnight opening is more difficult for CDFW to enforce than a day time opening. Due to the safety and enforcement issues associated with a midnight opener, the LAC proposes to move the recreational season opener to an alternate time. However, the LAC has expressed concerns over potential economic impacts to the Commercial Passenger Fishing Vessels and dive charter boats if the

opener is moved to after midnight compared to before midnight, as this could result in one less night of fishing.

Marking recreational hoop net floats

The LAC has also reached a consensus on supporting a rule requiring the marking of all hoop net floats with the operator's unique identifications (e.g., individual license numbers, GO ID numbers). This is intended to allow enforcement officers to better identify hoop net operators and lost gear.

Clarifying regulatory language on diving for lobsters

Current regulation prohibits the possession of "hooked devices" when diving for lobsters. This has led to different interpretations of the language as well as citation for spear fishermen who were in possession of spear guns while attempting to take lobsters by hand. The LAC proposes to clarify the language, remove the reference to "hooked device," and focus the regulatory language on how lobsters may only be taken by hand when diving. Merely carrying spearfishing gear while taking lobsters should be legal, while the use of such gear to aid in lobster fishing should remain illegal.

4.6 Management Strategy Evaluation Model (MSE)

An important step that CDFW is taking to further improve CA lobster fisheries management is the refinement of the **management strategy evaluation model** (MSE). MSE is a sophisticated model that integrates traditional fishery stock models with management measures to predict the effects of those measures. It is an individual-based simulation model. This means that each individual lobster is simulated as a unique agent and the fate of each lobster is dependent on its state-based probability of moving, reproducing, living, or dying in each time step. A lobster's state is described by features such as sex, reproductive stage, and size. The model incorporates the effects of both the recreational sector and the commercial sector and provides an estimate of future performance of the CA lobster stock under different sets of management activities.

Management strategy evaluation (MSE) – For the purposes of the spiny lobster FMP, the MSE is a computer model that simulates lobster population dynamics, designed by a team led by Dr. Yong Chen, University of Maine. The MSE was designed to allow CDFW to monitor and evaluate the effects of management measures and the lobster fisheries on the lobster population.

4.6.1 Capability of the MSE

The MSE includes: 1) an operating model for simulating the dynamics of the spiny lobster stock and fishery; 2) historical and simulated fishery-dependent, fishery-independent, and biological data; 3) a stock assessment model yielding estimates of the current stock biomass/abundance and fishing mortality; 4) a set of alternative management actions that are practical, enforceable, and can be simulated; 5) a set of performance measures for evaluating the performance of these management actions with respect to management objectives; and 6) a set of harvest control rules determining how the management regulations should be adjusted based on a set of defined biological reference points and stock assessment results. The model is very sophisticated, and it requires tremendous resources to run effectively. As in most fishery stock models, the MSE incorporates known characteristics of a fish population and its associated fisheries to simulate a virtual population. MSE can be used in that capacity to determine important population-level characteristics, such as abundance (i.e., perform a stock assessment). The MSE, for example uses total MPA coverage to calculate a probability of encounters between individual lobsters and lobster fishermen. The encounter rate is then used to determine the fishing mortality of the stock.

However, MSE's capability extends beyond the ability to conduct stock assessments. Once an MSE run produces a simulated CA lobster stock that is comparable in its key attributes to the actual stock, it could then apply different hypothetical HCRs to the virtual population and predict the performance of each HCR (e.g., comparing the 10-year yield of an HCR using a $CATCH_{THRESHOLD}$ of 0.9 with an HCR using a $CATCH_{THRESHOLD}$ of 0.8). The model would determine whether any threshold reference point has been reached during each

virtual fishing season and apply changes to the stock's fishing mortality accordingly to simulate management actions. The model then records the status of the stock, such as total yield, over multiple fishing seasons. CDFW would then be able to assess the merit of different management options using these results. The MSE currently does not take changing environmental trends into its calculation, though CDFW scientists are attempting to incorporate such considerations into the MSE model.

4.6.2 Incorporating the MSE

The core components of the model were completed in the fall of 2013. However, the model is not yet ready for deployment. Current model outputs exhibit unresolved patterns in residuals and questionable population trends for MPAs, suggesting that it requires further development. While the current version of MSE is able to incorporate all the management measures within the control rule toolbox (Section 4.3.3), it cannot incorporate CPUE and SPR as reference points. As in the refinement of $CATCH_{THRESHOLD}$, MSE can potentially use and refine $SPR_{THRESHOLD,}$ after the program code is modified to provide SPR estimates. In the meantime, CDFW will continue to improve these inputs with various monitoring efforts, including the effects of new management actions (e.g., at-sea sampling, lobster report cards, landing receipts; Section 5.1.1). If the MSE model is adapted to calculate SPR, CDFW would use the model as an alternate means of calculating $SPR_{THRESHOLD}$. Alternatively, if one of the reference points used by MSE is found to be a better indicator of the CA lobster stock's ability to replenish itself, the FMP will be amended appropriately to incorporate the new metric.

Eventually, the MSE has the potential to streamline future management actions for the CA lobster fisheries and reduce administrative uncertainties. More importantly, the model offers CDFW the potential to assimilate and analyze biological and regulatory information much more quickly, which would ultimately serve to enhance the fisheries. Once the model is fully developed, CDFW will make the appropriate recommendations to the Commission.

4.7 CA Lobster and Ecosystem Management

This FMP adopts an ecosystem approach to management. In this context, consideration for factors such as population structure, habitat, trophic interactions, cumulative impacts of the fisheries, and climate change is crucial (COS, 2012). The first part of this FMP is dedicated to the incorporation of information on both the environmental impact of the fisheries (Chapter 2) as well as the ecosystem role of the CA lobster (Sections 3.7, 3.8, 3.9) into the FMP, in addition to the information related to the CA lobster's own natural history (Chapter 3). Next, management measures were considered in the context of other existing state regulatory structure. One of the most notable existing measures is the system of interconnected MPAs that have been established in the SCB since 2012.

On January 1, 2012, the south coast regional network of 50 MPAs, covering 355 square miles or about 15% of state waters, went into effect (including 13 previously established MPAs in 2003 at the northern Channel Islands that were retained without change) (https://www.wildlife.ca.gov/Conservation/Marine/MPAs/Statistics). These MPAs were established to achieve a set of six ecosystem-based conservation goals, most of which are not strictly related to fisheries (FGC §§ 2851, 2853). However, properly managed MPAs have been shown to enhance fisheries under the right circumstances by protecting critical habitats (Grafton et al., 2006). The MPAs, especially the state marine reserves, make it unlawful to "injure, damage, take, or possess any living, geological, or cultural resource" unless the activities are part of a permitted research, restoration, or monitoring process (PRC § 36710(a)). Protection of critical habitat can, for the case of CA lobster, translate to increased spawning potential (Kay, 2011).

It is currently estimated that 14.6% of all known SCB CA lobster habitats are protected by MPAs (Section 4.3.1.3) assuming that CA lobster fisheries occur out to 100 m (~300 ft) depth). Refinement of the data, such as analyzing the difference between habitats inside MPAs and habitats outside MPAs, is an ongoing information need (MPA Monitoring Enterprise, 2014). CDFW incorporates this number as well as other MPA specific data (e.g., MPA size, adult spillover, fishing effort adjustment due to MPA) into the calculations of the SPR reference point through the Cable-CDFW Model.

A significant number of studies have been dedicated to the effects of MPAs over the past several decades (e.g., Grafton et al., 2006; Roberts et al., 2003). However, information detailing their effects on the CA lobster fishery has been sparse. It is known that MPAs can eliminate fishing mortality inside their boundaries, but displace fishing effort and intensify fishing in the non-MPA areas (Beverton and Holt 1957; Guenette et al., 1998; Goñi et al., 2010; Alcala et al., 2005; Shester, 2008). Existing research shows that under the right conditions, MPAs can allow lobsters to reach a larger reproductive size before being caught (Diaz et al., 2011). Past research on a related species of spiny lobster, *J. edwardsii*, further shows that larger females carry more eggs and produce stronger larvae (Smith and Ritar, 2007). If CA lobsters exhibit the same type of improvement in fecundity as they age, and if the southern California MPAs are allowing individuals to grow to a larger size before being caught, then the MPAs will contribute to the fisheries through enhanced recruitment.

MPAs have also been shown to contribute to lobster fishery yield in outside unprotected areas through movement (adult "**spillover**"). Whether MPAs will contribute to spillover of a fishery depends on a variety of factors, such as the location and size of the MPAs in relationship to the mobility of individual lobsters (Bevacqua et al., 2010; Moland et al., 2013). Furthermore, in an era of global climate change, MPAs are areas where CA lobsters would not be impacted simultaneously from climate change (Section 3.11) and fishing.

Spillover - The emigration of adults from a protected area to the fishing grounds, and/or larval export from the protected area to surrounding areas.

MPAs can also almost completely eliminate other ecosystem impacts from commercial and recreational fishing within their boundaries. These include bycatch and trap-habitat interactions. Moreover, the elimination of fishing pressure in certain areas can ensure that a portion of the CA lobster stock will grow to a size large enough to enable them to assist with controlling the local urchin population (Section 3.9).

In addition to the MPAs and the new HCR, measures that have been proven to be effective at keeping the CA lobster stocks at a biologically sustainable level (Section 2.4) will remain in place. Existing regulations for the recreational industry include the mandatory reporting requirement, minimum size limit, area closures, bag limit, gear restriction, and season restriction. Existing regulations for the commercial industry include the mandatory reporting requirement, minimum size limit, area closures, limited entry, gear restriction, trap specification, and season restriction. The CA lobster fisheries also adhere to the Marine Protected Areas (MPAs) regulations.

The management measures and strategies this FMP adopts are thus not designed to independently solve every ecosystem-related issue attributed to the CA lobster fisheries. Instead, the FMP management strategies, the MPAs, and existing management measures all have their respective strengths and weaknesses, and they are meant to complement each other. For instance, while the MPAs can eliminate fishing, and thus all bycatch, within their borders, they are not designed to curtail bycatch elsewhere. This is where existing rules such as trap design specifications and new rules like the proposed trap limit would complement the MPAs and reduce the overall ecosystem impact of the CA lobster fisheries. Additionally, the HCR, in conjunction with the proposed trap limit, will help control fishing effort and further buffer against unsustainable harvest of CA lobsters. The HCR will help maintain the role of CA lobster as an

important trophic link within the nearshore ecosystem as well as the integrity of the associated benthic habitat, and will also minimize impacts to non-targeted species.

While this FMP and existing management measures will go a long way towards protecting the CA lobster resource and its associated ecosystem, activities of other agencies with jurisdictions over coastal and nearshore areas may affect the lobster fishery. For example, the authority to manage coastal development of the state is vested in the California Coastal Commission (PRC §§ 30000 *et seq.*). The Coastal Commission can use the information within this FMP (Section 3.1) to inform its permitting and other regulatory functions to minimize impact to important lobster habitats. The information will also serve as a starting point for intergovernmental collaborations in important future developments.

5. Fishery Research Protocol – Essential Fishery Information

The MLMA requires CDFW to formulate FMPs with the best available science or other relevant information without delaying plan preparation (FGC § 7072(b)). Certain categories of EFI relate to the socio-economic aspect of a fishery while others relate to the natural history and biology of the fished species. CDFW must outline how it would obtain missing or outdated EFI within an FMP (FGC § 7081).

5.1 Research and Monitoring Needs for Essential Fishery Information

CDFW has primarily relied on its own **fishery-dependent data** to determine the status of the spiny lobster stock and associated fisheries. The need to improve existing data has shaped CDFW CA lobster-related research since 2007. In particular, improving information on the recreational fishery has been a priority with implementation of the recreational report card requirement. Further improvements to that system are needed. CDFW is also increasingly interested in development of reliable and regularly collected fisheries-independent data streams. Table 5-1 describes the future data needs for managing the CA lobster fishery, including the biological EFI category, their importance, current state of knowledge, and methods for improving them.

Fishery-dependent data - Information collected directly from or during the process of fishing, or from fishery landing data. May be collected from commercial and/or recreational sources, and may include catch/effort reported by fishermen, size and age composition of the catch, and biological samples collected at port.

5.1.1 Existing CDFW Research Methods

The following methods are currently employed by CDFW and its partners:

Logbooks

Commercial fishermen have been required to record specific information for each fishing trip in commercial logbooks since 1973. A logbook entry must contain the date, fisherman and crew ID, vessel ID, CDFW fishing block, a landmark (typically a shoreline feature or reef) corresponding to the area fished, the number of legal-size CA lobster retained, and the number of sublegal-size lobsters released. Effort is compiled based on the number of trap pulls or the length of the soak time. Associated landing receipt ID numbers can also be recorded. Each log has room to record 3 days of fishing with up to 5 sets of trap pulls per day. CDFW is working towards a transition from paper to electronic commercial fishing logs and plans for the CA lobster fishery to be the first to implement a voluntary electronic log by the 2019-20 fishing season.

Commercial Landing Receipts

Commercial landings have been recorded since the early 1900s via commercial landing receipts. Landing receipts record the date of sale, species(s) landed, port of landing, fisherman ID, vessel ID, CDFW fishing

block from which the catch was taken, the price paid, and weight landed. Landing receipts are filled out by fish dealers or by fishermen permitted to sell their own catch.

Correlating Commercial Logbooks and Landing Receipts

Information such as the weight and number of lobsters landed by a fisherman on a given day is important for both the management and the enforcement of the CA lobster fisheries. CDFW uses this type of information to obtain the annual average size of a landed CA lobster, which is crucial for determining the SPR of the stock. To obtain such information, correlation between commercial logbooks and landing receipts is necessary.

In the mid-1990s, CDFW transitioned from daily logs to new logs that record up to three days of fishing. Unlike the daily logs, which recorded the weights landed on a daily basis, the new logs provide space for the number of legal-size lobsters retained, but not weight. Landing receipts between fishermen and buyers, on the other hand, only record weight and not number of lobsters sold (Appendix IV). In order to determine the weight of the lobsters caught on an individual fishing date, CDFW must first identify the landing receipt ID numbers recorded on the log of that particular date. CDFW must then retrieve the specific landing receipt with the corresponding ID.

This current system of correlating logs with receipts is a complex process. For fishermen that sell all of their catch from a single day to one buyer, correlation is straight-forward. However, CDFW will not be able to determine the precise weight of the lobster caught on a single day for fishermen that sell multiple days' worth of catches to a buyer. CDFW can locate the landing receipt in question, but there is no way of attributing different portions of the landed weight to different days of fishing.

CDFW currently bases its SPR calculation on data taken from only log entries that are tied to one landing receipt. More sophisticated computer programs can also analyze the correlation between catch totals and landed weights from logs with multiple landing receipts per fishing day, but the process is much more complicated. CDFW will seek ways to address this issue such as amending landing receipts to record the total number of lobster landed as part of an up-coming revision process for all logs and landing receipts.

Recreational Lobster Report Cards

Report cards were introduced during the 2008-09 recreational season and must be purchased by every person fishing for lobster in California, including individuals who are not required to possess a valid sportfishing license (e.g., youths under 16, pier fisherman). Initially, the report cards were valid for a single calendar year and captured data for the last half of a given season and the first half of the subsequent season. Because of the mismatched timing, CDFW could not obtain results from a full season until approximately 15-17 months after the season ended. A new seasonal card introduced for the 2013-14 season can shorten the wait time to 3-5 months following season closure.

Report cards record the date, location, gear type, and number of lobster retained. The report cards provide 92 fishing location codes for fishermen to choose from as of the 2013-14 fishing season. The spatial resolution for coastal areas south of Point Conception is relatively high. However, the Channel Islands are each represented by a single location code, and CDFW's ability to analyze fine scale recreational catch patterns is limited. Furthermore, all take north of Surf Beach in Santa Barbara County (up to the California-Oregon border) is represented by a single code (Figure 2-9). CDFW may modify the spatial resolution of the report cards in the future based on management needs.

Recorded gear categories include conical hoop net, flat hoop net, skin diving, and SCUBA diving. However, the cards do not include the number of nets used nor the amount of time spent fishing. In addition, CDFW cannot practically compare the time recreational fishermen spent hoop net fishing directly with the time the community spent diving. Consequently, CDFW uses 'trips', or a single line from the report cards, as the unit of effort. Due to this, as well as uneven report card return rates, only limited effort comparisons are possible between hoop netting and diving using the report card. Refined data collection of effort could be achieved with two additional columns on the card: the number of nets used (zero if diving) and the total time spent fishing.

Accurate estimates of annual catch for the recreational fishery is critical for management and cannot be made when report card return rates are low. One method for improving catch estimates is to implement a telephone survey of report card holders who did not return their card, as is performed by CDFW for the red abalone recreational fishery. Combined report card and telephone survey data would also be necessary for accurate estimation of the proportion of trips employing different gear types.

At- Sea Fishery Sampling

At-sea sampling refers to instances when fishermen gather data during normal fishing operation. Such a program was integrated with other data collection efforts (e.g., observers, **fishery-independent** surveys, tagging studies) to manage the New Zealand rock lobster fishery (Starr and Bentley, 2002; Starr, 2010).

California Sea Grant in collaboration with CDFW conducted a three-year project for CA lobster based on a framework developed for the southern California rock crab fishery (Culver et al., 2010) and an earlier effort by CDFW. The project collected the same general information as the lobster logs but included animal size, sex ratio, reproductive condition, shell condition, and trap density. This has provided important corroboration for CDFW's logbook data (and vice versa) and was used to help refine our estimates of average weight and subsequent calculations of SPR. At-sea sampling programs can also provide more accurate estimates of CPUE. The program required willing and capable fishery participants and employed financial incentives to offset reduced productivity for those participants. Because there is not continued, dedicated funding for the project, the program's successful adoption in the future will depend on fishermen who recognize the value of additional data and voluntarily continue the work or additional mandatory reporting requirements.

Creel Sampling

Two creel surveys were undertaken by CDFW targeting the recreational lobster fishery. The data collected included fishing mode (type of fishing platform), gear, number of hours fished, fishing location, number of CA lobster released, number kept, carapace length, weight, and sex. The surveys involved intercepting fishermen leaving a site after fishing. Survey sites include launch ramps, piers, jetties, and beach access points.

Fishery-independent data – Scientific research to collect information that is independent of commercial or recreational fishing operations. Surveys utilizing commercial fishing gear may provide unbiased estimates of abundance. Surveys may also use other methods (e.g., acoustics, SCUBA, video) to collect other biological or ecological information (e.g., movement, migration, growth rates, natural mortality) relevant to a fishery.
California Recreational Fisheries Survey (CRFS) - The California Recreational Fisheries Survey (CRFS) is the method for estimating total marine recreational finfish catch and effort in California. The CRFS is a coordinated sampling survey designed to gather catch and effort data from anglers in all modes of marine recreational finfish fishing.

The first survey occurred in 1992 and targeted lobster fishing during the first two weekends of the CA lobster season at four sites. The 2007 survey encompassed the entire SCB and was done in preparation for the launch of the recreational lobster report card and sampled three of the four sites sampled in 1992. The 2007 survey also operated at night over the first 12 weeks. The 2007 sites were based on CDFW's long running finfish-oriented **California Recreational Fisheries Survey** (CRFS), which has since incorporated

lobsters into its survey program. It is important to note that while most recreational lobster fishermen fish at night, CRFS sampling only occurs during daytime. CDFW has used the results from these creel surveys to compliment data from the recreational report cards as well as other assessment efforts.

Research Trapping

Research trapping programs use lobster traps to sample populations. Research trapping is typically collaborative and takes place onboard commercial fishing vessels. In some instances, scientists trained to use commercial fishing gear can work from research vessels, which can reduce scheduling conflicts among partners, especially when commercial vessels are unavailable (Kay et al., 2010).

Research trapping is a powerful tool because data are collected in a manner that matches fishery-dependent methods, which makes data directly comparable in statistical analyses and stock assessment. Furthermore, traps allow researchers to sample a relatively large number of lobsters not typically possible with traditional research approaches (e.g., SCUBA). These programs have been employed in California to support MPA monitoring efforts as well as lobster tag recovering efforts in the northern Channel Islands (Kay et al., 2011) and in the southern portion of the SCB (Hovel et al., 2015; Hovel and Neilson, 2011).

Dive Surveys

SCUBA diving is an essential method for directly observing CA lobster in their natural habitat. A large number of research groups use SCUBA to monitor reefs in southern California. CDFW scientists collaborated with other academic researchers on a baseline study for CA lobster within southern California MPAs. The study included a research trapping and tag/recapture component, SCUBA surveys, and a habitat mapping/lobster movement component. The SCUBA survey was used to determine abundance, density, den occupancy, habitat type, and other ecological information at key locations inside and outside select MPAs. While this method is uniquely able to estimate animal densities and their association with particular habitat features, it suffers from several drawbacks. SCUBA surveys are typically conducted during the day when lobsters are in dens and may be difficult to observe. Additionally, the patchy spatial distribution of lobsters necessitates that large areas be surveyed in order to count a sufficient number for statistical analysis. While recognizing these challenges, SCUBA surveys may also be used to assess fishery impacts and fisherman behavior. Eggleston et al. (2003) performed SCUBA surveys of Caribbean spiny lobsters (*P. argus*) in the Florida Keys immediately before and after a recreational "mini-season" to demonstrate the magnitude of removal rates and their relationship to initial density. Similar surveys of CA lobster before the recreational season, immediately before the opening of the commercial season, and at the end of the season could provide information on the relative impacts of the fisheries and help optimize management responses. However this would involve a great deal of effort within a short time frame.

5.1.2 Additional Research Methods

The following methods are not currently in use by CDFW to provide lobster EFI. However, CDFW is a research partner in a number of collaborative projects that include some of these methods led by other institutions.

Port Sampling

Port sampling is a method by which samplers meet commercial vessels when they return from fishing and measure some fraction or all of the catch. This is a very efficient and cost-effective method for obtaining large sample sizes. During the 2008-09 fishing season, for example, a single researcher working with commercial lobstermen was able to sample 14 fishing trips from Santa Cruz Island and 17 trips from Santa Rosa Island. The catch sampled during these sampling sessions represented approximately 8.5% and 12.5%

of the total 2008-09 catch from the CDFW fishing blocks encompassing Santa Cruz and Santa Rosa Islands, respectively (Kay et al., 2011). Port sampling is ideal for monitoring length frequencies, sex ratios, mean weight of animals in the catch, and condition of animals.

Larval Collectors

Larval collectors are man-made devices upon which pueruli settle. They are typically constructed to resemble preferred settlement surface, and are usually deployed in nearshore waters. The effectiveness of two puerulus collector designs was tested by Miller (2014b) in California and Arteaga-Rios et al. (2007) noted significant positive correlation between pueruli in collectors and commercial catch in Baja, Mexico five years subsequent. While these studies are encouraging, the utility of puerulus larval collection for CA lobster is still uncertain, and further research on sampling methodology is needed. The California Cooperative Oceanic Fisheries Investigations' (CalCOFI) zooplankton sampling time series has the potential to reveal more information regarding the abundance and distribution of earlier stage phyllosoma larvae across several decades. Koslow et al. (2012) used this time series to identify a relationship between environmental conditions and phyllosoma abundance which were positively correlated. CA lobster landings were also correlated with phyllosoma abundance across much of the time series but the relationship breaks down during recent years under high exploitation rates. This may indicate that recent high removal rates of reproductive individuals is having a negative impact on larval production and potential recruitment. Further work is required to better understand the relationship between phyllosoma abundance and spawning stock abundance before phyllosoma could be confidently used as the basis for a reference point within the HCR. However, the phyllosoma data will be extremely valuable when managers are prompted by the HCR to investigate the underlying causes for the existing reference points crossing their thresholds. The positive correlation between phyllosoma abundance and environmental indicators will help managers to distinguish between fishery and environmental processes impacting the stock and craft appropriate responses. Abundance of earlier stage larvae may serve as an indicator of adult spawning potential while late stage larvae may help forecast changes in stock abundance, identify preferred settlement habitats, and differentiate source and sink areas. CDFW will continue to track the CalCOFI data on phyllosoma and will seek to develop collaborations to model larval transport in the SCB and California Current, which can help determine the sources and the destinations of the lobster larvae across southern California.

Laboratory Studies

Laboratory studies are useful for investigating aspects of lobster biology that cannot be studied in the field. Results of behavioral laboratory studies must be interpreted with caution because conditions in a controlled lab are inherently different from field conditions, though they are often designed to complement field studies.

Oceanography

Oceanography is a broad field within marine science that focuses on the physical properties and processes of the ocean (e.g., water temperature, salinity, depth, nutrient levels, storm activity, currents, and bottom types). This field of study can directly assess the effects of climate change, ocean acidification, and climate-driven hypoxia on future CA lobster population. Oceanography can also relate the physical characteristics of the ocean to biological processes such as productivity, trophic structure, population connectivity, distribution of larvae, growth rate and distribution of fish stocks, disease outbreak, and other management-relevant issues. Oceanographic data are typically collected with instruments deployed from boats and ships or with satellites; complex modeling is often the mainstay of data analysis.

Genetics

Genetics uses the hereditary material in an organism (e.g., genes coded for by DNA) to help understand a large number of biological processes. Because genes in DNA are passed from parents to offspring, and because certain genes are unique to individuals, populations, or species, they are a powerful tool for studying the relatedness of two or more organisms. This information can provide insight into topics like population connectivity, evolution, and disease susceptibility and resistance.

5.2 Biological EFI: Status, Application to Management, and Methods for Obtaining Data

Chapter 4 of the MLMA Master Plan designated this fishery as data rich for several EFI categories (e.g., growth rates and reproduction) and poor in others (e.g., stock distribution, recruitment). Even in areas where the population-wide characteristics are well understood, important details can still be missing or, regional differences have not been thoroughly explored (Table 5-1).

Age and Growth

Accurate age and growth data are essential for CA lobster management. Growth rate can be used to determine the age of maturity or SAM and estimate of the number of spawning seasons a lobster would experience before reaching legal size when coupled with observations of SAM. Published growth rates for *P. interruptus* are highly variable (Section 3.2), and it is unknown whether, or by how much, growth rates might vary through time or from region-to-region in California. Furthermore, decades of fishing have resulted in a scarcity of older lobster that complicates determination of the species' maximum size.

CDFW currently estimates CA lobster growth rates, and subsequently age, using the commonly applied von Bertalanffy growth model with parameters derived by Vega (2003a) for the Mexican stock. Tag-recapture data exists for the CA stock from three studies representing different regions of the SCB and different lobster size classes (see Appendix X). The first of these studies provides information on the growth of juveniles from Santa Catalina Island (Engle, 1979). The second study conducted in the northern Channel Islands provides information on the growth of adults ranging up to relatively large sizes. Third, CDFW collaborated with academic researchers and fishermen to tag CA lobsters in San Diego Bay (Hovel and Nielson 2011) and South Coast Region MPAs (Hovel et al., 2015). These studies rely not only on research trapping to recover tags but also on recovery by recreational and commercial fishermen. Investigations by CDFW into the fit of the von Bertalanffy and other possible models to these data suggest that the von Bertalanffy model may not be the best choice for the CA lobster data. However, less conventional growth modeling options were ultimately rejected during peer review of this FMP, in part because these data contain a gap in information for lobsters in the 30 to 50 mm CL size range. Until that gap is addressed CDFW will continue to use parameters from Vega (2003a) but place a high priority on participating in tagging studies that address these critical knowledge gaps.

Estimating the age of crustaceans has historically been more difficult than aging finfish because crustaceans shed most of their hard structures that might be used for aging each time they molt. Tag-recapture studies only provide an indirect estimate of the age of individual lobsters. New advancements in crustacean aging have recently been made by counting rings in hard parts of the eye stalk and gastric mill that are not shed during molting (Kilada, 2012). Another method measures the concentration of a pigment called lipofuscin, and was found to be a suitable method for aging Caribbean spiny lobster *Panulirus argus* (Matthews et al., 2009). These methods provide a direct measurement of age and the potential for more accurate understanding of growth. CDFW will seek opportunities to investigate the application of these techniques to CA lobster.

MPAs also provide researchers with an opportunity to correct for the maximum-size/age-related biases associated with fished populations. Due to the recent establishment of MPAs in southern California (established in 2012) it is unlikely that CA lobster populations inside the MPAs will show a dramatically different size structure than outside MPAs for many years (possibly 2-3 decades). CDFW participated in the south coast region MPA Baseline Study in an effort to track the effects of MPAs on CA lobster populations. The current status of knowledge related to age and growth EFI ranges from poor to moderate. Obtaining better information related to age and growth is a high management priority (Table 5-1).

Stock Distribution

The MLMA Master Plan defines a stock as "a population unit that is selected for management purposes" and its distribution as "where a stock is found." It is necessary to define the stock distribution because of management implications related to potential biological differences between sub-populations and jurisdictional issues (CDFG, 2001). CDFW currently manages the entire population within the SCB as one population and one stock. The status of knowledge related to where CA lobster are found is currently well-known and genetic evidence generally points to CA lobster within US borders being well-mixed during the larval phase (Section 3). However there has been some recent genetic evidence of either self-recruitment and/or spatially cohesive larval cohorts. CDFW will continue to monitor advancements in genetic work and larval tracking as we seek to confirm CA lobster's place in the spectrum between a single mixed population, a meta-population, or a group of separate sub-populations. The research priority for genetic structure is medium (Table 5-1). Regional differences in other aspects of CA lobster biology (e.g. fecundity, growth, reproductive timing) may also be indicators of sub-structure within the stock that may warrant consideration of regional management in the future (Section 6.2.2). Collection of this information is of medium to high importance as noted throughout this section and Table 5-1.

Ecological Interactions

The ecology of CA lobster is discussed in detail in Section 2.1. The species serves as an important scavenger and predator in the southern California kelp forest ecosystem. Predation on intertidal mussels by CA lobsters can relieve red algae from competition for space (Robles and Robb, 1993), and predation on urchins can relieve giant kelp from urchin grazing (Guenther et al., 2012 and references therein). CA lobster plays an important role in the ecology of rocky reefs, and it is associated with critical habitats such as surfgrass beds. Management should remain aware of information on the ecology and habitat preference of *P. interruptus*, and encourage related ecological research and monitoring.

A number of research programs both independently and in collaboration with CDFW are currently conducting long term monitoring of southern California reefs. These programs provide a valuable service monitoring the condition of CA lobster habitats, prey abundance, predators, water quality, and oceanography. The long list of research groups collecting such data include: the National Park Service Kelp Forest Monitoring Program, the Partnership for the Interdisciplinary Study of Coastal Oceans, Santa Barbara Coastal Long Term Ecological Research Program, the California Current – LTER, individual research laboratories, and Reef Check California. Research protocols and data collected for many of these organizations are available online. This FMP does not link ecological metrics directly to the reference points or the HCR, and future research and monitoring of ecological interactions are a medium level priority for CDFW at this time (Table 5-1).

Indices of Abundance - Measurements of the abundance of an organism made over time; used to make inferences about the abundance of an entire population.

Indices of Abundance

Indices of abundance (catch and CPUE) are used as reference points that link directly to the HCR in this FMP. Indices of abundance are perhaps the most common reference points used in fisheries management, and

they are described in detail in Section 4.2.4 and 4.3. CPUE and catch are currently tracked by CDFW and data will be available after each fishing season for the foreseeable future. CDFW is also interested in developing new types of data, making new control rules possible in the future. One example of this is CDFW collaboration on direct visual estimations of CA lobster density and abundance with various academic groups. The knowledge regarding catch and CPUE is rich. Their status as reference points means that the priority for continued monitoring of these parameters is high. CDFW has moderate information on visual surveys on the sea floor; this priority is low (Table 5-1). Larval abundance from CalCOFI as well as settlement studies offers prospective abundance indices that may be linked to spawning biomass and/or recruitment. Ongoing research in these areas is a medium priority.

Movement Patterns

Lobster movements can be divided into two general categories: 1) seasonal movements related to biological or environmental cues, and 2) more frequent foraging excursions (Section 3.6). Both are important to this FMP because they are mechanisms by which lobsters exit MPAs or district closures and become vulnerable to fishing. The spatial scale and frequency of these two movement types require different research approaches.

Lobster movement over longer time periods (i.e., seasonal) can be studied using traditional tag-recapture studies that use individually identifiable tags. CDFW has been involved in such a movement study in San Diego Bay in collaboration with San Diego State University. CDFW was also involved in a study examining spillover rates as part of the South Coast MPA Baseline Study in collaboration with fishermen, San Diego Oceans Foundation, and Scripps Institution of Oceanography.

Unlike seasonal movements, foraging excursions are best studied using “active” (signal-transmitting) tags that are applied to animals and tracked by researchers. CDFW undertook a multi-year tracking study with San Diego State University to look at CA lobster movement around San Diego Bay and the Point Loma kelp bed (Hovel & Neilson, 2011). The level of knowledge on movement patterns is moderate, and their priority is medium (Table 5-1). CDFW will continue to engage in independent and collaborative tagging studies.

Recruitment

Larval recruitment and fishery recruitment are two measures that can be useful in projecting the future trend of the fishery. Data that track larval abundance and recruitment can provide powerful information for fisheries management such as: 1) long term trends that provide direct evidence of a stock’s ability to replenish itself, 2) the state of the spawning biomass that produces the observed larval abundance (Jacobson and MacCall, 1995), and 3) annual levels of recruitment to predict future catches (e.g., Phillips, 1986; Caputi et al., 1995; Shanks et al., 2010). Spatial pattern of larval abundance also helps define reef areas that are sources or sinks for reproduction of the stock, which can be invaluable for understanding the role of MPAs as conservation tools. For these reasons, many lobster fisheries have data collection programs that track the abundance of larvae using artificial collectors. California has no collector program for CA lobster larvae, but phyllosoma larvae are collected on annual CalCOFI cruises and have been used to explore patterns and processes related to CA lobster larval abundance and environmental conditions or stock abundance (e.g., Johnson, 1960a, b; Pringle, 1986; Koslow et al., 2012).

Implementation of a formal CA lobster larval monitoring program could provide valuable information regarding the current and future conditions of the CA lobster stock. Abundance of earlier stage larvae may serve as an indicator of adult spawning potential while late stage larvae may help forecast changes in stock abundance. However, puerulus settlement data did not predict stock fluctuations of Australian lobster (Linnane et al., 2013a). The workload associated with a later stage puerulus larval collection program would

be significant because collectors must be sampled frequently (every 1-2 weeks) over the peak settlement period of 4+ months. This sampling includes recovery of the collecting devices and laboratory sorting of the contents to count larvae. Such programs are only valuable if they are run nearly every year and over long time spans. A recent study by Miller (2014b) examined the relative effectiveness of two collector designs, but testing would need to continue to identify the most appropriate type(s) of collectors for CA lobster. Thus, a larval recruitment monitoring program represents a significant long-term investment, and CDFW would need to identify the resources necessary to conduct this monitoring. A larval monitoring program that has the resolution to define larval sources and sinks could aid management, but would require a large number of larval collectors throughout the SCB and the associated cost would be significant. Such an approach would ideally be coupled with genetic studies that help identify the origins of settling larvae. An alternative to larval collection is to use oceanographic models of currents to estimate the locations of the population sources and sinks. Such a model was used to evaluate MPA network designs during the MLPA process in southern California. Development, refinement, and application of such models have not occurred within the context of CA lobster fishery, but CDFW will continue to explore this tool.

Monitoring fishery recruitment (growth of sublegal-size lobsters to legal size) allows for predictions of fishery yield for upcoming seasons, and provides assurance that reproduction has been successful in previous years (i.e., during the year(s) that current fishery recruits hatched and settled). Trends in sublegal-size abundance are used as reference points in some lobster fisheries (e.g., ASFMC, 2009). Obtainment of these data is inexpensive when collected in logbooks, but often do not reveal how many times individual lobsters are caught, released, and recaptured. Fisheries that use sublegal-size abundance to estimate fishery recruitment usually have dedicated survey programs for collecting these data. Current knowledge regarding recruitment ranges from poor to moderate. Obtaining better information on the stock's sublegal-size abundance is one of the highest priorities for management, while information regarding larvae has medium priority (Table 5-1).

Reproduction

Size and age at maturity are important parameters for both the Cable-CDFW model and the MSE model. Determining this parameter has primarily been based on observing berried females found in fishery harvests and research trapping. Recent CDFW measurements during tagging studies suggest that SAM is smaller than previously thought. How this parameter and the timing of reproduction vary regionally is unknown. Fecundity of large female lobsters such as those inside MPAs has also not been thoroughly sampled. For these reasons, determining variability across regions is a future goal. State of knowledge on CA lobster reproduction is moderate, and the priority for obtaining better information is high (Table 5-1).

Total Mortality

Total mortality - Natural mortality and fishing mortality combined.
Natural mortality (M) - The rate at which organisms in a population die due to natural causes.
Fishing mortality (F) - The rate at which organisms in a population die due to fishing.

Total mortality is the rate at which fish die, and it can be separated into two components: 1) **natural mortality** (causes include predation, disease, and old age), and 2) **fishing mortality**. Natural mortality is a critical parameter in biological models used in stock assessment. Several studies have estimated similar natural mortality rates for CA lobster (Chavez and Gorostieta, 2010; Kay, 2011; Nielson, 2011) and they are consistent with estimates for other temperate spiny lobster species (Kay and Wilson, 2012). Little is known about juvenile natural mortality. Factors that affect natural mortality include ocean temperature, oceanographic regimes (e.g., PDO, El Niño), reef-specific ecology, habitat characteristics, and existence of MPAs (Kay and Wilson, 2012). Approaches for estimating natural mortality include tag-recapture and examination of populations in MPAs.

Fishing mortality (*F*) is an estimate of the rate at which fish are caught. A harvest rate (*u*) can be calculated directly from *F*, and it is the percentage of the legally harvestable fish stock that is caught in a fishing season (Section 4.1). Fishing mortality (and harvest rates) lie at the core of this FMP. *F* directly links to the MLMA objectives (Table 5-1), to reference points determined or used by the FMP models, and to any control rule described by the FMP. A major emphasis of this FMP is focused upon the identification and management of harvest rates that avoid/minimize recruitment overfishing, economic overfishing, and ecological impacts. Available estimates for mortality range from poor to moderate and are adequate for modeling purposes. However, accurate and region-specific estimations of fishing mortality rates are central to accurate model runs, and are thus the highest research priorities identified in this FMP (Table 5-1).

Stock Composition - Any description of the population attributes of a stock (age, size, sex), usually within a spatial context. This commonly refers to the spatial distribution of breeding groups or genetically-related organisms.
Length frequency distribution - A graphical representation of the number of organisms by length.

Other EFI –Stock Composition

The models proposed by the CA lobster FMP to produce reference point data would benefit from additional EFI not explicitly listed in the MLMA Master Plan. CDFW may include any biological information that is "necessary to permit fisheries to be managed [sustainably]" as part of a fishery's EFI (FGC § 93). Additional EFI to improve modeling includes **stock composition**. Stock composition generally refers to the size composition (**length frequency distribution**), abundance, and sex ratio of a stock. Better information on the spiny lobsters' stock composition can provide a useful and independent corroboration to CDFW's other assessment efforts.

Length frequency distribution gives CDFW a way to corroborate calculations of growth rate, fecundity, and mortality. However, the assumption that length frequency data derived from commercial landings would accurately represent the length frequencies of natural populations holds true only if lobsters of all sizes have an equal chance of entering and remaining in traps or other fishing/sampling gear. Otherwise, the true population size composition will be misrepresented in any data based on traps. To compensate for potential bias within the landings database, CDFW currently supplements its length-frequency data with samples from research traps, gill nets, and SCUBA surveys that are part of the collaborative South Coast MPA baseline study. California Sea Grant's at-sea sampling pilot project and creel sampling also provide more accurate length frequency distributions. At-sea sampling currently has several advantages over port-sampling: 1) higher spatial resolution; 2) sublegal-size lobsters are measured; and 3) bycatch can be recorded. Currently CDFW does not have a program for collection of individual length frequency data with guaranteed consistency through time. Such a program would expand CDFW's options for calculation of fishing mortality with potentially greater accuracy, distinguishing processes effecting lobster life stages differentially, and tracking cohorts through time. Length frequency data from the recreational fishery would be similarly valuable and is not well represented by lengths in the commercial fishery because recreational fishermen are able to target larger individuals. CDFW does not expect that size information could be accurately collected on recreational report cards and creel surveys would be most effective.

Abundance of the legal-sized individuals can help assess present harvest rate and future catches. CDFW has calculated legal-size lobster abundance based on CDFW-collected commercial catch data in the past, but these estimations have relatively coarse spatial resolution. Finer geographical-scale estimations have also been made (e.g., Hovel and Neilson 2011; Kay et al. 2011; Iacchei et al 2005). CDFW has participated in new local studies to help fill the gaps between the previous studies, especially those pertaining to the southern portion of the bight.

The number of sublegal-size lobsters captured by the commercial fishery is being recorded in logbooks, and with improved tagging studies, comparisons of sublegal-size abundance across space and time can be adjusted to more accurately reflect the abundance of sublegal-size lobsters. Information on the sex ratio of the stock was recently collected by California Sea Grant's at-sea sampling program and CDFW is not planning any new monitoring effort to directly obtain information on stock sex ratios. Continued sex ratio information could be used to improve population model output and would be important if a sex-selective fishery were considered in the future.

In addition, research that describes invertebrate population changes in California MPAs is also an ongoing priority within CDFW to inform adaptive management of the State MPA network. MPAs affect lobster stock composition by producing large and localized increases in lobster average size and abundance inside reserve borders (Diaz et al., 2011). New information on the cumulative biomass and reproductive potential of the lobsters inside reserves can then be incorporated into the estimates for *F*, SPR, or other measures of stock size used in this FMP. CDFW's information on these parameters ranges from poor to rich, and obtaining better information is of the highest priority. This effort will potentially span decades as various components of the coastal ecosystem rebuild to pre-exploitation level.

Other EFI – Habitat Coverage by Type

An accurate estimation for the total percentage of CA lobster habitat that is contained within MPAs is an important input for the calculation of SPR (Section 4.3.1.3). CDFW obtained the current estimate by calculating the percentage of shallow hard-bottom habitats (0-100 m depth, 0-328 ft) that are protected by MPAs prohibiting both commercial and recreational take. This estimate utilizes the maximum extent of kelp canopy as a proxy for hard-bottom habitat in areas where seafloor mapping data are not available. Incorporation of other habitat types such as tidal flats and eelgrass beds is currently not appropriate either because the extent to which CA lobsters utilize these habitats is unclear, or because there is limited spatial data detailing the extent of these areas. Overall, CDFW possesses a moderate amount of information related to habitat coverage; better assessment of these areas is of the highest priority (Table 5-1). CDFW will continue to incorporate new information to better calculate the current state of the population's spawning potential, as well as to better estimate the baseline condition during the period of stability in the early 2000s, which is necessary to improve the SPRTHRESHOLD.

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Table 5-1: Categories of EFI identified by the MLMA Master Plan and specific data types and their priorities for research identified by this FMP.

Biological EFI Category (MLMA)	Specific data types used in fisheries management	Current status of knowledge *(poor, moderate, rich)*	Priority for management and FMP *(low, medium, high, highest)*	Data collection methods												
				Logbooks	Landing Receipts	Rec. report cards	At-Sea Sampling	Port sampling	Creel sampling	Research traps	Research SCUBA	MPA monitoring	Larval collectors	Lab studies	Oceanography	Genetics
Age and growth	Individual growth rates	moderate	high				S	S	S	P		P		S		
	Longevity (max age and size)	poor	high									P				
Stock distribution	Catch relative to fishing blocks	rich	low	P	P					P		S			S	
	Genetic population structure/larval mixing	moderate	medium													P
Ecological interactions	Role as predators (e.g., to control grazers)	moderate	low								P			S		
	Essential habitat (e.g., surfgrass / shelters)	rich	medium								P			S		
Indices of abundance	Catch (per season)	rich	**highest**		P	P			P							
	CPUE	rich	**highest**	P		P	P			P						
	Visual surveys on seafloor	moderate	low								P					
	Larval abundance	moderate	medium										P			P
Movement patterns	Seasonal/annual movement distances	moderate	medium				P			P						
	Nightly foraging distances	moderate	medium							P	P					
Recruitment	Source and sinks for larvae	poor	medium										P		P	P
	Larval abundance and recruitment	moderate	medium										P		P	
	Sublegal-size lobster abundance	poor	**highest**	P			P			P	S		S			
Reproduction	Size at maturity (SAM)	moderate	high				P			P		S		P		
	Fecundity	moderate	high							P		S		P		
Total mortality	Natural mortality	moderate	high							P		P				
	Fishing mortality (harvest rates)	moderate	**highest**	S	S		P			P		P				
	Handling mortality and sublethal impacts	poor	medium							P	P					
Stock composition	Size structure of stock (length frequency)	moderate	**highest**				P	P	P	P		P				
	Selectivity of length frequency sampling gear	poor	**highest**							P		P				
	Mean size of lobsters in catch	rich	**highest**	P	P		P	P		S						
	Effects of MPAs on size and abundance	moderate	**highest**				S			P	S	P				
Habitat coverage	% of a habitat type covered by MPAs	moderate	**highest**				P			P	P				S	

For each data type, descriptions are provided for the current status of knowledge and the priority of improving data collection for management under this FMP (i.e., importance for assessing, monitoring, and maintaining sustainability of the fishery). Finally, data collection methods that are best suited to obtaining each data type are indicated. (P = primary data source; S = secondary data source).

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5.3 Socioeconomic EFI: Update on the 2013 Economic Report

The purpose of socioeconomic EFI is to help inform CDFW of the social and economic impacts of potential regulatory actions (CDFG, 2001). The MLMA Master Plan characterized the CA lobster fishery as data poor back in 2001. Various socioeconomic aspects of the fishery have since been analyzed first in a 2009 report and again in 2013 (Hackett et al., 2009; Appendix VI; Section 2.5). CDFW will continue to pursue similar studies in the future to update established knowledge and fill any knowledge gaps. In particular, future survey efforts should track the popularity of hoop nets as well as improve estimates on groups that have been sparsely sampled in previous socioeconomic surveys (Section 2.2).

Employment

The commercial CA lobster fishery was responsible for an estimated 323 full-time equivalent jobs during the 2011-12 fishing season. The commercial fishery was also responsible for a total estimated economic effect of over $22 million in southern California over the same fishing season (Appendix VI). Analysis of the economic effects of the recreational fishery has not been done.

Expenditure

Analysis of the expenditures for both the recreational and the commercial fisheries during the 2011-2012 fishing season indicate that the Commercial fishery expended ~$10.5 million and the recreational fishery expended ~$40.8 million.

Resource Demand

The MLMA master plan defines resource demand as "the relationship between the quantity and quality of a good or service, and demand by the user at various market price or cost" (CDFG, 2001). Neither the 2009 nor the 2013 reports on the CA lobster fishery focused on this particular issue. However, recent increase in foreign demand and the associated rise in ex-vessel value for CA lobster show that better analyses on market demand may become increasingly important for effective fishery management.

Revenue

Revenue includes revenue from both sales conducted within the coastal community and sales through exports (CDFG, 2001). The ex-vessel value of lobsters landed in the 2011-12 fishing season was estimated at ~$12.9 million. The revenue earned by supporting industries (e.g., boatyards, trap makers, etc.) is also part of the economic impact of the commercial fishery, and it has been estimated to be just under $5 million per year between the 2009-10 and the 2011-12 fishing seasons (Appendix VI). However, as with the employment EFI, revenue for the supporting industry of the recreational fishery has not been calculated, and at this point can only be inferred from the sector's expenditure.

User/Industry Demographics

The demographics of the current commercial fishermen have not been analyzed. However, 86% of the recreational fishermen come from zip codes that are within 50 miles of the coastline (Appendix VI). Sport fishermen from further inland spend a disproportionately higher amount of money on their recreational trips (Appendix VI).

5.4 Cooperation and Collaboration in Fisheries Research

Globally, involvement of multiple stakeholders in fisheries research (e.g., the collection of fishery-dependent EFI) is increasing as researchers, managers, and fishermen expand communications and

partnerships. The level and type of this involvement by stakeholders can differ widely. Research that involves stakeholders in some specific aspect of the project is considered cooperative research. In cooperative research, each stakeholder may focus their resources on one aspect of the research or may work jointly on one or several parts of the project (e.g. collecting data aboard a vessel provided by another stakeholder). Collaborative research, like cooperative research, brings stakeholders together to work towards a common goal. However, true collaborative research also involves stakeholders during all phases of research including hypothesis generation, data collection, and interpretation of results (NRC, 2004; Wendt and Starr, 2009).

Wendt and Starr (2009) add the caveat that true collaborative research also includes a joint intellectual effort during all phases of the research. While the distinctions between these two types of research are conceptually distinct, in most cases multi-stakeholder research is neither purely cooperative nor purely collaborative, but a continuum between the two as determined by the specific stakeholder involvement (NRC, 2004).

Cooperative and collaborative fisheries research (CFR) hold significant potential to improve fishery management by increasing the quantity of data collected (Karp et al., 2001; NRC, 2004) as well as improving communication, understanding, and trust between managers and stakeholders (McCay and Jentoft, 1996; Conway and Pomeroy, 2006; Wendt and Starr, 2009). In cases where the knowledge and skill of the stakeholders is successfully incorporated, CFR can also result in increasing the quality of data collected (NRC, 2004; Wendt and Starr, 2009).

While these benefits can be significant, they must also be weighed against the cost of conducting CFR. Elements for evaluating and prioritizing CFR include the expected benefits, the expected research costs, and the expectations for success (NRC, 2004).

Fishery participation in data collection and management is an integral part of some lobster fisheries (Phillips and Kittaka, 2000). In certain fisheries, industry participation focuses mostly upon CFR, in large part because it is cost-effective. However, because of its tight links to co-management, CFR can provide a bridge to locally-based co-management systems that may increase fishery sustainability (Wilson et al., 2003; Gutiérrez et al., 2011). Consequently, industry participation in other fisheries includes co-management arrangements in which industry directly participates in structuring harvest regulations. Important examples of lobster fisheries with CFR and co-management agreements include *P. interruptus* in Baja, Mexico (Scientific Certification Systems, 2011; Phillips et al., 2013), *H. americanus* in Maine (ASMFC, 2009; Acheson and Gardner, 2010), and *J. edwarsii* in some fishing communities in New Zealand (Miller and Breen, 2010).

Collaborative research and/or co-management can also be furthered when members of the commercial fishery and the recreational fishery form organizations to exchange information and perspectives as well as to represent them during government processes. This FMP does not preclude future improvement to the HCR or better management alternatives, and the stakeholder community should encourage initiatives that further sustainability and fisheries performance as long as they adhere to the MLMA objectives. Fishermen are encouraged to collaborate on their own initiatives and to form community organizations to help inform management. An example of this type of arrangement is the California Sea Urchin Commission. Furthermore, interested parties may wish to work with CDFW and the Commission to develop innovations not explicitly mentioned in this FMP. These can include, but are not limited to, gear innovations, monitoring tools, regional management, and other technological advances.

6. Implementation and Amendment Process of the FMP

6.1 Implementation

The implementation of this FMP can be divided into 3 categories: 1) enforcement, 2) research and monitoring, and 3) management.

6.1.1 Enforcement

CDFW Law Enforcement Division (LED) officers patrol the coast and offshore islands off southern California on a daily basis. They also conduct inspections of landings, wholesale and retail facilities, restaurants, and vehicles used to transport fish. These officers serve to ensure compliance with CDFW regulations, including the ones that will result from this FMP, through both education and enforcement actions. They also collaborate with CDFW scientists to conduct research activities, participate in management activities, and provide on-the-ground information to management. Active enforcement is important to help ensure the estimated benefits to the stock from harvest regulations (e.g., MPAs, size limit, etc.) are realized.

6.1.2 Research and Monitoring

Chapter 4.7 outlines and discusses how CDFW will continue to monitor the CA lobster fisheries and to improve upon the existing state of knowledge regarding the fisheries and the species. These efforts include both primary research aimed at obtaining and refining the EFI as well as periodic monitoring of fishery-dependent data, such as information generated from the recreational lobster report cards and commercial landing receipts and logbooks.

6.1.3 Management

The Marine Life Management Act requires that "[f]ishery management decisions are adaptive and are based on the best available scientific information and other relevant information" (FGC § 7056(g). Furthermore, management systems should be periodically reviewed for their effectiveness and fairness (FGC § 7056(m)). The CDFW will analyze and act on the results of research and monitoring efforts as appropriate to better inform the management framework outlined in the FMP. The ongoing and potential research efforts described in the previous chapter are expected to yield new useful information regarding the CA lobster stock and fisheries.

By design, the HCR is adaptive in nature. The ocean is a dynamic environment; requiring very specific action could lead to improper management responses. The HCR directs CDFW to investigate the underlying causes of any significant change relative to the threshold reference points. Refinement with the most up-to-date information will always be part of this process, as will active solicitation of input from stakeholders in interpreting the data. Once the underlying cause of a change is identified, CDFW will undertake analysis (e.g., using the MSE model, constituent input, etc.) to determine the most appropriate course of action.

CDFW will continue to seek input from the various constituents as appropriate. CDFW will also bear the primary responsibility of conducting other future amendment processes. To facilitate active oversight and proactive management, CDFW projects that CA lobster management will require a minimum of two full-time dedicated scientific staff positions and one scientific aid position in the future. The scientific staff will be responsible for overseeing the commercial data collected from the trap logs and the landing receipts and the recreational data collected from the lobster report cards. The staff will also be conducting and coordinating future research and public outreach efforts. The dedicated scientists will also be responsible for monitoring the threshold reference points and advising CDFW management of the status of the fisheries and the stock.

6.1.4 Cost

Costs associated with lobster management as outlined in this FMP can be divided into two categories: 1) regular and ongoing research and management and 2) investigations that may be prompted by the HCR on an unknown and irregular basis. Ongoing management will include all of the biological and enforcement tasks associated with existing regulations and statutes as well as proposed regulatory changes associated with this FMP. The annual cost estimates outlined in Table 6-1 are a minimum. Estimated personnel costs are based on current rates which will rise in the future.

Monitoring the reference points outlined by this FMP and managing the current data streams will require a minimum of three CDFW Marine Region biological personnel dedicated exclusively to CA lobster. These include one environmental scientist already on staff plus one new environmental scientist and one new scientific aid to be hired. Staff benefits and overhead rates of 47.66% and 35.00% were applied, respectively.

The enforcement costs for the CA lobster fisheries totaled $ 493,463 for the 2013-14 fishing season. Officer hours accounted for $206,792 and $286,671 was attributed to patrol crafts' fuel and maintenance. It is not known how new regulations associated with this FMP will impact costs and therefore past costs should be considered the minimum of what may be required in the future. Aspects of recreational hole-punching of CA lobster tails and the commercial trap limit are likely to both require additional effort from enforcement staff and also improve enforcement efficiency. In total, CDFW expended 3,142 regular officer hours at an average of $47.09 per hour and 833 overtime hours at an average of $70.63 to regulate the commercial and recreational fisheries. Of this, 1,758 regular officer hours and 454 overtime hours were expended to enforce recreational statutes and regulations on shore. Enforcement of statutes and regulations from patrol crafts required 804 regular hours and 279 overtime hours. An additional 581 regular hours and 102 overtime hours were expended to enforce commercial laws and regulations that were not otherwise covered by vessel-based enforcement actions.

When HCR reference points are crossed, investigation of the underlying causes will be required. The scope of those investigations will depend on the number and identity of the reference points below threshold and their position. Scenarios of lesser concern may be investigated by examining existing data streams and require only some additional staff time from Marine Region staff not dedicated to lobster. Scenarios of greater concern may require dedicated field research efforts. This would involve equipment and travel costs, additional staff time, and possibly contracts with outside entities.

Table 6-1: Estimated Annual Implementation Costs.

Biological Personnel	New Environmental Scientist	Existing Environmental Scientist	Scientific Aid	Subtotal
Salaries & wages	72,702	72,702	23,000	
Staff benefits	34,650	34,650	10,962	
General expenses	6,000	6,000	1,500	
Other Expenses	20,000			
Overhead	46,673	39,673	12,412	
Biological personnel total	180,025	153,025	47,874	380,924
Enforcement (personnel & equipment combined)				493,463
ONGOING MANAGEMENT TOTAL				874,387

6.2 Adjustment and Amendment to Administration, Regulations, and the FMP

Under the FGC, each FMP "shall include a procedure for review and amendment of the plan, as necessary" (FGC § 7078). In particular, an FMP shall specify the type(s) of regulations that CDFW can adopt without amendment(s) to the FMP (FGC § 7087(b)). In addition to the type of regulations that can be adopted without an FMP amendment, this section will also prescribe the conditions of changing the FMP. This section does not apply to routine day-to-day CDFW operations.

6.2.1 Regulatory Amendments that Do Not Warrant FMP Amendments

The Commission can adopt new regulation concerning the CA lobster fishery without amendment to the FMP. These may include regulations designed to improve the orderly operation of the fisheries or more efficient conservation of the relevant resources. The LAC recommendations are examples of these regulations. This section does not modify CDFW's and the Commission's authority to promulgate regulations during emergencies (e.g., FGC § 240, GC § 11349.6).

6.2.2 When and How the FMP Will Be Amended

If new, relevant information becomes available, an FMP amendment based on that information may be appropriate. Not all changes to management procedures outlined in this FMP would prompt an amendment. For example, addition of a new or removal of an existing reference point would require amendment but refining parameters or calculations within the Cable-CDFW model using new EFI data would not require amendment. Any amendment that would affect an existing regulation or requires new regulations would be accompanied by a regulatory amendment proposal for the Commission.

CDFW may propose an FMP amendment out of its own initiative and discretion. In this case, CDFW will solicit input from Tribes, stakeholders, and the Commission. CDFW will provide Tribes and stakeholders with the relevant schedule and agenda. They will have at least 30 days to review the proposal prior to the hearing. CDFW may submit the proposal to the Commission after 30 days, or it may hold further public meetings before submission (see also FGC § 7077). Interested parties may also propose plan provisions or amendments to either CDFW or the Commission. Existing CDFW and Commission workload and priorities may affect the timeliness of the Commission's response to petitions.

An FMP amendment can be focused on a particular part of the document; an amendment process should not automatically trigger the amendment of the entire FMP. However, an amendment on one part of the FMP should not contradict another part. Adopting a new type of reference point not contemplated in Section 4.3 HCR is one example. Changing or replacing a threshold reference point should not automatically trigger a review of the entire natural history of the CA lobster, but such a change must not contradict other parts of the HCR that are not being amended.

6.3 List of Inoperative Statutes

The implementing regulations of this FMP will render the following sections of the Fish and Game code inoperative once they are adopted:

1. FGC § 8251: This section dictates the season length for the commercial CA lobster fishery. The HCR prescribed by this FMP incorporates changes to season lengths as a possible management adjustment.
2. FGC § 8252: This section prescribes the size limit for the commercial sector, which is identical to the recreational sector limit found in the CCR. The commercial limit will be moved into Title 14, CCR reflecting the Commission's authority to make adjustment.
3. FGC § 8254(c): This section states an annual lobster permit fee of $265. The permit fee will change due to implementation of the trap tag program.

4. FGC § 8258: This section lists the Districts where commercial lobster traps may be used to take CA lobster. The use of commercial traps to take CA lobster in certain Districts may change if the District closure option within the harvest control rule toolbox is used.

This FMP will render the following sections of the Fish and Game code inoperative as applied to only the CA lobster fisheries once the implementing regulations are in place:

1. FGC § 7857(e): This section prohibits CDFW from issuing more than one of a single type of permit, including a lobster permit, to a single fisherman. The trap limit program envisioned by the FMP may allow fishermen to stack multiple permits, and thus this section will be rendered inactive for lobster operator permits.
2. FGC § 7857(j): This section prohibits the transfer of a commercial fishing license, permit, or other entitlement. This section will be made inoperative to be consistent with the objectives of this FMP related to permit transferability and the acquisition of a second permit as part of the proposed trap limit program.
3. FGC § 8102: This section states the conditions for issuing limited entry permits to a working partner of a permit holder in cases where the permit holder dies, is incapacitated or retires. This section will be made inoperative as it applies to the spiny lobster fishery to be consistent with the commercial spiny lobster limited entry fishery permit program and trap limit program as described in the FMP.
4. FGC § 8103: This section states the conditions for transferring limited entry permits upon the death of the permit holder. This section will be made inoperative as it applies to the spiny lobster fishery to be consistent with the commercial spiny lobster limited entry fishery permit program and trap limit program as described in the FMP.
5. FGC § 9004: This section requires commercial fishermen to service any deployed trap every 96 hours. However, proposed regulations will extend this servicing requirement to every 168 hours. As such, this section will be rendered inoperative as applied to the spiny lobster fishery.

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Glossary

Abundance - The total number of animals in a population. This is rarely known, but usually estimated from relative abundance (see **Relative abundance**), although other methods may be used.

Adaptive management - In regard to a marine fishery, means a scientific policy that seeks to improve management of biological resources, particularly in areas of scientific uncertainty, by viewing program actions as tools for learning. Actions shall be designed so that even if they fail, they will provide useful information for future actions. Monitoring and evaluation shall be emphasized so that the interaction of different elements within the system can be better understood.

Advisory Committee - The Advisory Committee is a body composed of public constituent representatives that provide important advice to the spiny lobster fishery.

Allocation - In the LFMP, allocation means a certain amount of lobster set aside for recreational, commercial, and ecosystem needs.

Bag limits - The total amount of fish or other species that may be captured per person per day by law.

Benthic - On or relating to the region at the bottom of a sea or ocean.

Biomass (B) - The total weight of organisms at a given point in time in a defined stock, area, population, or catch.

Bycatch - Fish or other marine life that are taken in a fishery but are not the target of the fishery. Includes non-target organisms whether or not they are discarded, and includes organisms discarded because they are of an undesirable species, size, sex, or quality, or because they are required by law not to be retained.

Cable-CDFW Model - A simplified and efficient fishery stock model developed for the California spiny lobster by Dr. Richard Parrish. CDFW currently uses this model to calculate the SPR of the stock.

Capacity - The potential ability of a vessel or a fleet of vessels to capture organisms. This ability is based on the number of fishing vessels in the fleet, the size and technical efficiency of each vessel, time spent fishing, and management regulations.

Catch Per Unit Effort (CPUE) - The rate at which fish are caught; typically expressed as a number or weight of fish captured per unit of effort. Units of effort can be assigned many ways, including the time spent fishing (hours or days), the amount of fishing gear deployed (number of vessels, traps, nets, etc.), the number of times that fishing gear is deployed and retrieved (e.g., net hauls, trap pulls), or a combination of these estimates. Because it is difficult and expensive to scientifically measure the number of fish in an area (abundance), CPUE is often used as an index for the relative abundance of organisms across time or space. For CA lobster, CPUE is typically defined as the number of legal (or sublegal-sized) lobsters per trap pull for the commercial fishery, and number of legal lobsters retained per fishing trip for the recreational fishery. Effort is most often described in terms of trap pulls, total traps, and number of active permits for the commercial fishery, and number of fishing trips for the recreational fishery.

Commercial fishery - Describes a group of enterprises and individuals as well as their actions associated with fishing for certain species with the intent of selling the catch.

Commission – California Fish and Game Commission

Conical hoop net - A modified style of hoop net used to catch lobster by the recreational lobster fishing sector in California; it is basket shaped, does not collapse, and does not lie flat on the seafloor.

Creel survey - Catch information gathered from recreational sources.

California Recreational Fisheries Survey (CRFS) - The California Recreational Fisheries Survey (CRFS) is the method for estimating total marine recreational finfish catch and effort in California. The CRFS is a coordinated sampling survey designed to gather catch and effort data from anglers in all modes of marine recreational finfish fishing.

Department - In the context of the LFMP, refers to the California Department of Fish and Wildlife (CDFW).

Depleted/Depletion - Exploitation of a resource down to unsustainable levels.

Depressed fisheries - The condition of a fishery for which the best available scientific information and other relevant information that the Commission or Department possesses or receives, indicates that a declining population trend has occurred over a period of time appropriate to that fishery. With regard to fisheries for which management is based on maximum sustainable yield, or in which a natural mortality rate is available, "depressed" means the condition of a fishery that exhibits declining fish population abundance levels below those consistent with maximum sustainable yield.

Economic output - Represents deliveries of final goods and services by the sector to domestic households, investment, government and non-profit institutions, and net exports outside the local economy.

Economic overfishing - Fishing levels that exceed maximum economic yield.

Ecosystem - The physical and climatic features and all the living and dead organisms in an area that are interrelated in the transfer of matter and energy, which together produce and maintain a characteristic type of biological community. Ecosystems can range in size.

Effort - A measure of some expenditure in pursuing an activity. The measure in CA lobster fishing effort is usually in terms of number of trap pulls, traps fished (in commercial fishery), number of fishing trips, or time spent fishing.

Effort Creep - A phenomenon where technological advancements in a fishery are able to mask the declining efficiency of a fishery caused by stock declines.

El Niño - A periodic warming of the ocean surface waters in the eastern Pacific Ocean. It is characterized by a lack of upwelling of cold, nutrient-rich waters nearshore.

Essential fishery information (EFI) - With regard to a marine fishery, means information about fish life history and habitat requirements; the status and trends of fish populations, fishing effort, and catch levels; fishery effects on fish age structure and on other marine living resources and users; and any other information related to the biology of a fish species or fishery that is necessary to inform management.

Ex-vessel price/Ex-vessel value - The value of fish at first sale by fishermen at the dock, distinguished from wholesale or retail value.

Fecundity - The reproductive capacity of an individual female animal during a reproductive event or breeding season, generally expressed as the number of eggs or larvae per unit weight or per individual.

Finfish – Any species of bony fish or cartilaginous fish (sharks, skates and rays). Finfish do not include amphibians, invertebrates, plants or algae.

Fishery - Fishing for, harvesting, or catching one or more populations of marine fish or marine plants that may be treated as a unit for purposes of conservation and management and that are identified on the basis of geographical, scientific, technical, recreational, and economic characteristics.

Fishery-dependent data - Information collected directly from or during the process of fishing, or from fishery landing data. May be collected from commercial and/or recreational sources, and may include catch/effort reported by fishermen, size and age composition of the catch, and biological samples collected at port.

Fishery-independent data – Scientific research to collect information that is independent of commercial or recreational fishing operations. Surveys utilizing commercial fishing gear may provide unbiased estimates of abundance. Surveys may also use other methods (e.g., acoustics, SCUBA, video) to collect other biological or ecological information (e.g., movement, migration, growth rates, natural mortality) relevant to a fishery.

Fishing mortality (F) - The rate at which organisms in a population die due to fishing.

Growth overfishing - Fishing in which yield per recruit is lower than theoretical maximum values due to the removal of small and rapidly growing fish.

Habitat - The physical, chemical, and biological features of the environment where an organism lives.

Harvest control rules (HCR) -Harvest control rules are plans of action that prescribe adjustments in harvest regulations (e.g., fishing effort, total allowable catch, minimum legal size) and are activated ("triggered") when the calculated amount of a resource that can sustainably be taken (the defined upper limit, also known as "threshold reference point") is reached or surpassed. Harvest control rules must be based on objective, measurable criteria such as population size, productivity, density, or other inputs.

Harvest rate (u) - The percentage of legally harvestable individuals in a population that are removed each year due to fishing.

Harvest regulations - The rules that define how fishermen are allowed to harvest fish. Harvest regulations are diverse and include restrictions on size of animals harvested, effort, total catch, gear types, season, or location where fishing is permitted.

Hoop net - A round net used to catch lobster by the recreational lobster fishing sector in California; it traditionally lies flat on the seafloor and assumes a basket shape upon retrieval to the surface.

Indices of Abundance - Measurements of the abundance of an organism made over time; used to make inferences about the abundance of an entire population.

Individual transferable quota (ITQ) - A program which limits the catch allowed per license or individual as well as the number of individuals who participate.

Input (from **stock assessment models) -** The numerical parameters provided to a stock assessment model; these can be a biological parameter such as the growth rate of the species, or it can be a management parameter, such as the legal size limit.

Intertidal - The part of the shore that lies between the low and high water lines.

Instantaneous Fishing mortality (F) - The rate at which organisms are harvested or killed due to fishing; F is an instantaneous rate that reflects the rate at which a proportion of a population is being lost, whereas the harvest rate (*u*) is an annual rate that reflects the rate at which a number of fish from a population is being lost.

Landing receipt - A document provided by the Department to commercial fish markets for recording landing information. Information required includes date, port of landing, species or market category of fish, pounds landed, and price paid.

Landings - The number or poundage of fish unloaded at a dock by commercial fishermen or brought to shore by recreational fishermen for personal use. Landings are reported at the points where fish are brought to shore. Note that landings, catch, and harvest define different things.

Length frequency distribution - A graphical representation of the number of organisms by length.

Life history - The history of changes an organism passes through in its development from egg, spore, or other primary stage until its natural death.

Limited entry program - Regulatory program that restricts the total number of permitted fishing licenses or vessels.

Lobster Advisory Committee - A committee composed of representatives for the recreational fishery, the commercial fishery, environmental interest groups, scientific experts, non-consumptive recreational interest groups, and federal resource managers; the committee was responsible for providing crucial constituent inputs during the drafting process of this FMP in the form of a consensus recommendation.

Logbooks - Records of fishing activity and catch maintained by commercial fishermen. Typically used to estimate CPUE in assessment models.

Management strategy evaluation (MSE) - For the purposes of the CA lobster FMP, the MSE is a computer model that simulates lobster population dynamics, designed by a team led by Dr. Yong Chen, University of Maine. The MSE was designed to allow CDFW to monitor and evaluate the effects of management measures and the lobster fisheries on the lobster population. The model will not be ready for use until CDFW adapts its scripts to the state's fishery management framework.

Marine Life Management Act (MLMA) - The Marine Life Management Act (MLMA), which became California law January 1, 1999, calls for using several tools to meet its goals of conserving entire ecosystems, placing value on non-consumptive benefits, sustainability, habitat conservation, restoring depressed fisheries, limiting bycatch, and recognizing the interests of people dependent on fishing. FMPs are one of those tools.

Marine Life Protection Act (MLPA) - The MLPA, enacted in 1999, required the California Department of Fish and Wildlife to develop a Marine Life Protection Program, including a Master Plan for a network of Marine Protected Areas (MPAs) within state waters. The network of MPAs includes an improved State Marine Reserve (complete no-take areas) component and other classifications of MPAs (State Marine Parks and State Marine Conservation Areas). The goals of the MLPA are varied and include protecting portions of ecosystems in a variety of habitats, preserving biodiversity, and helping to sustain and protect populations of fished species.

Marine protected areas (MPAs) - Areas closed to all fishing, or to specific user groups, or to the take of certain species; they are used to geographically limit effort and to protect portions of stocks as well as various ecosystem services and non-consumptive uses.

Maximum economic yield (MEY) - The maximum possible revenue after accounting for the costs of fishing that may be achieved in a fishery. MEY typically is reached at smaller catches than MSY.

Maximum sustainable yield (MSY) - In a marine fishery, means the largest catch that can be taken from a stock continuously over time that does not result in a continuing reduction in stock abundance, assuming constant environmental conditions. MSY is generally presented as a maximum annual catch that can be maintained indefinitely; however, MSY can change with fluctuations in abundance and environmental variability (e.g. shifts in ocean regimes), requiring adjustments in allowable harvest.

Natural mortality (M) - The rate at which organisms in a population die due to natural causes.

Nearshore - All oceanic state waters within 0-3 miles from shore or less than 100 fathoms deep, whichever is greater.

Nocturnal - Relating to, or occurring at night.

Non-consumptive uses - Activities which involve the specified resource but no harvest is involved.

Offshore - All oceanic waters outside state waters or deeper than 100 fathoms (for comparison see **Nearshore**).

Optimum Yield (OY) - With regard to a marine fishery, means the amount of catch taken in a fishery that: 1) provides the greatest overall benefit to the people of California, particularly with respect to food production and recreational opportunities, and takes into account the protection of marine ecosystems; 2) is the maximum sustainable yield of the fishery, as reduced by relevant economic, social, or ecological factors; and 3) in the case of an overfished fishery, provides for rebuilding to a level consistent with producing maximum sustainable yield in the fishery. Optimum yield should be no greater than maximum sustainable yield.

Output (of stock assessment models) - The substantive predictions of a model; for this FMP, it usually corresponds to the reference points.

Overfished - A stock that is at unacceptably low levels because it has experienced overfishing and has not been rebuilt.

Overfishing - Means a rate or level of take that the best available scientific information indicates is not sustainable or that jeopardizes the capacity of a marine fishery to produce the maximum sustainable yield on a continuing basis. The depletion of fish stocks to unacceptably low levels. See **Growth overfishing, Recruitment overfishing, and Economic overfishing**.

Pelagic - Of or relating to aquatic organisms that live in the ocean without direct dependence on the shore or bottom.

Physiological - Of or relating to the normal functioning of an organism.

Plankton - Very small organisms that passively drift with tide and current.

Planktonic - Of or related to **plankton.**

Population - All the individuals of a species that live in the same geographic area. A population may contain several discrete breeding groups or stocks.

Productivity - Describes the birth, growth, and death rates of a stock. A highly productive stock is characterized by high birth, growth and mortality rates, and as a consequence has a high turnover. Such stocks can usually sustain higher exploitation rates and, if depleted, could recover more rapidly than comparatively less productive stocks.

Proxy - A number that is used as a substitute for another number. In fisheries management, landing information is often used as a proxy for other types of information not yet available.

Recreational fishery - Describes a fishery associated with taking of any fish for any purpose other than profit.

Recruit - An organism entering the exploitable stage of its life cycle; or a larval or juvenile organism as it settles or appears in the adult ecological niche. See **Recruitment**.

Recruitment - The process, event, or rate by which individuals enter new life stages or segments of a population. *Larval recruitment* refers to the process or event by which larvae of marine species exit the planktonic life stage. *Fishery recruitment* (or, recruitment to the fishery) refers to the moment that an animal becomes vulnerable to capture in a fishery – usually because it has attained some minimum size or age for harvest.

Recruitment overfishing - Fishing that depletes the mature adult population (spawning stock) to low levels at which reproduction (and subsequent recruitment) is inadequate to replenish the population.

Reference points (biological reference points) - Reference points are quantitative (numerical) values that inform managers about the current status of a stock. Two important types must be considered, target and threshold (or limit) reference points. *Target reference point* is a numerical value that indicates that the status of a stock is at a desirable level; often management is geared towards achieving or maintaining this target. *Threshold (limit) reference point* is a numerical value that indicates that the status of a stock is unacceptable (e.g. overfished or too small), and that management action should be taken to improve stock status.

Relative abundance - Usually measured with indices that track trends of a population biomass (e.g., CPUE) over time. It is not a direct or (usually) precise estimate of biomass.

Report card - A mean of collecting fishery-dependent data on the recreational lobster fishery in California. Lobster report cards collect information on the number of people recreationally fishing for lobster each year, the gear they use, and their harvest and success rates. Required since 2008 for all persons fishing recreationally for lobster in California.

Scavengers - Animals that feed on dead or decaying organisms.

SCUBA - "Self-Contained Underwater Breathing Apparatus" utilized by the recreational lobster fishing sector in California to catch lobster by hand. **Settlement -** In marine ecology, it means the process by which organisms change from a pelagic larval life history phase to assume a new mode of life as a member of a sea-floor community. For CA lobster, it is the stage at which pueruli (late-stage larvae) settle to nearshore, surfgrass habitat.

Size at maturity (SAM) - The size at which 50% of animals in a population have reached sexual maturity and are capable of reproduction.

Size limit - The minimum size a fish or other organism must be for it to be possessed.

Skin diving - Breath hold diving (freediving) utilized to catch lobster by hand by the recreational CA lobster fishing sector in California.

Southern California Bight (SCB) - The coast and its immediate offshore areas between Point Conception to the north and the U.S. – Mexico border to the south. The curvature of the coastline and the relatively shallow depth of the area lead to oceanographic and biological characteristics that are clearly distinguishable from the central California coast.

Spawning potential ratio (SPR) - A ratio of the number of eggs produced during the lifetime of an average female in a fished population to the number of eggs produced during the lifetime of an average female in an unfished population; used to characterize the amount of impact fishing has on a population's ability to reproduce.

Spillover - The emigration of adults from a protected area to the fishing grounds, and/or larval export from the protected area to surrounding areas.

Stock - A group of fish of the same species in a given management area. A single stock may be comprised of multiple populations or be a portion of a single larger population.

Stock assessment - An evaluation of the status of a stock, including past and current stock levels and information to help guide future harvest. Assessments may integrate many different biological data, including growth rates of fish, mortality rates, age at first reproduction, fecundity, size classes present in the catch, and selectivity of fishing gear.

Stock Composition - Any description of the population attributes of a stock (age, size, sex), usually within a spatial context. This commonly refers to the spatial distribution of breeding groups or genetically-related organisms.

Stock Size - Total estimated number or biomass of fish within a stock.

Substrate - The surface or medium on or in which an organism lives (i.e., mud, sand, rocks).

Sustainable, Sustainable use, and Sustainability - With regard to a marine fishery, means both of the following: 1) continuous replenishment of resources, taking into account fluctuations; and 2) securing the highest possible present and long-term social and economic benefits, maintaining biological diversity, and managing fisheries in a way that does not exceed **optimum yield**.

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Thresholds (threshold reference points) - For the purpose of this FMP, the levels of stock size or reproductive potential that are not sustainable.

Total allowable catch (TAC) - A specified numerical catch objective for each fishing season, the attainment (or expected attainment) of which may cause closure of the fishery.

Total allowable effort (TAE) - A specified numerical effort objective for each fishing season. This can be expressed in number of boats, amount of gear used, etc.

Total economic output - The total amount of economic output that does not take into account the amount of intermediate goods consumed during the harvest/production process. For CA lobsters, this means the amount of money generated before costs such as trap cost are considered. Also known as Gross Economic Output.

Total economic value added – Total economic output less the goods and services used up to create that output. For the CA lobster fishery, it means the net value after costs like trap purchases are accounted for. Also known as Net Economic Output.

Total mortality - Natural mortality and Fishing mortality combined.

Traps - Generally, a wire basket or cage used for trapping certain types of organisms.

Trap limit - A type of regulatory measure that restricts the number of traps a fisherman may simultaneously utilize within a given season.

Unfished biomass - The unfished or pristine biomass.

Upwelling - On the California coast, upwelling is the upward movement of deep waters into the nearshore ecosystem due to springtime winds moving the topmost layers of water away from land.

Yield - The total number or biomass of fish captured.

Yield per recruit (YPR) - A theoretical value that describes the yield to a fishery that is contributed by a given number of recruits (usually a single recruit).

Zooplankton - Small animals passively carried along with water currents and other water movement.

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Personal Communication

Culver, Carolynn. Sea Grant Advisor/Research Scientist. Marine Science Institute, University of California, Santa Barbara. Santa Barbara, CA.

Matthews, Thomas. Fishery Biologist, Florida Fish and Wildlife Conservation Commission. Tallahassee, FL.

Renzullo, Jennifer. Field Manager, CA Lost Fishing Gear Recovery Project. UC Davis Wildlife Health Center. Davis, CA.

Salazar, James. Owner, Saba Slayer Kayak Fishing Guide Service. Rolling Hills Estates, CA

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Appendix I: Letter to Tribal Representatives

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State of California – Natural Resources Agency
DEPARTMENT OF FISH AND WILDLIFE
Santa Barbara Field Office
1933 Cliff Drive, Suite 9
Santa Barbara, CA 93109
www.wildlife.ca.gov

EDMUND G. BROWN JR., Governor
CHARLTON H. BONHAM, Director

October 10, 2013

Name
Title
Business
Street Address
City, STATE Zip

Dear Honorable [FILL IN FULL NAME], Chairperson:

The California Department of Fish and Wildlife (Department) would like to inform you as a tribal representative that its Marine staff will be writing and compiling a Spiny Lobster Fishery Management Plan (FMP) over the next several months. The Department would like to know if spiny lobster is a culturally significant species to your Tribe, and, if so, if you would like to provide input into the development of the FMP or to seek government-to-government consultation with the Department about the FMP and the management of the spiny lobster fishery.

The Marine Life Management Act requires that the fishery management plan shall form the primary basis for managing California's commercial and sport marine fisheries. The spiny lobster supports important commercial and sport fisheries in southern California, and this FMP will ensure the continued health of the lobster fisheries in California.
The FMP will summarize all the readily available information on spiny lobster and its fisheries including: lobster natural history and population dynamics; fishery landings, regulations, and participants; current management and conservation measures; monitoring of the fisheries; essential fisheries information that is still needed; and a harvest control rule(s) should the lobster resource show signs of being overfished.

The Department has received suggestions and recommendations from various stakeholder groups, and has worked with a Lobster Advisory Committee that was created last year to develop recommendations. The lobster FMP website is: http://www.dfg.ca.gov/marine/lobsterfmp/ .

The Department understands that the spiny lobster fishery may be of interest to some tribes in California, and the Department is soliciting input from tribes. The Department is also committed to understanding tribal interests, if any, relating to the spiny lobster fisheries in southern California before the draft FMP is completed. Next year, the draft lobster FMP will be peer reviewed both scientifically and by the general public. While tribes can provide comments on the spiny lobster FMP at that time, the Department would like to understand tribal interests early in the process.

The Department would welcome your preliminary input on southern California's spiny lobster resource and fisheries by November 15, 2013, so that it might be considered when writing the draft FMP. Please send your comments to Ms. Kristine Barsky, Senior Marine Biologist and Lobster FMP Coordinator, via email at Kristine.Barsky@wildlife.ca.gov or to the address above. If you would like more information on

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the lobster FMP, or would like to set up either an informal informational meeting or a formal government-to-government consultation, please contact Ms. Barsky at (805) 985-3114.

We look forward to receiving your comments.

Sincerely,

Craig Shuman
Manager of the Marine Region

ec: Steven Ingram, Senior Staff Counsel and Tribal Liaison
Office of the General Counsel
Department of Fish and Wildlife

Sonke Mastrup, Executive Director
California Fish and Game Commission

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Tribes contacted for the Lobster FMP process

Tribe Contacted
Costanoan Ohlone Rumsen Carmel Tribe
Fernandeno Tataviam Band of Mission Indians
Gabrieleno/Tongva San Gabriel Band of Mission Indians
Gabrielino Tongva Nation
San Fernando Band of Mission Indians
Tehachapi Indian Tribe
Juaneño Band of Mission Indians
Juaneno Band of Mission Indians Acjachemen Nation
Juaneno Band of Mission Indians Acjachemen Nation
Barona Group of the Capitan Grande
Campo Kumeyaay Nation
Ewiiaapaayp Tribal Office
Inaja Band of Mission Indians
Jamul Indian Village
Kwaaymii Laguna Band of Mission Indians
La Jolla Band of Mission Indians
La Posta Band of Mission Indians
Los Coyotes Band of Mission Indians
Manzanita Band of Kumeyaay Nation
Mesa Grande Band of Mission Indians
Pala Band of Mission Indians
Pauma Band of Yuima
Rincon Band of Mission Indians
San Luis Rey Band of Mission Indians
San Pasqual Band of Mission Indians
Santa Ysabel Band of Diegueno Indians
Sycuan Band of the Kumeyaay Nation
Northern Chumash Tribal Council
Salinan Tribe of Monterey & San Luis Obispo Counties
Coastal Band of the Chumash Nation
Santa Ynez Band of Mission Indians
Viejas Band of Mission Indians

State of California – Natural Resources Agency
DEPARTMENT OF FISH AND WILDLIFE
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Santa Barbara, CA 93109
www.wildlife.ca.gov

EDMUND G. BROWN JR., Governor
CHARLTON H. BONHAM, Director

October 19, 2015

Contact name
Tribal group name
Address

Dear Honorable Tribal Representative:

The California Department of Fish and Wildlife (Department) would like to inform you as a tribal representative that several items are under development regarding the management of California's spiny lobster fisheries, and we are inviting your Tribe to provide input before these items are submitted to the Fish and Game Commission (Commission) for their possible consideration. In particular, the Department will be delivering two principle items to the Commission during 2015 and 2016: 1) a California Spiny Lobster Fishery Management Plan (FMP), and 2) new spiny lobster commercial and recreational fishery regulations. We anticipate proposing the first item at the Commission's December 2015 meeting and the second item at the Commission's February 2016 meeting. The Department would like to know whether your Tribe is interested in providing input on one or both of these proposed management items. At your discretion, your Tribe's input could be provided during the established provisions under the Commission process for public input beginning in December 2015, or through discussions or formal government-to-government consultation prior to December.

The California Spiny Lobster FMP

The Marine Life Management Act requires that fishery management plans (FMPs) shall form the primary basis for managing California's commercial and sport marine fisheries. The California spiny lobster resource supports important commercial and recreational fisheries in southern California, and this FMP sets a management framework for the fishery to ensure the continued health of the fisheries in California.

The FMP summarizes all the readily available information on spiny lobster and its fisheries including: lobster natural history and population dynamics; fishery landings, regulations, and participants; current management and conservation measures; monitoring of the fisheries; essential fisheries information that is still needed; and a harvest control rule to provide for a sustainable harvest.

The Department has received suggestions and recommendations from various stakeholder groups, and has worked with a Lobster Advisory Committee that was created to develop recommendations. The draft California Spiny Lobster FMP is currently available on the Departments spiny lobster FMP website at http://www.dfg.ca.gov/marine/lobsterfmp/ .

Amending Spiny Lobster Commercial and Recreational Regulations

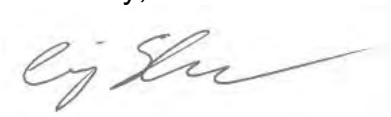
The Department is scheduled to request authorization to publish notice of intent to amend regulations associated with the FMP at the Commission's February 2016 meeting. Proposed commercial spiny lobster regulation amendments that will be considered by the Commission include: a commercial trap

limit; increasing the trap service requirement from 4 to 7days; extending the period (from 6 to 9 days) for deploying and retrieving traps before and after the season; and reporting of commercial trap loss. Proposed recreational amendments include: requiring the hole-punching or fin-clipping of all retained lobsters; changing the timing of the recreational season opener from 12:01 am to 6 a.m. on the first Saturday of the season; require hoop net operators to mark hoop net floats with GO-ID numbers; and clarifying methods of take for crustaceans.

If you would like more information on the California Spiny Lobster FMP or the proposed regulatory amendments, or to request a printed copy of the draft FMP, please contact Mr. Tom Mason, Senior Environmental Scientist, by email, tom.mason@wildlife.ca.gov, or by phone, (562) 342-7107. If you would like to request formal government-to-government consultation, please contact Steven Ingram, Tribal Liaison, by email, tribal.liaison@wildlife.ca.gov, or by phone, (916) 651-7401.

We look forward to receiving your input.

Sincerely,



Craig Shuman, D. Env.
Regional Manager, Marine Region

ec: Steven Ingram, Senior Staff Counsel and Tribal Liaison
Office of the General Counsel
Department of Fish and Wildlife

Sonke Mastrup, Executive Director
California Fish and Game Commission

Tribe Contacted
Agua Caliente Band of Cahuilla Indians
Augustine Band of Cahuilla Mission Indians
Barona Group of the Capitan Grande
Cabazon Band of Mission Indians
Cahuilla Band of Indians
Campo Band of Mission Indians
Chemehuevi Reservation
Colorado River Indian Tribe
Ewiiaapaayp Tribal Office
Fort Mojave Indian Tribe
Iipay Nation of Santa Ysabel
Inaja Band of Diegueño Mission Indians
Jamul Indian Village
La Jolla Band of Mission Indians
La Posta Band of Mission Indians
Los Coyotes Band of Mission Indians
Manzanita Band of Kumeyaay Nation
Mesa Grande Band of Diegueño Mission Indians
Morongo Band of Mission Indians
Pala Band of Mission Indians
Pauma Band of Luiseño Indians
Pechanga Band of Mission Indians
Ramona Band of Cahuilla Mission Indians
Rincon Band of Mission Indians
San Manuel Band of Mission Indians
San Pasqual Band of Diegueño Mission Indians
Santa Rosa Band of Cahuilla Indians
Santa Ynez Band of Mission Indians
Soboba Band of Mission Indians
Sycuan Band of the Kumeyaay Nation
Torres-Martinez Desert Cahuilla Indians
Twenty-Nine Palms Band of Mission Indians
Viejas Band of Kumeyaay Indians

Appendix II: Executive Summary of the Constituent Involvement Plan

This Constituent Involvement Plan details the activities that will be conducted to involve constituents and participants in the development of the Spiny Lobster Fishery Management Plan (FMP). The FMP is being developed for the spiny lobster fishery by the California Department of Fish and Game as required under the Marine Life Management Act of 1998. An important part of the act is the good faith effort to involve all interested parties in resource management decisions through the dissemination of accurate information and collaboration.

I. Points of Input for Constituents

The Department uses a number of avenues to engage the public in development of the Spiny Lobster Fishery Management Plan (FMP).

Lobster Advisory Committee

- The Advisory Committee is a collaborative body of representatives from major constituencies that provides the Department with advice, recommendations, and feedback regarding actions that need to be taken during the development of the FMP. The Advisory Committee will give guidance on FMP objectives and end products, as well as provide ideas on content and management options that address the key issues put forth by constituents, members of the public, and our contractors. The Committee will review draft documents generated during the FMP process, and will provide feedback on content.

- CDFW ensured that the composition of the Lobster Advisory Committee reflects the diversity of interests and complexity of the California spiny lobster fishery. The Committee is made up of twelve members and five alternates, as follows:

- Rodger Healy (Commercial Fishing Member)
- Jim Colomy (Commercial Fishing Member)
- Shad Catarius (Commercial Fishing Member)
- Josh Fisher (Commercial Fishing Alternate Member)
- Jim Salazar (Recreational Fishing Member)
- Michael Gould (Recreational Fishing Member)
- Al Stasukevich (Recreational Fishing Member)
- Paul Romanowski (Recreational Fishing Alternate Member)
- Lia Protopapadakis (Marine Science Member)
- Kevin Hovel (Marine Science Member)
- Jono Wilson (Marine Science Alternate Member)
- Sarah Sikich (Environmental Organization Member)
- Huff McGonigal (Environmental Organization Alternate Member)
- Sean Hastings (Federal Agency Member)
- David Kushner (Federal Agency Alternate Member)
- Claudette Dorsey (Non-Consumptive Recreational Member)
- Chris Grossman (Non-Consumptive Recreational Member)

Lobster Advisory Committee Schedule

Meeting Dates:

- **June 20, 2012, Los Alamitos (9:00 AM to 4:00 PM)** – LAC Charter and Ground Rules development, Timeline for FMP, List of Lobster FMP Issues, FMP Conceptual Framework, Comments from Public Meetings, and Review of Draft Fishery Overview Chapter
- **August 1, 2012** –Review Summary of Management Options.
- **December 5, 2012** – Discuss findings of Economic Profile Report, and Comments on Draft Fishery Management and Conservation Chapter.
- **April 10, 2013** – Discuss poaching issues and recreational fishery management
- **June 12, 2013** – Review Comments from Public Management Options Meetings.
- **July 10, 2013** – Discuss and evaluate fishing management options
- **August 15, 2013** – Review Management Strategy Evaluation Results.
- **September 11, 2013** – Finalize consensus for recreational fishing management measures, discuss and evaluate the harvest control rule, and identify monitoring and research priorities and funding mechanisms

Schedule for Public Meetings

Public Information Meetings

Description (both dates and locations): The purpose is to introduce the Lobster Fishery Management Plan (FMP) process, and explain what an FMP is and what it is not. CDFW will also discuss the general timeline for FMP completion. The majority of this meeting will focus on gathering information from members of the public regarding the issues or management concerns that need to be addressed during the FMP process.

Dates and Locations:
Wednesday, April 18, 2012
Oxnard Performing Arts and Convention Center
800 Hobson Way
Oxnard, CA 93030
http://www.oxnardpacc.com/directions.html

Thursday, April 19, 2012
Grand Pacific Palisades Hotel
Auditorium
5805 Armada Dr.
Carlsbad, CA 92008
http://www.grandpacificpalisades.com/map-directions

Agenda (both dates and locations):

6:00 p.m.	Open House Workshop (no pre-registration required)
6:30 p.m.	Public meeting begins
6:45 p.m.	Highlights of the FMP Process and how to contribute
7:00 p.m.	Public Questions and Comments
8:00 p.m.	Open House Workshop
9:00 p.m.	Meeting concludes

Management Options Meetings

The purpose is to receive comments on potential management options, the impact of each option, and preferred options or suites of options.

- Dates: **April 23-24, 2013**
- Locations: **Ventura and Orange counties**

Fish and Game Commission Regulator Process

The formal regulatory process will begin in February 2015.

Written Comments

- The Spiny Lobster Fishery Management Plan Web Site has the ability to receive written comments. Web Site address: http://www.dfg.ca.gov/marine/lobsterfmp/
- Written comments can also be mailed to:
  Department of Fish and Game
  Attn: Spiny Lobster FMP
  1933 Cliff Drive, Suite 9
  Santa Barbara, CA 93109

II. Methods for Providing Constituents with Information

Since communication and participation are crucial to a successful FMP process, the Department will provide information through a range of options.

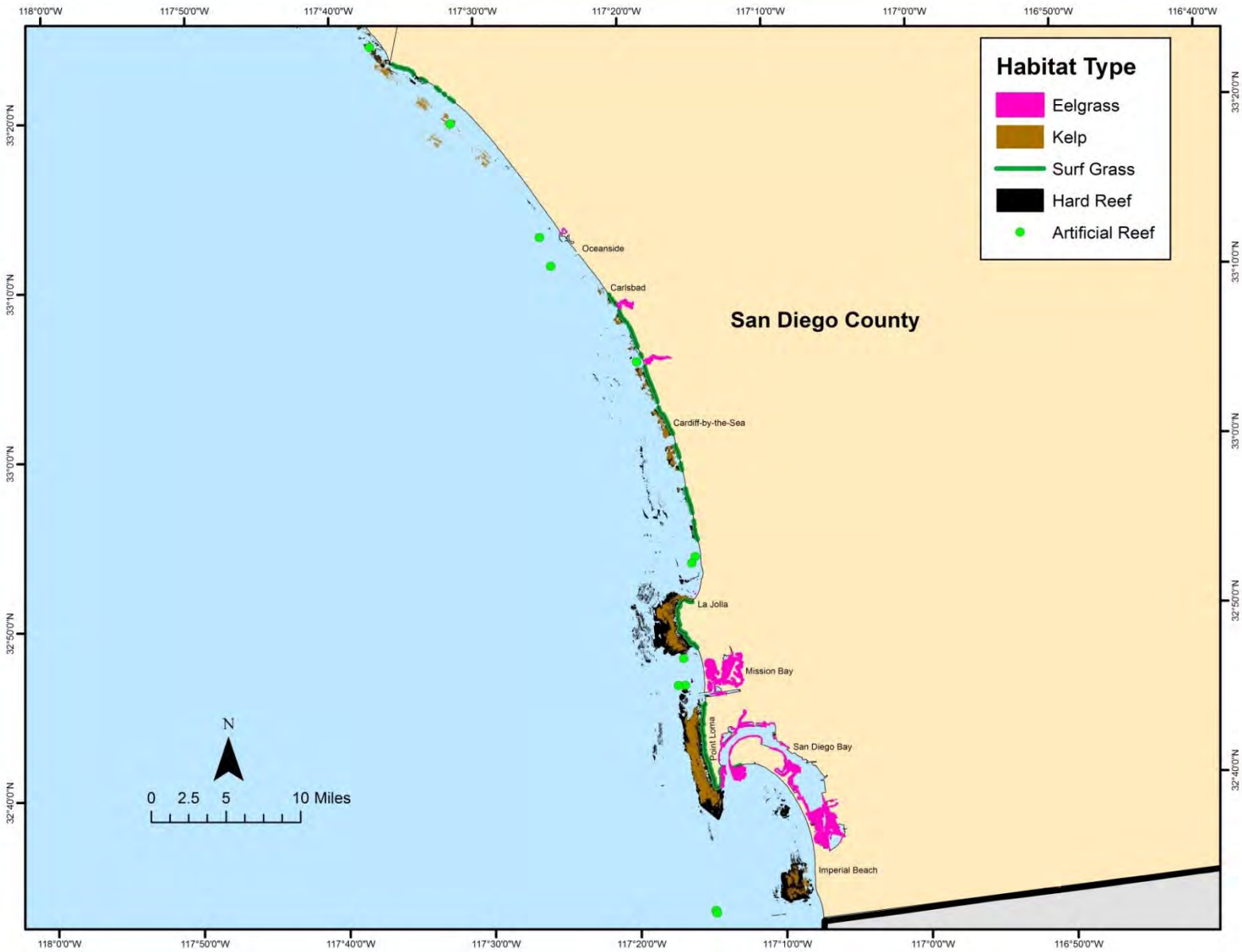
Available Resources

- The Spiny Lobster Fishery Management Plan Web Site: http://www.dfg.ca.gov/marine/lobsterfmp/
- Electronic notices. Constituents can sign up for the Lobster FMP News Service through the Spiny Lobster Fishery Management Plan Web Site. The News Service will distribute electronic notices about future events. Once you are signed up, you can expect to receive emails that:
  - Announce the debut of a fully populated Lobster FMP website that includes informative background documents on lobster.
  - Keep constituents informed of news and public meeting information during the Lobster FMP process.
  - Announce the availability of Lobster FMP draft documents
- For those who cannot receive email, the Lobster FMP team will send the identical announcements via the U.S. Postal Service. To sign up to receive the Lobster FMP News Notices via mail, please contact Ms. Rosalyn McFarland at (805) 568-1231 to provide your mailing address.
- Flyers available at Fish and Game offices, and posted at strategic locations.
- Marine Management Newsletter

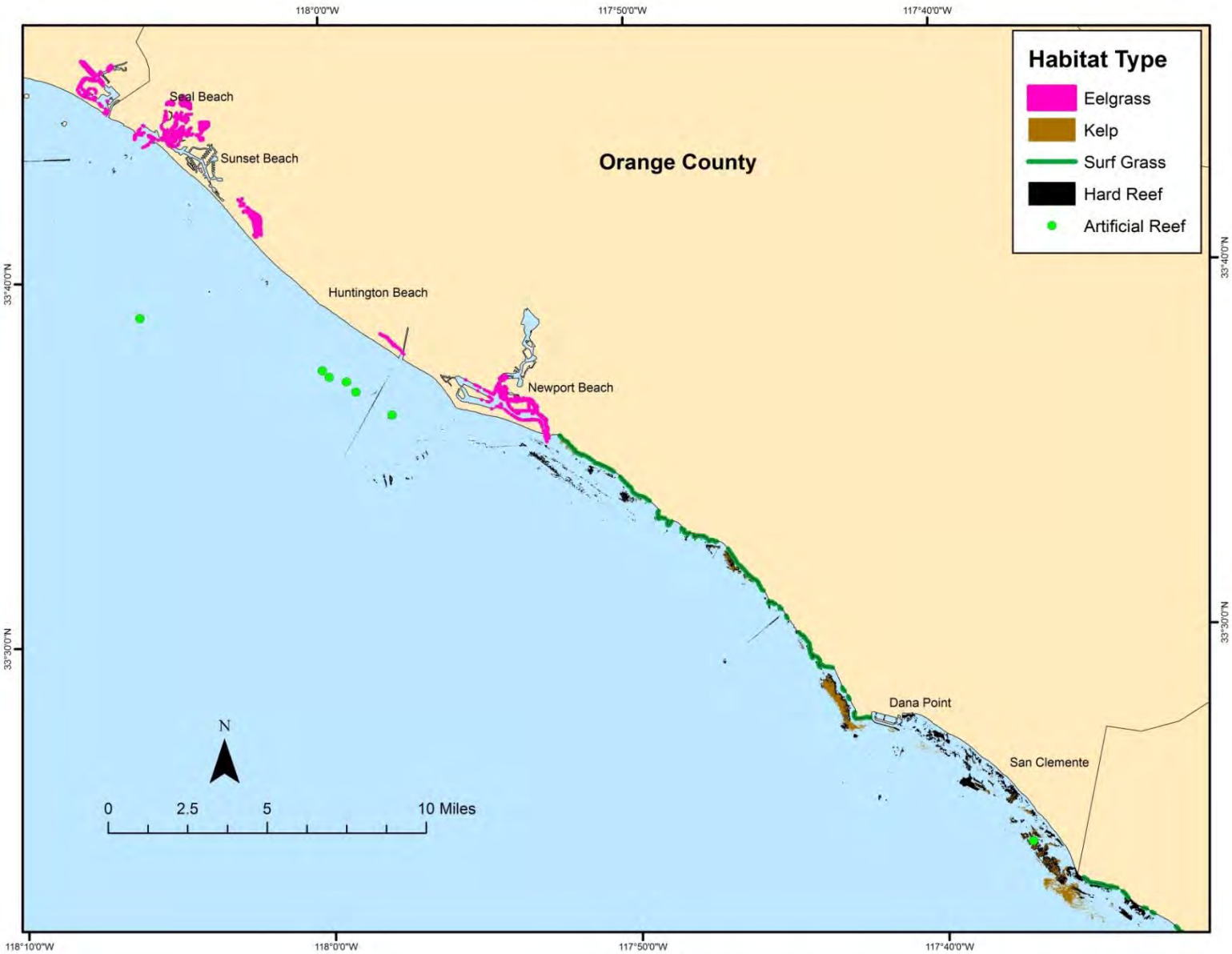
Special Publications

- Spiny Lobster Stock Assessment
- Technical Panel Review Publication of Stock Assessment

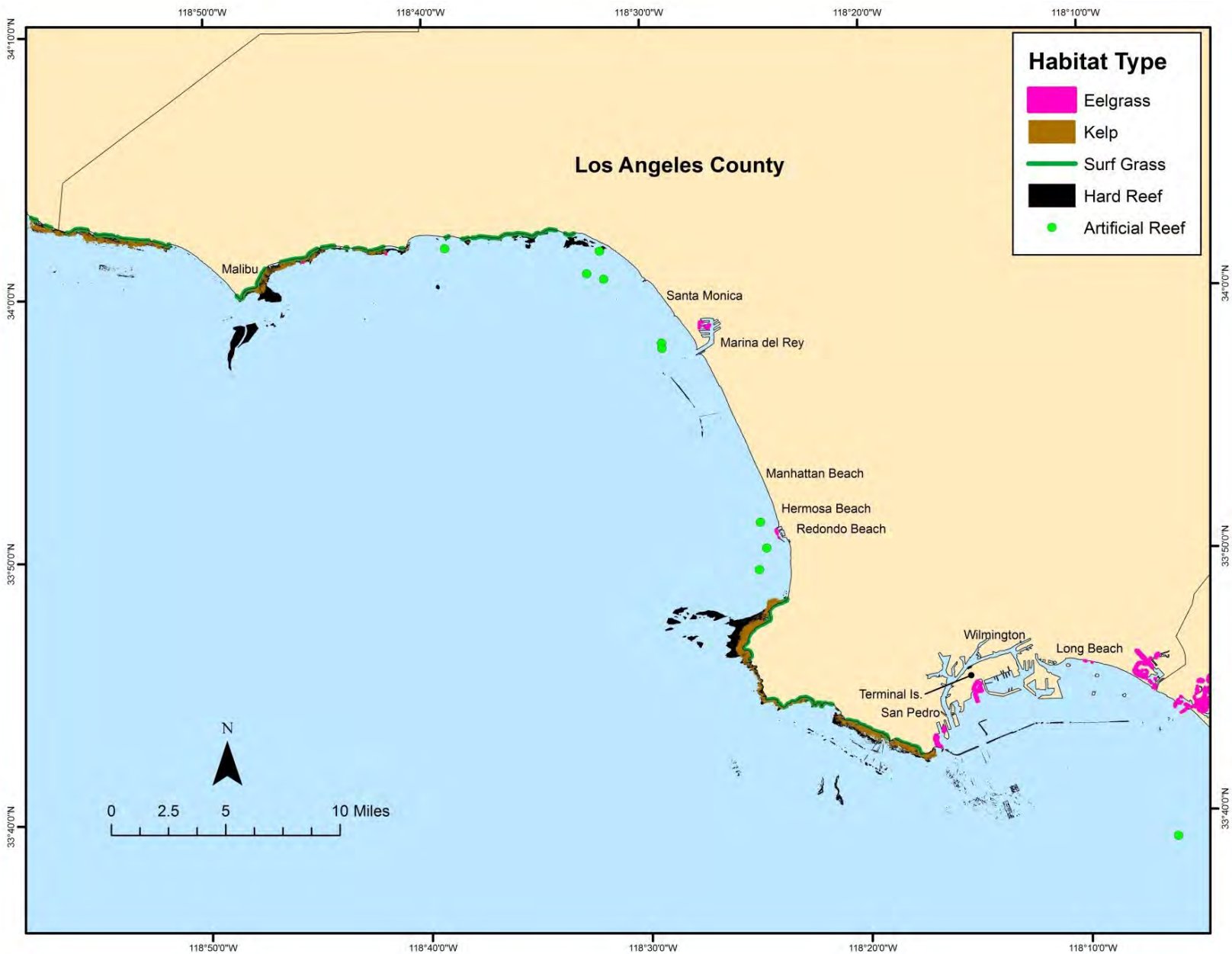
Appendix III: Habitat Maps by Areas



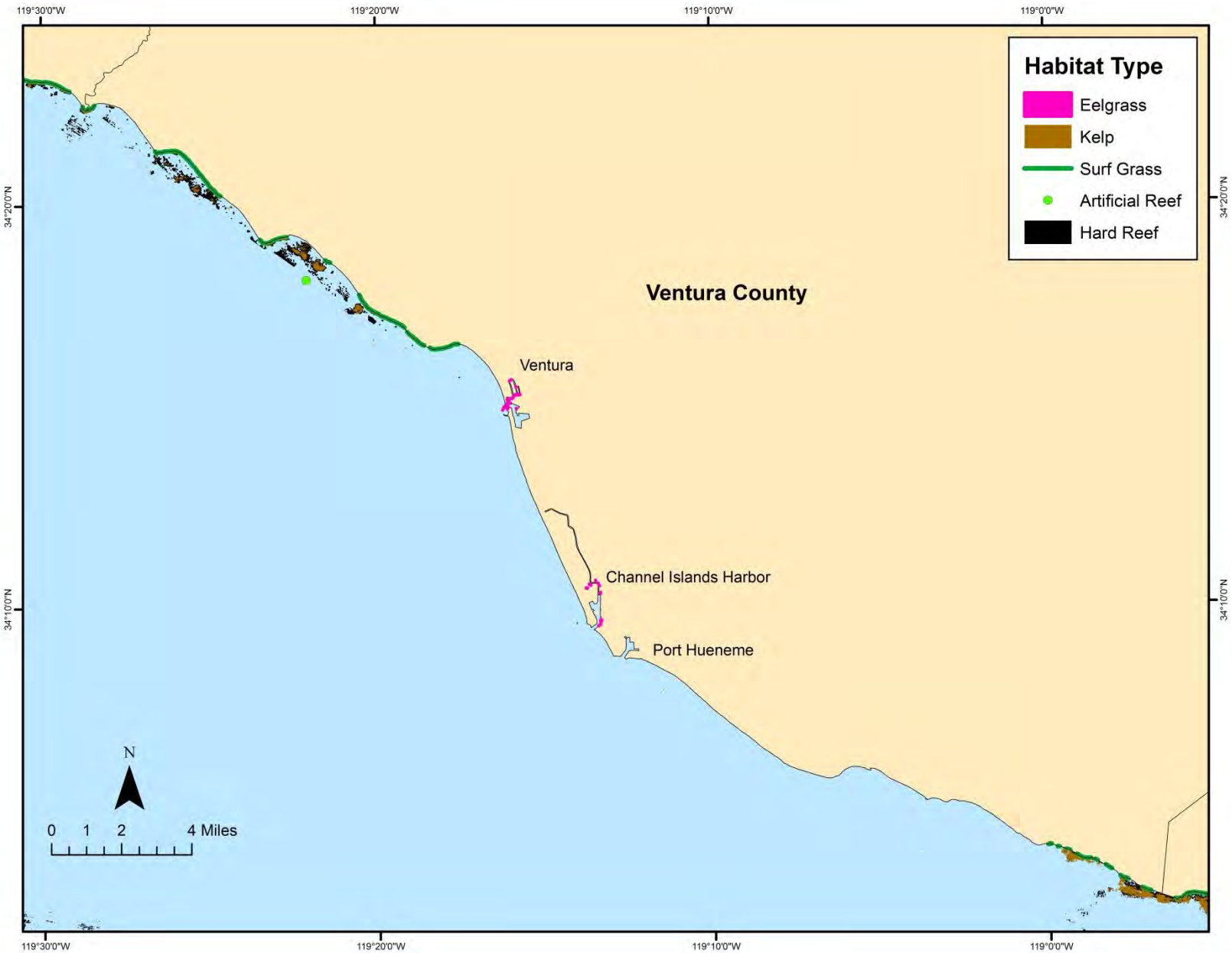
Critical CA lobster habitats along San Diego County



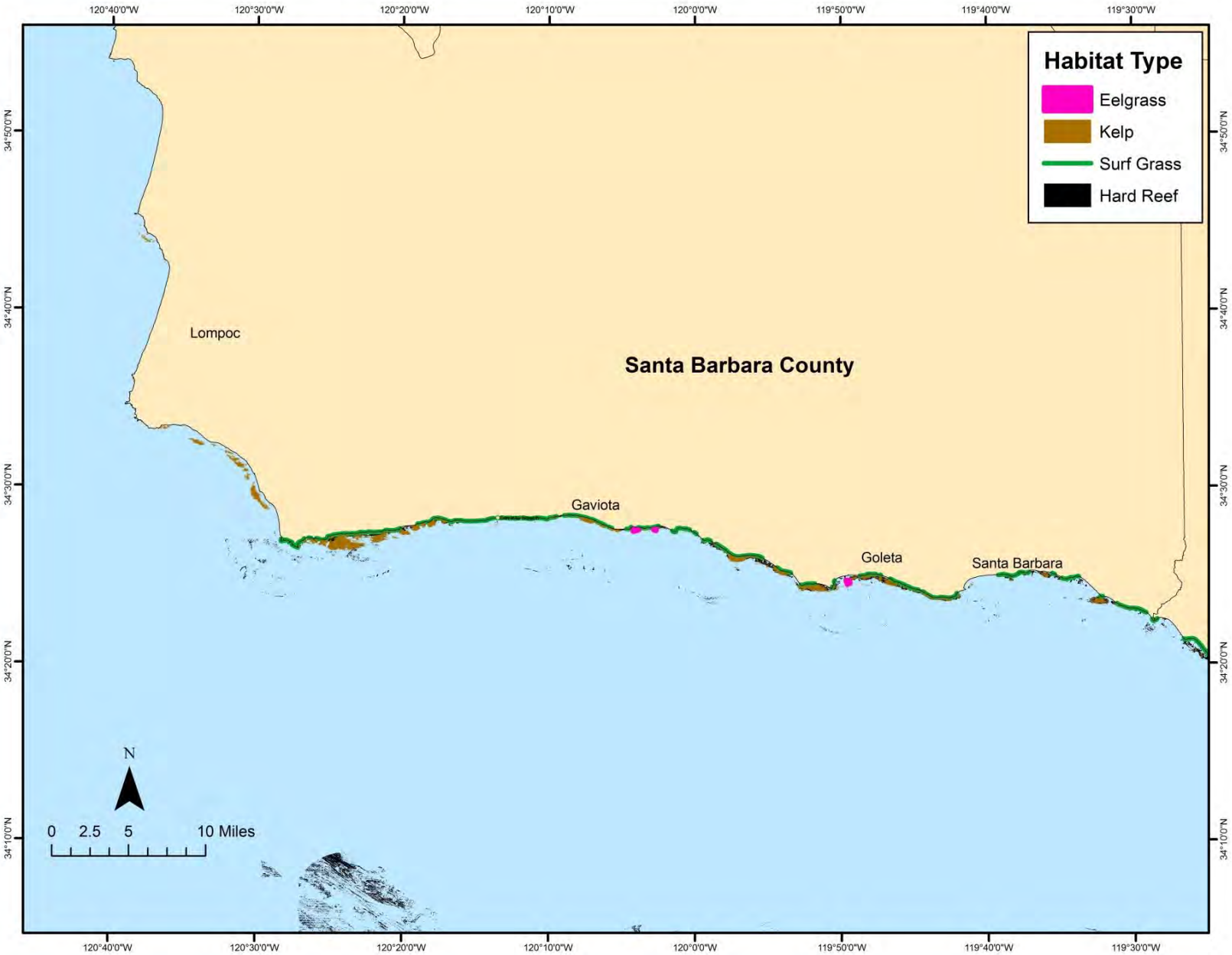
Critical CA lobster habitats along Orange County



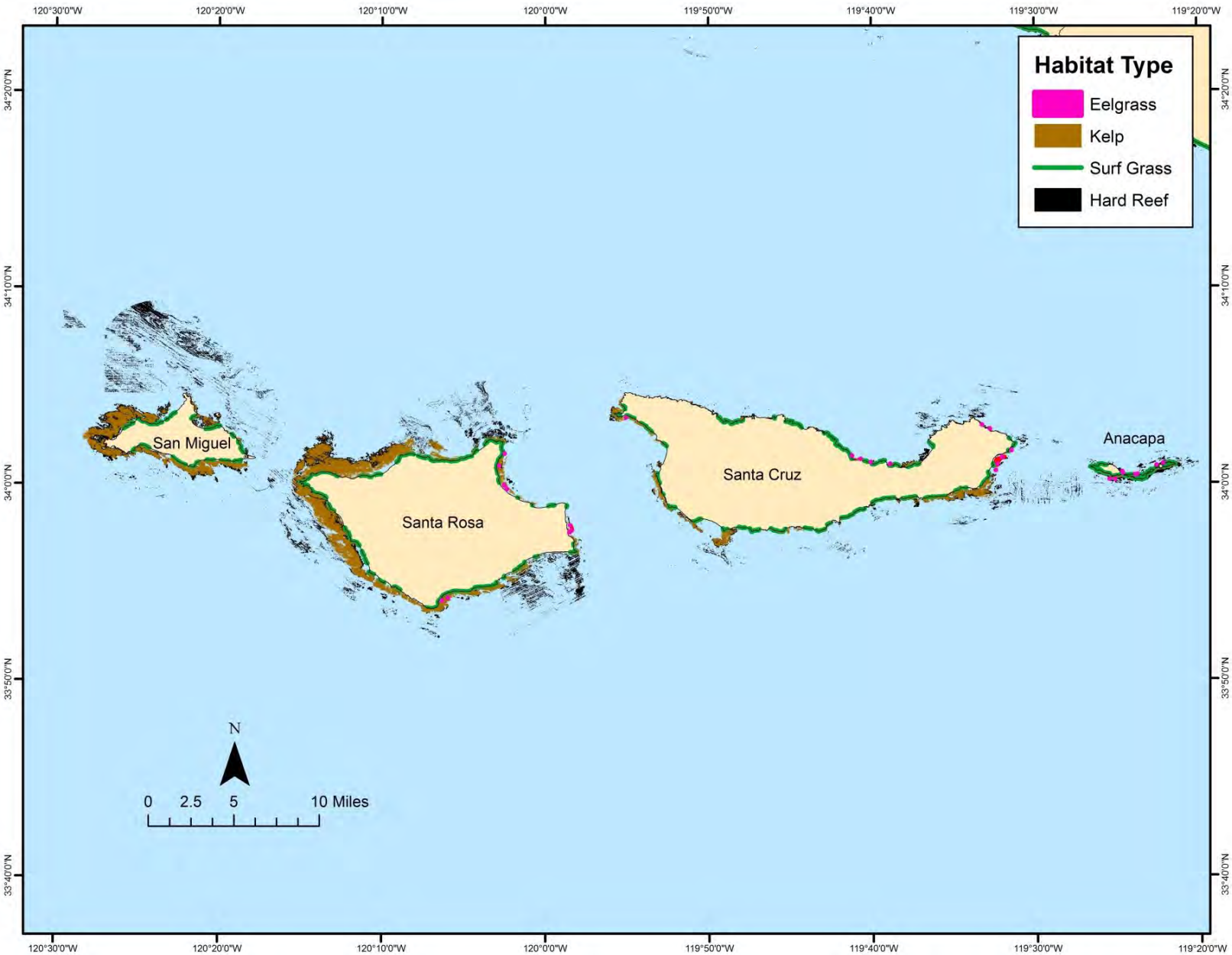
Critical CA lobster habitats along Los Angeles County



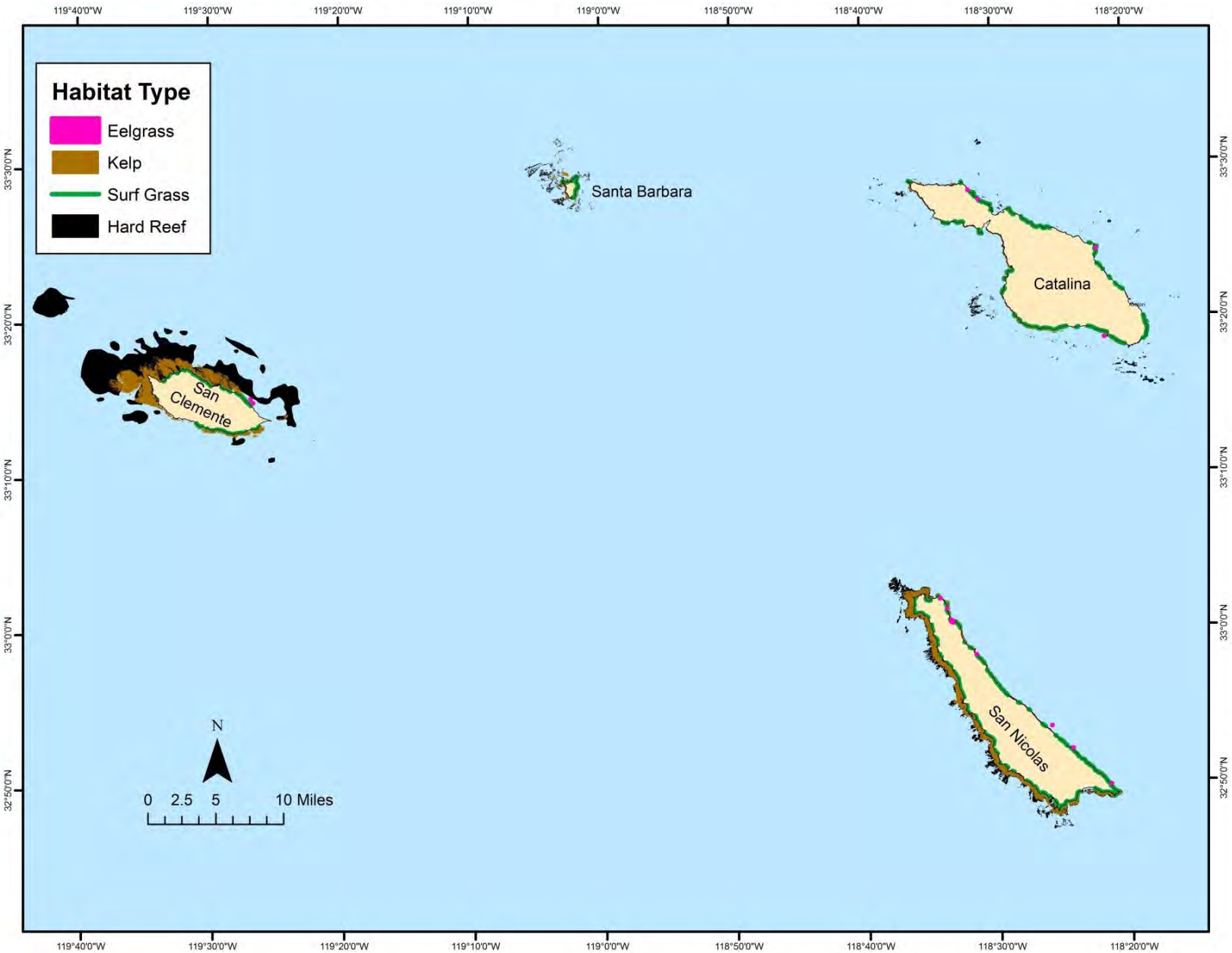
Critical CA lobster habitats along Ventura County



Critical CA lobster habitats along Santa Barbara County



Critical CA lobster habitats around the Northern Channel Islands



Critical CA lobster habitats around the southern Channel Islands

Appendix IV: Current Commercial Logs and Landing Receipts

CALIFORNIA DEPARTMENT OF FISH AND GAME
DAILY LOBSTER LOG

SL 242726

FISHERMAN LAST NAME	F.I.	FISHERMAN ID NUMBER	VESSEL NAME	F& G VESSEL NUMBER
		L		

TRAP LOCATIONS (NEAREST LANDMARK)	F & G BLOCK NUMBER	DEPTH (IN FEET)	No. TRAPS PULLED	No. NIGHTS IN WATER	No. SHORTS RELEASED	No. LEGALS RETAINED	DATE TRAPS PULLED MONTH DAY YEAR
							NOTE PAD:
							☐ MULTI-DAY TRIP/RECEIVERED

LANDING RECEIPT NUMBER (S)
1) 2)

CREW ID NUMBERS
L L

TRAP LOCATIONS (NEAREST LANDMARK)	F & G BLOCK NUMBER	DEPTH (IN FEET)	No. TRAPS PULLED	No. NIGHTS IN WATER	No. SHORTS RELEASED	No. LEGALS RETAINED	DATE TRAPS PULLED MONTH DAY YEAR
							NOTE PAD:
							☐ MULTI-DAY TRIP/RECEIVERED

LANDING RECEIPT NUMBER (S)
1) 2)

CREW ID NUMBERS
L L

TRAP LOCATIONS (NEAREST LANDMARK)	F & G BLOCK NUMBER	DEPTH (IN FEET)	No. TRAPS PULLED	No. NIGHTS IN WATER	No. SHORTS RELEASED	No. LEGALS RETAINED	DATE TRAPS PULLED MONTH DAY YEAR
							NOTE PAD:
							☐ MULTI-DAY TRIP/RECEIVERED

LANDING RECEIPT NUMBER (S)
1) 2)

CREW ID NUMBERS
L L

DFG 122 (5/09) GREEN = DEPT. OF FISH & GAME COPY ******* YELLOW = FISHERMAN COPY

FISHERMAN LAST NAME	F. I.	ID NUMBER	PORT OF FIRST LANDING	LOCATION WHERE FISH WERE CAUGHT
		L		

VESSEL NAME	VESSEL ID	FISH BUSINESS NAME	FISH BUSINESS ID
			-

FISH NAME	POUNDS	PRICE	TOTAL AMOUNT	CONDITION	GEAR
1) SHEEPHEAD 145	, .	$.			
2) CALIF 260 SCORPIONFISH	, .	$.			
3) CABEZON 261	, .	$.			
4) SABLEFISH 190	, .	$.			
5) HAGFISH 457	, .	$.			
6) CALIF 452 MORAY EEL	, .	$.			
7) LOBSTER 820	, .	$.			
8) RED ROCK 341 CRAB	, .	$.			
9) YELLOW ROCK CRAB 342	, .	$.			
10) BROWN ROCK CRAB 343	, .	$.			
11) ROCKCRAB 801	, .	$.			
12) SPIDER 803 CRAB	, .	$.			
13) KELLET'S 731 WHELK	, .	$.			
14) SPOT 815 PRAWN	, .	$.			
15)	, .	$.			
16)	, .	$.			
17)	, .	$.			
18)	, .	$.			
19)	, .	$.			

PRIMARY GEAR USED

GEAR LEGEND

21 FISH TRAP
22 PRAWN TRAP
27 CRAB / LOBSTER TRAP
OTHER

(BIOLOGIST USE) FISH CODE

NOTE PAD

TOTALS # _____ $ _____

CORRECTIONS - FOR FIELD BIOLOGIST USE ONLY

LINE #	FISH CODE	POUNDS	PRICE	CONDITION	GEAR
		, .	$.		
		, .	$.		
		, .	$.		

CHANGES ON BACK

FISHERMAN/PERMITTEE SIGNATURE _____ RECEIVED BY _____

CERTIFIED UNDER PENALTY OF PERJURY AS TRUE AND CORRECT

F&G 625 -O (11/10) GREEN = DEPT. OF FISH & GAME COPY ******** YELLOW = FISHERMAN COPY ******** PINK / GOLDENROD = FISH BUSINESS COPY (2)

Landing Receipt

Appendix V: Climate Change Vulnerability of the CA Spiny Lobster

By Dr. Douglas J. Neilson

The science of climate change (CC) involves the study of climatic stressors (e.g., atmospheric air temperature) affected by increasing man-made atmospheric greenhouse gas (GHG) concentrations, and their associated environmental responses. An exhaustive discussion of all the potential stressors is beyond the scope of this chapter and only a small portion, deemed to have obvious potential impacts when applied to the California spiny lobster fishery, will be covered. For the most part, these impacts are restricted to those acting directly on the lobster or fishery. There are understood to be indirect impacts as well, where CC affects some aspect of the environment that cascades down to the lobster. While changes to lobster habitat included in ecosystems that also include lobster will be briefly discussed, the larger topic of how ecosystem interactions are affected by CC is beyond the scope of this chapter. As our understanding of CC evolves, and direct or cascading responses in the environment are newly recognized or better resolved, this chapter should be revisited. As such, this chapter should be considered an initial step in an ongoing effort to addressing lobster-related CC issues.

This chapter will briefly discuss the life history and associated habitats for the California spiny lobster which will be important to understand as we discuss CC vulnerabilities. What CC is, and the underlying cause – GHG, and specifically changes in CO_2 - will then be discussed. Since CC is understood to be a global phenomenon and is being driven at this scale, this chapter will first lay out how the selected climate variables are expected to change over time. The relatively local response to CC in California will then be discussed, followed by how the spiny lobster population, habitat, and fishery, are potentially affected. Finally, ocean acidification will be briefly addressed. Ocean acidification is not a result of CC but rather is caused by the same rise in atmospheric CO_2 that contributes to CC.

Spiny Lobster Life History and Habitats

The California spiny lobster is endemic to the west coast of North America from Monterey, California southward at least as far as Magdalena Bay, Baja California (Wilson, 1948; Schmitt, 1921), with a small isolated population in the northwestern corner of the Gulf of California (Kerstitch, 1989). The main portion of the population resides in Mexico, and relatively few lobsters are found north of Point Conception. In U.S. waters, spiny lobsters are commercially fished from Point Conception south to the Mexican Border. Lobsters spend their larval phase, which can last up to ten months, as part of the plankton (Mai & Hovel, 2007; Mitchell 1971). Carried by currents, lobster larvae have been found as far as 530 km offshore and at depths as deep as 137 m (California Department of Fish and Game, 2001). The final, puerulus, stage is a strong swimmer and moves inshore in search of shallow, vegetated habitats such as eelgrass or surfgrass beds (Mai & Hovel, 2007) in which to settle. Survival of the individual is therefore dependent on both the starting distance offshore of the pueruli and its ability to locate suitable habitat. Sub-adult and adult lobster are bottom dwellers and found at depths ranging from the intertidal to 64 m (California Department of Fish and Game, 2001)

Spiny lobster are found in rocky areas often with plant communities dominated by giant kelp (*Macrocystis* sp.), feather boa kelp (*Egregia* sp.), coralline algae (*Corallina* sp.), and surf grass (*Phyllospadix* sp.) (Lindberg, 1955). They are also associated with eel grass (*Zostera* sp.) which flourishes in sandy areas (California Department of Fish and Game, 2001). Spiny lobsters are a major predator of benthic invertebrates and act as a keystone species preying on mussels along rocky shores (Robles et al., 1990) and on sea urchins in kelp forests (Tegner and Levin, 1983; Lafferty, 2004).

Climate Change

Climate Change is occurring as evidenced by observations of increasing global air and ocean temperatures, widespread melting of snow and ice, and rising global average sea level (IPCC, 2007). The scientific consensus is that the driving force behind this change is man-made sources of greenhouse gases (GHG) – carbon dioxide (CO_2), methane, and nitrous oxide - and globally the average net effect of human activities since pre-industrial times has been one of warming. While methane and nitrous oxide concentrations are significant contributors to climate change, CO_2 is the currently the primary contributor and will be the focus of this discussion. The primary source of CO_2 is fossil fuel consumption.

In 2005, global atmospheric CO_2 levels were measured at 379 ppm, far exceeding the range observed over the last 650,000 years, and emissions grew by approximately 80% between 1970 and 2004 (IPCC 2007). In 2012, average atmospheric CO_2 levels had grown to 392.6 ppm globally, and exceeded 400 ppm for the first time at several arctic sites (Blunden and Arndt, 2013).

Responses to Climate Change

Local responses to climate change may not follow the global trend in either magnitude or direction of response. Because of this, global trends will be discussed briefly to introduce each climate stressor and lay the foundation on which to compare and contrast the local, California responses.

Global Responses

The IPCC (2007) reported that eleven of the twelve years from 1995 to 2006 ranked among the twelve warmest years since 1850. All of the ten warmest years on record have occurred since 1998 including 2012 (Blunden and Arndt, 2013), and 1998 was the only year in the 20th century hotter than 2012 (NOAA 2012). The trend appears to be continuing; July 2013 was the 37th consecutive July and 341st consecutive month with a global temperature above the 20th century average (Osborne and Lindsey, 2013). The rate of warming has also increased. Since 1880, the decadal rate of increase has been 0.11°F increasing to 0.28°F per decade since 1970 (NOAA, 2012).

Global average sea level rise (SLR) has occurred at an average rate of 1.8 mm yr^{-1} since 1961, increasing to 3.1 ± 0.7 mm yr^{-1} since 1991 (IPCC, 2007). Estimations of future global sea rise are on the order of 8-23 cm (3.15-9.06 in) by 2030, 18-48 cm by 2050, and up to 140 cm by 2100, all relative to sea level in 2000 (NRC 2012). These estimates vary however based upon which models are used and which variables are included; the NRC values, for instance, are higher than the IPCC (2007) estimation (18-59 cm) for the year 2100.

California Responses

Air temperatures are expected to increase more over continental land masses than over the oceans (Bakun, 1990). Along the California coastline, this will result in atmospheric pressure gradients leading to intensification of winds (Field et al., 1999). Stronger winds, in turn, are expected to intensify upwelling along the west coast of the US. Under normal conditions, intensification of upwelling would lead to cooler water temperature. However, higher air temperature can also lead to stronger thermal stratification and a deepening of the thermocline (Roemmich and McGowan, 1995), reducing the cooling effect of, and nutrient delivery by, the upwelling. On millennial timescales, upwelling has been positively correlated to air temperatures (Pisias et al., 2001), and upwelling along the California coast has increased over the last 30 years (Snyder et al., 2003). Previous warm periods were associated with reduced current flow in the California Current system (Pisias et al., 2001).

SLR will vary depending on a number of factors both long-term and short term. These include storm events, melting ice and glaciers, circulation patterns, climate variations, and tectonics. (NRC, 2012). Modeled SLR at west coast tide gage locations predicted relative sea level rises of around 0.35 ± 0.25 mm yr^{-1}. Total SLR off Los Angeles, relative to 2000, is projected at 14.7 ± 5.0 cm (5.79 ± 1.97 in) by 2030, 28.4 ± 9.0 cm by 2050, and 93.1 ± 24.9 cm by 2100.

The primary force behind year-to-year variability along the California coast is the El Niño Southern Oscillation (ENSO) (Field et al., 1999). The name refers to coupled ocean-atmospheric processes where the Southern Oscillation is a flip-flop of atmospheric pressure over the south Pacific, and where El Niño refers to the in-water response. El Niños result in rapid warming events in California, increased storminess, and drops in phytoplankton and kelp productivity. Strong El Niño events can increase sea levels 10 to 30 cm (3.94 – 11.81 in), raise sea surface temperature (SST) an average of 2.7 °F, increase stratification, and decrease nutrient delivery into surface waters, all over a few winter months. El Niño events persist for a few months to a year with some extreme El Niños lasting for two years. La Niña displays an equally abrupt and short-lived effect on California coastal ecosystems. However, in the case of La Niña, SST is suppressed (-1.8 °F on average). Currently it is unknown whether ENSO activity will be enhanced, or damped, or whether the frequency of ENSO events will change (Collins et al., 2010)

Lobster

Increased SST conditions will likely favor the spiny lobster fishery since behavioral changes related to warm temperatures, increase harvest (Pringle, 1986; Koslow et al., 2012). Also, California is situated at the northern edge of the lobster's current domain range; lower numbers of lobster north of Point Conception are generally attributed to the cooler water found there. Increasing SST could therefore result in a general extension northward of lobster, particularly during El Niño years or times of enhanced Davidson Current northward flow. These latter two conditions are also thought to provide episodic transport of larvae north from Mexico which would also increase the spiny lobster abundance over time. (Pringle, 1986).

As SST increases, assemblages within southern California kelp forests will shift to more dominance of southern species – such a shift has already been observed in some kelp forests (Field et al. 1999). Kelp itself may be impacted by increasing SST and reduced nutrients, although it is unclear at this point exactly what response, positive or negative, kelp forests will have relative to climate change. Likewise, It is unclear if the California spiny lobster, being more tropical, would be directly (i.e. physiologically) affected negatively by increasing SST.

There is an increased likelihood of disease with higher water temperatures. As an example, the bacterial infection, epizootic shell disease, is present in American lobster stocks on the east coast of the US and is possibly linked to higher water temperatures. Catchability increases with increasing temperature. Considered alone, this could lead to higher harvests in the future. Even if countered by other climate change factors, variations in catchability would still need to be understood and addressed in stock assessment and modeling efforts for accurate results.

It is still unclear whether increased stratification or upwelling, countering stratification, will be the dominant response to climate change. Increased stratification, however, is projected to lead to declines in zooplankton abundance (Roemmich and McGowan, 1995) which could adversely affect the zooplankton larval phase of the spiny lobster directly or indirectly by reducing food sources. Conversely, upwelling and alongshore transport are strong determinants of dispersal and recruitment (Gaylord and Gaines, 2000; Connolly et al., 2001). Harley et al. (2006) cited modeling work that suggested increased

offshore movement (e.g., upwelling) can be negatively correlated with population size in benthic species. Very strong upwelling, therefore, could reduce the ability of lobster to maintain adult populations in some areas. This is probably more applicable to regions north of Point Conception and, as such, would act to reduce northward movement of the lobster range rather than impact the southern California population.

Increasing SLR will lead to coastal inundation and increased coastal erosion, in particular when accompanied by expected higher intensity storm events coinciding with high tidal periods. Coastal erosion can lead to silting of coastal habitat necessary for the lobster, in particular seagrass beds used for settlement and adult foraging. Even in areas spared from excessive silting, seagrass beds would still be sensitive to changing wavelengths of light brought about by increased turbidity and water depth. The fishing industry could also experience flooding at dock and harbor facilities. This would potentially affect both the fishermen and dealers.

Seagrass beds could be impacted by more frequent, higher intensity storm events damaging part of a bed, or completely destroying it. These events could also become relatively common occurrences. Damage or destruction of seagrass beds would impact lobster through reduction in suitable habitat for puerulus settlement. This could result in adult mortality exceeding recruitment leading to local loss of populations. Similarly, kelp beds could be damaged or destroyed at more frequent intervals. Lobsters are considered, along with urchins and kelp, to be necessary for the health of the kelp forest ecosystem. If kelp is lost at higher frequencies the result could be an imbalance in the kelp/lobster/urchin relationship leading ultimately to loss of the ecosystem (and by extension, the lobster located there). In terms of the fishery, these storm events could also affect the fishermen economically by hindering their ability to fish, and by the destruction of gear.

Changes to the lobster stock may also occur via altered larval distribution and settlement, loss or gain of coastal nursery habitats, and altered abundances of strongly interacting species (e.g. predators and prey) (Pecl et al. 2009). Though first-stage larval abundance generally is correlated with SST (Fig. 5), changes in wind patterns and storm frequency may alter larval dispersion and settlement (Caputi et al. 2010). Because spiny lobster larvae spend up to 10 months in the plankton stage, and the final larval stage actively swims from offshore to coastal nursery habitats, settlement success is dependent on the planktonic larvae's distance offshore at the time of final molt. Any change in currents and storms that result in farther offshore dispersion will have an adverse effect on harvest in the future.

Ocean Acidification

Although not specifically caused by climate change, ocean acidification is a separate phenomenon also related to increasing amounts of atmospheric CO_2. The ocean absorbs CO_2 from the atmosphere naturally and acts as a buffer for atmospheric CO_2. The pH of the oceans, however, is affected by the level of absorbed CO_2. With increasing levels of atmospheric CO_2, the ocean's CO_2 level also rises and the water becomes more acidic. It has been estimated that the oceans have absorbed half of the anthropogenic-induced CO_2 from the atmosphere (Pecl et al., 2009), and this has resulted in a more acidic ocean. (Caldeira and Wickett, 2003; Royal Society, 2005; Pecl et al, 2009). As acidity continues to increase, there will be increasingly adverse effects on many organisms that use calcium carbonate for their shells and skeletons since calcium carbonate will dissolve as acidity increases. Water corrosive enough to dissolve seashells has been observed off California and similar occurrences are expected to become more frequent (Feely, 2008). The types of organisms potentially affected include snails and mussels, corals, and many phytoplankton species. It is unclear if there will be any adverse effects of

acidification directly on lobster (Pecl et al., 2009). Also, distribution, extent, and composition of coastal vegetated habitats that house lobster all may change due to altered dissolved CO_2 concentrations.

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Appendix VI: Economic Report

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H. T. HARVEY & ASSOCIATES
ECOLOGICAL CONSULTANTS

An Economic Report on the Recreational and Commercial Spiny Lobster Fisheries of California

Photo Courtesy of: California Department of Fish and Wildlife

Prepared by:

Dr. Steven C. Hackett
Dr. Sharon Kramer
M. Doreen Hansen
David Zajanc

3 April 2013

We are grateful for the participation of many recreational and commercial spiny lobster fishermen in the data-gathering component of this report. We thank Kristine Barsky and Kai Lampson of CDFW for their support and assistance. We also acknowledge the extensive assistance provided by staff at H. T. Harvey & Associates and at CDFW.

1125 16th Street, Suite 209 • Arcata, CA 95521 • Ph: 707.822.4141 • F: 707.822.4848

Executive Summary

- The project scope was to update annual expenditure estimates associated with commercial spiny lobster fishing in California from Hackett et al. (2009); to use the California Ocean Fish Harvester Economic (COFHE) model from Hackett et al. (2009) to estimate the economic impacts associated with ex-vessel commercial landings in California; to develop a spiny lobster recreational fishing sampling design and survey questionnaire; and to use the survey results to estimate recreational fishing expenditures in California.
- Based on 2012 interview data and prior "bottom-up" expenditure modeling from Hackett et al. (2009), we estimate that commercial fishermen targeting spiny lobster in California spent ~$10,555,000 on fishing- and vessel-related expenditures in the 2011-12 fishing season.
- Based on the mean of total ex-vessel revenue from the 2009-10 through 2011-12 commercial fishing seasons in California, we estimate that the multiplier effect associated with commercial landings resulted in total annual statewide economic output of ~$22,523,000 and 323 jobs. Of the California counties in which spiny lobster landings occurred, San Diego County experienced the largest share of statewide output and jobs. Based on 2012 survey data we estimate that annual expenditures in the recreational fishery in California were ~$37,093,000. Note that not all of these expenditures necessarily occur in California. Also note that these are expenditures and not total economic impact, which is beyond the scope of this report.
- The average recreational fisherman has fished spiny lobster for nearly 9 years and spends an average of just over 2/3 of a day on a typical fishing trip. Spiny lobster fishing constitutes an average of just over 1/3 of a recreational fisherman's total fishing effort in a given year. Private vessels provided just over 1/2 of all access to the recreational fishery, and on average about 8% of a vessel's annual usage was estimated to be targeted at spiny lobster fishing.

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Section 1.0 Introduction

The California spiny lobster, *Panulirus interruptus* (hereafter spiny lobster), occurs in shallow, rocky coastal areas from Point Conception (Santa Barbara County) into Mexico, including offshore islands and banks (Barsky 2003). A significant commercial and recreational fishery exists for spiny lobster, and the season in California runs from early October to mid-March, with approximately 2/3 of landings usually being made from October through December. Commercial fishermen targeting spiny lobster set baited, wire traps from vessels that usually range between 22 to 49 feet in length. Spiny lobster has been a relatively lucrative fishery. A total of 751,000 pounds of spiny lobster was landed by commercial fishermen in 2011 in California at a total ex-vessel value of ~$12,910,000, yielding an average price per pound of ~$17.00 (CDFW 2013). In 2012, preliminary data indicate roughly similar landings as 2011. Price per pound fluctuates throughout the season, and in the 2012/13 fishing season it ranged from $12 to $25 per pound. Export markets (e.g., China) have helped drive higher prices in the commercial fishery in recent years (Barsky, pers. comm., 2013).

This economic report provides an update of direct expenditure information by commercial fishermen described in Hackett et al. (2009). Commercial expenditure updating occurred by way of interviewing a set of commercial spiny lobster fishermen and identifying the extent to which mean expenditure levels by category have changed since 2007. This report also utilized the California Ocean Fish Harvester Economic (COFHE) commercial fishery economic impact model from Hackett et al. (2009) to estimate total economic impact. This was done by applying the COFHE multipliers (available at http://www.dfg.ca.gov/marine/economic structure.asp) to the mean of total seasonal ex-vessel revenue averaged over the 2009-10, 2010-11, and 2011-12 fishing seasons. Commercial fishery economic impacts were estimated at the county, region, and statewide scales. Note that in Hackett et al. (2009) the spiny lobster fishery was grouped with crab in the "Lobster and Crab" operational configuration (OC). In contrast, this report focuses entirely on the targeted spiny lobster fishery.

This report also includes an estimate of the direct expenditures made by recreational fishermen targeting spiny lobster in the recreational fishery off the coast of California. These direct expenditures were estimated from survey data gathered in collaboration with California Department of Fish and Wildlife (CDFW) using the spiny lobster report card database. It is beyond the scope of this study to estimate economic impact. To do so one would need to "margin" the retail expenditures to get a wholesale estimate, group expenditures by appropriate economic sector category, and apply multipliers (e.g., RIMS II) or use economic impact software (e.g., IMPLAN).

In Section 2 below we summarize commercial expenditures in the spiny lobster fishery. In Section 3 we describe economic impacts associated with the mean of the last 3 season's worth of ex-vessel revenue from commercial spiny lobster harvest. In Section 4 we summarize estimated expenditures in the spiny lobster recreational fishery. The survey instruments used to elicit commercial and recreational fishing data are provided in the Appendices to this report.

Section 2.0 Estimated Commercial Expenditures in the Spiny Lobster Fishery

The overall goal for this portion of the report was to update the expenditure information for the "lobster and crab" operational configuration (OC) from Hackett et al. (2009). Due to resource constraints, we were unable to reproduce the comprehensive survey methodology used in Hackett et al. (2009). Instead we used a key-informant interview methodology in which we asked commercial spiny lobster fishermen the extent to which (inflation-adjusted) expenditures by category (averaged at the individual fisherman level) reported in Hackett et al. (2009) reflected expenditures for a "typical" commercial fisherman. We asked contacts at CDFW to identify commercial fishermen who were likely to have a broad, industry-wide perspective and who would thus be able to reflect on the expenditures made by a typical commercial spiny lobster fisherman.

Annual average fixed and variable cost information from the lobster and crab OC in Hackett et al. (2009) was provided to the interviewees in numerical and pie-chart format (see Appendix A for an example used for the small-vessel stratum). These "cost sheets" were adjusted for inflation (2007 nominal expenditures from Hackett et al. (2009) were adjusted to 2012 values). Interviewees were asked to determine a percentage by which those expenditures should be increased or decreased to reflect the expenditure experience of a "typical" spiny lobster commercial fisherman. Some expenditure categories from Hackett et al. (2009) such as "electrical gear" and "other gear" purchases and repairs were consolidated into a "gear purchases" and "gear repairs" category. The cost sheets were stratified into vessel size classes used in Hackett et al. (2009) – small (< 26 feet), medium (26 to 36 feet), and large (> 36 feet). Cost sheets for a given size class were given to selected fishermen with vessels of the same size class, and afterwards personnel from H. T. Harvey & Associates called to interview the commercial fishermen and complete the questionnaire component of the cost sheets.

A total of 10 commercial fishermen participated in the interviews. We use the term "interviewee" below to refer to these commercial spiny lobster fishermen who were interviewed in 2012 to help us update Hackett et al. (2009) expenditures circa 2007. Of the 10 interviewee responses, 8 were determined to be useable, while 2 were not (addressed below). When participants reported a range of values (e.g., "bait expenses from the cost sheet need to be increased by 10-30%"), then the mean of the range (in this instance, 20%) was coded and used in the analysis. If a fisherman simply indicated that costs should "increase" or "decrease", those data were treated as a blank (unanswered) and not used in the following analysis (there were very few of these responses). Percentage changes for each cost category were averaged within each vessel size class (small size class and a combined medium-large size class).

As noted above, we asked interviewees to report a "typical" commercial fisherman's expenditures within a vessel size class in the spiny lobster fishery, and to indicate the percentage increase or decrease that should be made to the 2007 expenditure information from Hackett et al. (2009). Many of the interviewees indicated that expenditures we reported from the 2007 study were far too low, even after the figures were inflated to

current dollars, and suggested very large expenditure increases. When such expenditure increases were implemented fleet-wide, net revenues (e.g., ex-vessel revenue less reported expenditures) were estimated to be negative. Conversations with CDFW contacts indicated that negative net revenues were very unlikely for this lucrative fishery. We then turned to an analysis of activity level. An analysis of trip frequency determined that the interviewees selected by CDFW were more active fishermen than the average commercial fisherman. As a result it is likely that the interviewees were reporting "typical" expenditures that actually reflected the experience of the top 10-20% of commercial fishermen. As many categories of estimated expenditures increase with activity level, applying percentage increases from these highly active fishermen would result in a substantial over-estimate of fleet-wide expenditures. To correct for this likely overestimate of expenditures, we developed an "activity-based" weighting system.

First we used the expenditure estimation models by category from Hackett et al. (2009) and applied those to each commercial fisherman in the commercial spiny lobster fishery based on their vessel type, home port, and number of trips. Next we inflated these expenditures to current dollars. We then adjusted these expenditures using the mean percentage change by expenditure category provided by the commercial spiny lobster interviewees (one set of mean percentage change values was calculated from small-vessel interviewees, and another set was calculated from combined medium and large vessel interviewees). This percentage change is likely to be too high for most commercial spiny lobster fishermen, for reasons described in the preceding paragraph. Accordingly, we then applied the activity-based weight to each expenditure category for each commercial spiny lobster fisherman in a given vessel size class. The activity-based weight is a quotient equal to the individual fisherman's total number of fishing trips in 2011 divided by the mean number of fishing trips by the relevant interviewee group in 2011. The effect of this activity-based weight is to deflate (inflate) the percentage change from the interviewee group when an individual fisherman's level of activity is less than (greater than) that of the interviewee group. This weighting system was not applied to expenditure categories that are unlikely to be related to activity level – slip fees, member association fees, harbor fees, and interest.

Note that responses from 2 interviewees remained inexplicable and substantial outliers even after consideration of their vessel size, number of trips, and other observable characteristics. This raised concern about their reliability, ultimately resulting in those interviewee responses not being included in the analysis.

We also discovered that while we asked participants to provide an annualized value for engine, hull, and other major capital purchases, the responses were consistent with reporting an actual purchase price rather than an annualized "debt service" type value. For example, we might receive a reported annual expenditure of $16,000 for engine purchase, when what we wanted was the "annualized" cost (which might be ~ $1,800 per year as debt service on a 10 year loan). We thus needed to annualize these capital expenditure percentage change values from the interviewee group. To do so, we used data on frequency of capital purchases from Hackett et al. (2009) to develop an additional "annualized capital purchase" weighting system. The annualized capital purchase weight simply equals the frequency of non-blank and non-zero capital expenditure responses from the commercial fisherman survey in Hackett et al. (2009). Annualized engine and hull purchase expenditures for each commercial spiny lobster fisherman were thus estimated the same way as

other expenditure categories described in the preceding paragraph, except that the additional annualized capital purchase weight was also applied.

Commercial license, permit, and boat registration expenditures were calculated from CDFW 2011/12 fees. Once we estimated all expenditure categories for each individual commercial spiny lobster fisherman as described above, a fleet-wide expenditure total was built from the bottom up by summing expenditures estimated for each commercial fisherman. The resulting annual expenditure estimates for the commercial spiny lobster fishery are provided in Table 1. We estimate that commercial spiny lobster fishermen spent $10,555,000 in expenditures related to spiny lobster fishing for the 2011-12 fishing season. Nearly one half of this figure was estimated to derive from crew wages, bait, and fuel.

Table 1. Annual Estimated Expenditures for the California Spiny Lobster Commercial Fishing Fleet for Fishing Season 2011-12

	Estimated Total Expenditures			
Vessel Size Categories	**< 26**	**26 - 36**	**> 36**	**Grand Total**
Fixed Expenditures				
Hull Repair	51,754	191,515	129,482	**372,751**
Hull Purchase	37,380	100,317	32,348	**170,045**
Engine Repair	116,752	216,295	65,951	**398,997**
Engine Purchase	65,139	152,793	10,490	**228,423**
Gear Repair	195,973	216,341	161,195	**573,509**
Gear Purchase	116,509	217,036	119,781	**453,326**
Insurance	73,819	169,990	102,172	**345,981**
Storage	110,863	69,906	24,653	**205,422**
Interest	0	79,243	78,019	**157,262**
Registration and License Fees	54,582	57,890	20,675	**133,147**
Slip	181,581	317,976	142,250	**641,807**
Variable Expenditures				
Bait	733,113	590,865	282,964	**1,606,941**
Food	54,218	126,005	69,993	**250,217**
Fuel	496,234	508,249	325,447	**1,329,930**
Crew Wages	603,042	900,017	366,229	**1,869,287**
Harbor Fees	0	9,434	3,322	**12,756**
Transportation	250,753	139,917	65,304	**455,974**
Member Fees	3,398	10,869	3,827	**18,094**
Federal Tax	238,043	618,720	263,595	**1,120,359**
State Tax	44,170	117,054	50,045	**211,268**
	Total			
Grand Total Expenditures	3,427,322	4,810,431	2,317,742	**10,555,495**

Section 3.0 Economic Impact Estimates for the Commercial Spiny Lobster Fishery

3.1 Overview of Economic Impact Assessment

The material below draws closely from Hackett et al. (2009). Firms in every industry are linked through their purchases and sales with firms in other industries and with households. Inter-industry linkages and the impact of activities in one industry on overall household income, employment, business sales, tax revenues, and other economic conditions are important but not always apparent by examining direct industry statistics. Input-output models display direct, indirect, and induced economic linkages, and measure impacts of changes or proposed changes in industrial activity or in government policies that are expected to change industrial activity. Direct impacts are associated with the direct purchases of inputs (e.g., labor and intermediate inputs) by an industry to support an increase in industry output. Indirect impacts are associated with additional "rounds" of inter-industry purchases and sales that are generated as a result of direct impacts. Induced impacts are from increases in household expenditures that result from increases in household income associated with direct and indirect impacts.

Input-output models form the core of modern economic impact assessment decision support tools. Hackett et al. (2009) offers economic impact assessment models for California's commercial fisheries. To build these models, Hackett et al. (2009) collected statewide commercial fishing expenditure and earnings data in 2007 for 20 different OCs or fishery sectors that reflect vessel and gear types and the associated commercial fishing expenditures for target species groups. These expenditure data, combined with CDFW landings and revenue data, were used to develop input-output models with 20 detailed OCs for the state of California, 4 coastal regions within California, and 22 individual counties that make up those coastal regions. These 27 models, collectively called the COFHE Model, were developed by King and Associates, Inc. (coauthors in Hackett et al. 2009) from a widely used and respected regional economic modeling tool called the IMPLAN (IMpact Analysis for PLANning) system (MIG 2013).

The COFHE models are designed to show the economic linkages and impacts of California's commercial fish harvesting industries and how they are affected by external economic, regulatory, or environmental changes that affect ex-vessel revenues. These models show how each commercial fishing OC is linked with other industries and with households. The models were then used to develop economic "multipliers" that show the "ripple" effects of changes in fisheries and fisheries management decisions on the California economy. The multipliers developed through the COFHE model are presented per million dollars of direct sector output.

The most typical use for the COFHE model is to assess the economic impact associated with a regulatory change that has known impacts on ex-vessel revenues due to changes in landings. In this report we apply the COFHE model multipliers to total ex-vessel revenue at county, region, and statewide scales. The resulting economic impact is associated with the existence of the commercial spiny lobster fishery in California. If,

hypothetically speaking, this fishery were newly opened, then the economic impact figures provided below would provide an estimate of the additional economic activity associated with opening the fishery at different geographical scales. Key economic impact terms are defined in Table 2 below.

Table 2. Definitions of Economic Impact Terms Used in this Report

IMPLAN Term	Definition
Direct Effects	The impacts associated with the direct purchases of inputs (e.g., labor and intermediate inputs) by an industry to support a $ 1 increase in industry output.
Indirect Effects	The impacts associated with additional "rounds" of inter-industry purchases and sales that are generated as a result of direct impacts. Indirect impacts include the direct impacts of purchases of inputs (e.g., labor and intermediate inputs) by industries that sell to the industry responsible for the direct impacts, and by the industries that sell to those industries, and so on.
Induced Effects	The impacts associated with increases in household expenditures that result from increases in household income associated with direct and indirect impacts. The inclusion of induced impacts based on "income effects" is what distinguishes Type II multiplier Effects from Type I multiplier effects.
Total Effects	The total of all direct, indirect, induced impacts.
Industry Output	Total industry production, equal to shipments plus net additions to inventory.
Jobs	Annual average number of full time-equivalent jobs, including self-employed individuals.
Employee Compensation	Total payroll costs, including wages and salaries plus benefits.
Indirect Business Tax	Sales, excise fees, licenses and other taxes paid during normal operation. This includes all payments to the government except for taxes based on income.
Labor Income	Sum of Employee Compensation and Proprietor's Income.
Other Property Income	Includes corporate income, rental income, interest and corporate transfer payments.
Proprietor Income	Income from self-employment.
Total Value Added	The value added during production to all purchased intermediate goods and services. This is equal to employee compensation plus proprietor's income plus other property income plus indirect business taxes.

*Source: Adapted from IMPLAN User Guide, Version 2.0

3.2 Economic Impacts Associated with the Mean Value of Ex-Vessel Landings over the 2009-10 through 2011-12 Fishing Seasons

Below we provide economic impact estimates at the county, region, and state-wide scales. Note that these economic impact estimates are based on the mean value of ex-vessel landings over the 2009-10, 2010-11, and 2011-12 spiny lobster commercial seasons. We estimate that the multiplier effect associated with commercial landings resulted in total annual statewide economic output of ~$22,523,000 and 323 FTE jobs (Table 3). Of the California counties in which spiny lobster landings occurred, San Diego County experienced the largest share of statewide output and jobs (Table 4).

Table 3. Economic Impacts for the State of California

	California			
	Direct Effects	**Indirect Effects**	**Induced Effects**	**Total Effects**
Output	$11,188,354	$4,992,389	$6,342,309	$22,523,052
Employee Compensation	$695,893	$1,401,744	$1,778,367	$3,876,004
Proprietor's Income	$3,831,866	$208,003	$293,616	$4,333,496
Labor Income Effect	$4,527,770	$1,609,747	$2,071,983	$8,209,500
Other Property Type Income	$198,604	$691,843	$1,315,695	$2,206,142
Indirect Business Taxes	$750,257	$337,810	$373,031	$1,461,110
Total Value Added	$5,476,632	$2,639,411	$3,760,708	$11,876,751
Jobs	241.4	34.8	46.7	322.8

Table 4. Economic Impacts by County: Los Angeles, Orange, Santa Barbara, San Diego, and Ventura

	Los Angeles				Orange			
	Direct Effects	Indirect Effects	Induced Effects	Total Effects	Direct Effects	Indirect Effects	Induced Effects	Total Effects
Output	$1,943,905	$882,078	$1,098,382	$3,924,364	$1,650,987	$676,320	$790,676	$3,117,983
Employee Compensation	$120,907	$243,046	$310,368	$674,321	$102,688	$197,796	$216,747	$517,231
Proprietor's Income	$665,764	$38,835	$52,973	$757,571	$565,442	$29,148	$40,142	$634,732
Labor Income Effect	$786,671	$281,882	$363,343	$1,431,894	$668,130	$226,945	$256,889	$1,151,963
Other Property Type Income	$34,506	$120,716	$228,897	$384,119	$29,307	$102,006	$173,631	$304,944
Indirect Business Taxes	$130,354	$58,824	$64,413	$253,590	$110,710	$48,917	$49,292	$208,919
Total Value Added	$951,530	$461,423	$656,651	$2,069,603	$808,147	$377,868	$479,811	$1,665,826
Jobs	41.9	6.1	8.2	56.2	35.6	4.8	5.8	46.3

	Santa Barbara				San Diego			
	Direct Effects	Indirect Effects	Induced Effects	Total Effects	Direct Effects	Indirect Effects	Induced Effects	Total Effects
Output	$2,353,173	$659,931	$899,510	$3,912,615	$3,643,257	$1,303,157	$1,665,442	$6,611,856
Employee Compensation	$146,363	$205,255	$259,506	$611,126	$226,603	$394,015	$472,866	$1,093,487
Proprietor's Income	$805,931	$32,763	$44,623	$883,317	$1,247,768	$56,011	$76,763	$1,380,543
Labor Income Effect	$952,296	$238,019	$304,129	$1,494,443	$1,474,375	$450,026	$549,629	$2,474,027
Other Property Type Income	$41,771	$103,191	$205,634	$350,597	$64,671	$193,329	$370,064	$628,061
Indirect Business Taxes	$157,797	$53,097	$58,194	$269,088	$244,306	$100,142	$107,902	$452,350
Total Value Added	$1,151,864	$394,307	$567,957	$2,114,128	$1,783,352	$743,494	$1,027,595	$3,554,438
Jobs	50.8	6.0	7.7	64.4	78.6	10.8	13.3	102.8

	Ventura			
	Direct Effects	Indirect Effects	Induced Effects	Total Effects
Output	$1,597,033	$517,177	$582,053	$2,696,263
Employee Compensation	$99,332	$160,609	$166,446	$426,387
Proprietor's Income	$546,963	$18,479	$26,436	$591,880
Labor Income Effect	$646,295	$179,088	$192,883	$1,018,267
Other Property Type Income	$28,349	$76,490	$135,721	$240,560
Indirect Business Taxes	$107,092	$41,226	$39,983	$188,301
Total Value Added	$781,738	$296,804	$368,587	$1,447,128
Jobs	34.5	4.2	4.9	43.5

Section 4.0 Estimated Expenditures in the Spiny Lobster Recreational Fishery

We developed a recreational survey instrument that, like other recreational fishing surveys, seeks expenditure information associated with spiny lobster fishing. Capital expenditures on vessel and non-specific gear are weighted by the reported percentage of targeted usage in the spiny lobster recreational fishery. The survey instrument is provided in Appendix B of this report. A stratified random sampling design was also developed for CDFW. In order to preserve confidentiality, CDFW conducted the telephone surveys and provided us with tabulated results. We begin with an overview of the survey methodology, and then provide demographic summary information and expenditure estimates drawn from the tabulated results of the survey.

4.1 Survey Methodology

A stratified random sampling design was developed for sampling spiny lobster recreational fishermen, as it is likely that there are substantially different levels and types of expenditure across groups of fishermen. Stratified sampling takes advantage of the ability to create groups where the target of interest (i.e., angler expenditures) is most similar among units (i.e., recreational fishermen) within a stratum, which helps reduce variation of the overall estimate (Thompson 1992, see Cochran 1977, for greater detail on stratified sampling). In this case we use strata that delineate groups based on home origin (i.e., the fisherman's residence), catch location, and gear type.

Stratification based on home origin regions was used in an attempt to account for potential differences in expenditure incurred by geographic area. Home origin is defined as the location where people live, and was determined based on the zip codes provided on spiny lobster report cards. The rationale for home origin groups is based on the likelihood that fishermen traveling to the catch location from further away have an increased likelihood of incurring a lodging expense. Catch location pertains to the area fished, as indicated by the location codes on the report cards. The rationale for catch location groups is based on the likelihood that fuel and related expenditures linked to additional vessel transit distance to the fishing grounds will vary across catch locations. This is especially the case for offshore and island catch locations where transit expenditures are expected to be considerably higher than catch locations that are closer to the coast.

We based our final decision on appropriate home origin regions on sample size considerations, geographical breaks related to population density (extent of urbanization), and graphical analyses. As illustrated in Figure 1 the majority of returned cards are from coastal zip codes immediately adjacent to the coast (1,174 of 4,640), or zip codes for locations outside the immediate coastal strip but within 50 miles of the coast (2,834 of 4,640). There was a large drop-off in the number of returned report cards beyond 50 miles from the coast (632 of 4,640), suggesting a substantial decrease in activity from fishers further than 50 miles from the coast, assuming that reporting rates do not differ with distance from the coast. In addition, most of the population

lives within 50 miles of the coast, and are more likely to take day trips to go fishing with reduced expenditures per fishing trip compared to those who would travel from further away and make longer trips.

In summary, we utilized the following home origin regions:

1. Coastal (zip codes directly adjacent to the coast)
2. Regional (i.e., close enough to the coast for reasonable day trip, < 50 miles, but beyond coastal)
3. Beyond (> 50 miles from the coast)

Figure 1. Map of Potential Home Origin of California Spiny Lobster Recreational Fisherman. Note that "Within 50 miles to Coast" includes zip code areas that are partially within this zone

In addition to home origin regions, we also pre-stratified based on catch location regions. Fishing grounds in coastal waters off San Diego, Los Angeles/Orange County, and Santa Barbara/Ventura were grouped into a "Not Offshore" category (3,679 of 4,640 report cards). Due to the potential for greater trip expenditures associated with catch locations in the Channel Islands and more distant offshore grounds, a second category, "Offshore and Islands" (961 report cards) was created.

Finally, gear type is an important consideration for pre-stratification in that the focus of the trip and behavior patterns/investment in the recreational fishery may differ a great deal. Anglers targeting spiny lobster generally utilize either some type of diving gear, or deploy some form of hoop net. The equipment associated with each method also differs, as does the expenditure of the equipment.

For the purposes of pre-stratification, we collapsed the 2 types of hoop netting (traditional basket-style hoop nets and rigid conical-style hoop nets) into one category, "hoopers", and the 2 types of diving (skin and scuba) into another category, "divers" (Barsky 2003). Overall there were a greater number of returned report cards for hoopers (2,840) than divers (1,800). The CDFW's 2007 creel survey of recreational lobster fishermen found that 80% used hoop nets and 20% were divers.

We had considered finer breaks in categories (e.g., between traditional and rigid hoop nets, or between scuba and skin diving), but concluded that differences in net technology did not warrant further stratification. Due to sample size considerations (i.e., relatively few skin divers), and the large degree of overlap between the 2 activities for many fishermen, we opted for a single comprehensive "divers" category.

Analysis of activity patterns also showed the strongest differences between gear types (see Figure 2), supporting the idea that the expenditures between hoopers and divers may be considerably different. Distributions of activity patterns were plotted using kernel smoothing techniques (Bowman and Azzalini 1997) to allow graphical comparisons among gear types. Kernel smoothing was used to estimate probability densities for the range of values of activity patterns found in the dataset. These probability densities were plotted against the number of trips to graphically represent distributions of activity patterns. In general, divers tended to take more trips per year than hoopers, and were more likely to make > 5 trips in a year/season.

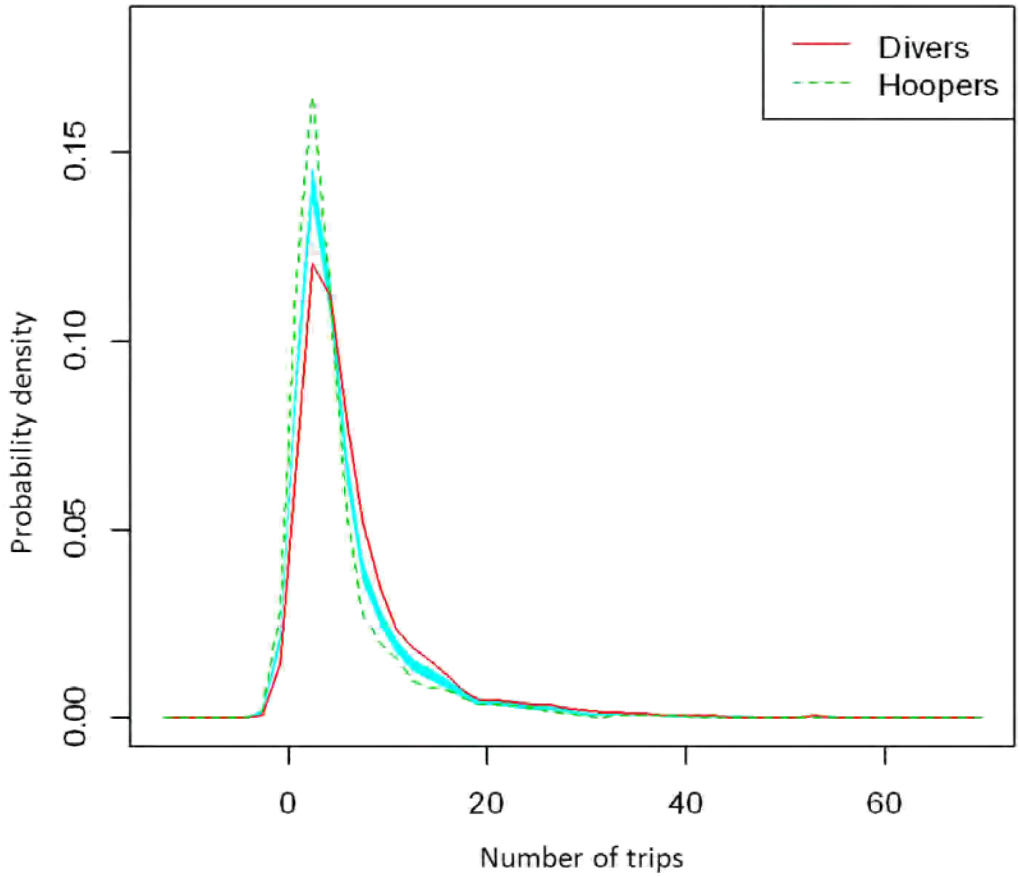

Figure 2. Smoothed Probability Density Distribution Curves for Activity Patterns by Gear Type. The turquoise band is a reference band of equality (see Bowman and Azzalini 1997); if both lines fall within the band, there is no difference between the 2 distributions.

To classify the data, we designated a dominant gear type used by a fisherman (defined as > 50% of trips, i.e., > 50% of trips diving resulted in classification as "divers"; > 50% of trips hooping resulted in classification as "hoopers"; 50/50% of trips for "divers"/"hoopers" resulted in classification as "both" (1 report card)). If no one category represented > 50% of the trips (27 report cards), we evaluated the detailed record of trips to determine the appropriate gear category (23 of 27 were deemed "both"). Due to the small number of fishermen in the "both" category however, we decided to lump this category with the category that had the most similar pattern of activity, the "hoopers."

We developed stratum-specific sample sizes that are proportional to the stratum size (i.e., proportional allocation). If we had more information regarding variance of expenditures within each stratum, we could try to achieve optimal allocation of sampling effort using different sampling proportions per stratum, minimizing variance for a given expenditure; however, this information does not currently exist. Proportional allocation is the same as the optimal allocation scheme in that it minimizes variation for a given expenditure under certain conditions (i.e., when the stratum variances are equal and the costs of sampling each unit within a given stratum are equal) (Chambers and Clark 2012). For the purpose of this study, we are assuming that

both conditions hold. Although it would be desirable to allocate more effort to those strata that have greater variance, there are no data to support that allocation at this time. In addition, it is reasonable to assume that calling an angler from one stratum will have a similar cost to calling a fisherman in any other stratum. Table 5 provides the proposed stratum sizes and the sample sizes by stratum.

Table 5. Sample Sizes by Stratum

Home Origin	Location	Gear Type	Stratum Size	Proportion of Total	Proposed Sample Size	Actual Sample Size
< 50	Not offshore	Hoopers	1,711	0.37	111	140
< 50	Not offshore	Divers	708	0.15	46	64
< 50	Offshore	Hoopers	236	0.05	15	20
< 50	Offshore	Divers	179	0.04	12	17
Beyond	Not offshore	Hoopers	198	0.04	13	18
Beyond	Not offshore	Divers	114	0.02	7	10
Beyond	Offshore	Hoopers	44	0.01	3	4
Beyond	Offshore	Divers	276	0.06	18	24
Coastal	Not offshore	Hoopers	537	0.12	35	47
Coastal	Not offshore	Divers	411	0.09	27	37
Coastal	Offshore	Hoopers	114	0.02	7	10
Coastal	Offshore	Divers	112	0.02	7	10
Total			4,640		300	401

A minimum proposed sample size per stratum of 3 was selected, as this is the absolute minimum required to generate a reasonable estimate of variance. For the vast majority of strata, proposed sample sizes are much greater than 3 (see Table 5). The strata selected were a balance between the idea of lumping strata to provide the greatest sample sizes possible per stratum, and making sure that we had enough strata to capture the groups most likely to have relatively large differences in expenditures with similar expenditures within each group. This approach resulted in a recommendation of a total sample size of 300 completed interviews, which amounts to picking the sample size that allows us to use 3 at a minimum for any given stratum under proportional allocation.

Interviews were conducted by telephone by CDFW personnel based on a list of randomly selected spiny lobster report card identification numbers. CDFW personnel then linked the selected identification numbers to the appropriate phone numbers before making the telephone calls. Potential survey participants were selected from recreational fishery participants who returned a 2011 spiny lobster report card. Interviewers would call a number, and if they were unsuccessful with the target interviewee (no answer, refusal to

participate, language barrier), then they would move on to the next contact on the list. If they completed the list for a particular stratum and still had not met the target number of completed surveys, then they would start over from the top of the list in an attempt to reach target interviewees who did not answer the first time (skipping prior refusals, language barriers, and completed interviews). Under this procedure the maximum number of times that a contact could be called was twice. In contrast meeting the sample size for some of the stratum groups was easier (more people answered the phone, fewer refusals, language barriers, etc.) and interviewers did not have to call all of the contacts on the list. A few contacts were obviously erroneous or didn't have phone numbers: Interviewers did not attempt to contact these people. CDFW generally found anglers to be willing to participate, and as a result CDFW elected to increase sample size by about 1/3 overall, with increases spread as evenly as possible across all strata. The column "actual sample size" in Table 5 indicates the number of recreational fishers interviewed by CDFW.

4.2 Expenditure Estimates for the Spiny Lobster Recreational Fishery

4.2.1 Estimation Methods

Estimates of the mean expenditures were generated using a bottom-up approach, taking estimates of the mean expenditure from respondents and extrapolating to the total number of report cards that were sold. Estimates of expenditures (mean, standard deviation) were first generated by stratum in accordance with the stratified sampling design used to select participants for the telephone survey. Mean expenditure for each stratum was generated based on the following formula for stratified estimators from Cochran (1977):

$$\bar{y}_{st} = \sum \frac{N_h}{N} \cdot \bar{y}_h ,$$

where N_h is the number of spiny lobster report cards in stratum h, N is the total number of spiny lobster report cards sold in 2011 adjusted by the % of returned cards that did not fish (13.5%), N = 28,868, and $\bar{y}_h$ is the estimated mean expenditure for stratum h. Once this estimate was obtained, the total was simply calculated as:

$$\hat{Y} = N \cdot \bar{y}_{st} .$$

Estimates of the 95% confidence interval for total expenditures were calculated based on the estimated sampling variance as:

$$\hat{Y} \pm t \cdot \sqrt{\hat{V}\left(\hat{Y}_{st}\right)} ,$$

where t is the appropriate t-value, and the sampling variance is estimated as:

$$\hat{V}\left(\hat{Y}_{st}\right) = \sum \frac{N_h(N_h - n_h)(s_h^2)}{n_h},$$

where N_h is as defined previously, n_h is the stratum sample size, and s_h^2 is the stratum variance (Cochran 1977).

All trip-related expenditures were attributed to spiny lobster fishing expenditures, as the survey instrument specifically asked for typical expenditures associated with spiny lobster fishing trips. In contrast, annual boat-related costs, which included items such as boat insurance and gear replacement, were attributed to spiny lobster fishing based on the percentage of annual boat or water craft usage that was reportedly dedicated to spiny lobster fishing in 2011. Note that these costs are subject to potential inestimable inaccuracies of the interviewee's perception of the percentage of their boat usage for spiny lobster fishing. The exceptions to the calculations based on the percentage of annual boat or water craft usage for spiny lobster fishing were fishing gear and related expenditures specifically linked to spiny lobster fishing. In calculating the average annual expenditure for the "other" costs (Question 10 of the annual, seasonal, one-time expenditure section), we assumed that these costs were strictly related to spiny lobster due to the way the question was worded (i.e., "…related to recreational lobster fishing…"), and so these costs were not adjusted based on vessel usage in the spiny lobster fishery.

In their 2006 estimation of the economic contribution of marine angler recreation in the U.S., Gentner and Steinback (2008) utilized a mail survey methodology applied to a sample of anglers originated from the Marine Recreational Information Program (MRIP) intercept survey to elicit angler expenditure information. As with the present study, Gentner and Steinback (2008) used a license-based random survey frame for their California angler expenditure estimates. They report the potential for avidity bias that could affect certain categories of durable expenditures, based on prior experience, and corrected for avidity bias using weights developed by Thomson (1991). One can argue that mail surveys such as those employed by Gentner and Steinback (2008) require an elevated level of commitment and initiative on the part of the angler to complete and return, and this commitment and initiative may be correlated with their level of avidity. In contrast, our telephone interview methodology at least partially addresses this issue and we therefore do not believe there is a strong case for avidity bias in our data, and consequently do not apply avidity weights.

For total annual travel expenditures, most categories of responses were multiplied by the respondent's number of trips (extracted from a separate CDFW database). We also applied $0.55 per mile to reported spiny lobster fishing-related ground transportation based on the federal rate from 2011. To determine total annual respondent expenditures on dive or party boat trips, we multiplied the reported cost per trip fare by the reported number of such trips in 2011.

For the calculation of the 95% confidence interval (CI) for total cost for a particular expenditure category, we used a weighted average of the degrees of freedom based on the effective "n" (see Satterthwaite 1946, as cited

in Cochran 1977) for each cost type (i.e., annual boat purchase cost, boat insurance, etc.) to find the appropriate t-value; weights were based on the contribution of the cost type to the total annual cost.

4.2.2 Demographic Information and Estimated Expenditures in California's Recreational Fishery for Spiny Lobster

Means, totals, and standard deviations (SD) for expenditures are presented in Tables 6 through 10. The average recreational fisherman has fished spiny lobster for nearly 9 years and spends an average of just over 2/3 of a day on a typical fishing trip (Table 6). Spiny lobster fishing constitutes an average of just over 1/3 of a recreational fisherman's total fishing effort in a given year (Table 6). Private vessels provide just over 1/2 of all access to the recreational fishery (Table 7), and on average about 8% of a vessel's annual usage was estimated to be targeted at spiny lobster fishing (Table 8A).

Annual expenditures in the recreational fishery for spiny lobster in California are estimated to be $37,093,000 (Table 9). The largest sources of expenditures were non-coastal residents who live within 50 miles of the coast who fished spiny lobster along the coast, and those who live more than 50 miles from the coast who dove for spiny lobster offshore (Table 9). Spiny lobster gear, boat/gear maintenance, and boat purchases were the largest annual expenditure categories (Table 8), while transportation, vessel fuel, meals and beverages, and dive/party boat fees were the largest trip-based expenditure categories (Table 10). Note that not all of these expenditures necessarily occur in California. Also note that these are expenditures and not total economic impact, which is beyond the scope of this report.

Table 6. Demographic Estimates for the Spiny Lobster Recreational Fishery, Means and Standard Deviations

Home Origin	Location	Gear Type	Years Fishing for Spiny Lobster		Spiny Lobster Fishing Trip Duration (Days)		Fraction of Total Fishing Effort (Lobster)	
			Mean	SD	Mean	SD	Mean	SD
<50	Not offshore	Hoopers	3.91	5.95	0.31	0.40	0.26	0.30
	Not offshore	Divers	18.18	13.45	0.31	0.35	0.43	0.29
	Offshore	Hoopers	8.10	11.17	1.28	0.82	0.26	0.26
	Offshore	Divers	12.88	11.76	0.81	0.97	0.57	0.33
Beyond	Not offshore	Hoopers	2.12	1.41	0.57	1.24	0.34	0.42
	Not offshore	Divers	7.70	13.00	1.73	1.43	0.41	0.47
	Offshore	Hoopers	2.50	1.29	2.38	1.49	0.37	0.44
	Offshore	Divers	9.46	11.15	3.90	2.77	0.49	0.43
Coastal	Not offshore	Hoopers	9.91	16.38	0.18	0.07	0.28	0.32
	Not offshore	Divers	11.57	11.35	0.24	0.35	0.47	0.34
	Offshore	Hoopers	2.60	0.94	0.79	1.35	0.30	0.38
	Offshore	Divers	21.70	16.73	1.41	1.55	0.45	0.29
		Overall	8.75	3.86	0.68	0.25	0.35	0.13

Table 7. Proportion of Recreational Fishermen who Fish for Spiny Lobster by Access Type

			Proportion by Access Type											
Home Origin	Location	Gear Type	Beach	Beach/ Boat	Boat	Charter Boat	Jetty	Kayak	Launch from Beach	Party Boat	Pers. Water-Craft	Pier	Private Boat	Shore
<50	Not offshore	Hoopers	0.03	0.00	0.00	0.00	0.01	0.04	0.01	0.05	0.00	0.22	0.64	0.00
	Not offshore	Divers	0.50	0.00	0.00	0.00	0.00	0.03	0.00	0.03	0.00	0.00	0.44	0.00
	Offshore	Hoopers	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.00	0.00	0.95	0.00
	Offshore	Divers	0.24	0.00	0.00	0.00	0.00	0.00	0.00	0.35	0.00	0.00	0.41	0.00
Beyond	Not offshore	Hoopers	0.06	0.00	0.00	0.00	0.00	0.00	0.00	0.06	0.06	0.28	0.56	0.00
	Not offshore	Divers	0.00	0.00	0.00	0.00	0.00	0.00	0.60	0.10	0.00	0.00	0.30	0.00
	Offshore	Hoopers	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00
	Offshore	Divers	0.08	0.00	0.00	0.00	0.00	0.00	0.00	0.75	0.00	0.00	0.17	0.00
Coastal	Not offshore	Hoopers	0.04	0.00	0.00	0.00	0.02	0.00	0.00	0.06	0.02	0.15	0.70	0.00
	Not offshore	Divers	0.68	0.03	0.11	0.03	0.00	0.03	0.00	0.00	0.00	0.00	0.11	0.03
	Offshore	Hoopers	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00
	Offshore	Divers	0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.20	0.00	0.00	0.30	0.00
		Mean	0.18	0.00	0.01	0.00	0.01	0.02	0.02	0.10	0.00	0.11	0.54	0.00

Table 8A. Estimated Annual Recreational Fisherman Expenditure Estimates

Home Origin	Location	Gear Type	Boat or Water Craft		% of Annual Boat or Water Craft Usage (for Lobster)		Boat Insurance		Slip Fees	
			Total	SD	Mean	SD	Total	SD	Total	SD
<50	Not offshore	Hoopers	$996,904	$6,358,197	0.08	0.17	$132,034	$331,774	$159,637	$979,413
	Not offshore	Divers	$823,356	$3,560,214	0.13	0.25	$119,658	$303,138	$307,318	$1,198,819
	Offshore	Hoopers	$0	$0	0.08	0.12	$94,743	$168,694	$247,802	$850,070
	Offshore	Divers	$0	$0	0.09	0.18	$81,912	$246,970	$263,756	$820,755
Beyond	Not offshore	Hoopers	$369,600	$1,083,138	0.09	0.20	$116,458	$435,255	$246,640	$1,045,327
	Not offshore	Divers	$0	$0	0.10	0.32	$56,720	$179,364	$10,635	$33,631
	Offshore	Hoopers	$0	$0	0.04	0.07	$4,829	$9,119	$0	$0
	Offshore	Divers	$0	$0	0.00	0.01	$486	$2,383	$0	$0
Coastal	Not offshore	Hoopers	$24,880	$147,694	0.12	0.23	$64,926	$209,046	$80,596	$264,884
	Not offshore	Divers	$62,197	$378,331	0.08	0.20	$22,446	$85,459	$74,844	$362,830
	Offshore	Hoopers	$177,250	$560,514	0.02	0.03	$53,459	$168,057	$116,560	$236,388
	Offshore	Divers	$0	$0	0.06	0.08	$55,412	$135,934	$170,068	$402,831
		Overall	$2,454,188	$7,399,602	0.08	0.08	$803,083	$781,569	$1,677,855	$2,303,579

Table 8B. Estimated Annual Recreational Fisherman Expenditure Estimates

Home Origin	Location	Gear Type	DMV Registration Fees (Boat and Trailer)		Boat Taxes		Annual Maintenance or Replacement of Boat Gear and Equipment	
			Total	SD	Total	SD	Total	SD
<50	Not offshore	Hoopers	$88,976	$524,967	$32,809	$124,490	$743,664	$2,074,209
	Not offshore	Divers	$30,517	$105,277	$44,115	$139,018	$1,320,574	$3,934,693
	Offshore	Hoopers	$3,242	$6,473	$55,775	$97,186	$375,212	$708,445
	Offshore	Divers	$13,171	$48,453	$11,795	$48,633	$156,615	$488,614
Beyond	Not offshore	Hoopers	$5,041	$17,584	$704,978	$2,900,032	$162,610	$359,090
	Not offshore	Divers	$2,127	$6,726	$19,143	$60,535	$141,800	$448,411
	Offshore	Hoopers	$1,199	$1,968	$103	$206	$10,275	$20,550
	Offshore	Divers	$236	$865	$347	$1,495	$1,216	$5,273
Coastal	Not offshore	Hoopers	$19,001	$60,846	$24,197	$88,904	$489,314	$1,228,024
	Not offshore	Divers	$6,256	$19,150	$1,555	$6,971	$85,438	$264,160
	Offshore	Hoopers	$2,184	$6,709	$28,360	$89,682	$52,466	$133,029
	Offshore	Divers	$1,046	$3,306	$33,805	$92,672	$183,311	$548,287
		Overall	$172,996	$541,800	$956,982	$2,912,914	$3,722,496	$4,769,842

Table 8C. Estimated Annual Recreational Fisherman Expenditure Estimates

Home Origin	Location	Gear Type	Electronic Gear		Spiny Lobster Fishing Gear		Other Expenditures	
			Total	SD	Total	SD	Total	SD
<50	Not offshore	Hoopers	$102,838	$421,853	$1,237,232	$2,089,914	$49,765	$251,005
	Not offshore	Divers	$105,514	$461,687	$956,023	$1,616,749	$310,185	$896,550
	Offshore	Hoopers	$371,829	$1,598,685	$128,267	$167,942	$0	$0
	Offshore	Divers	$0	$0	$441,668	$916,559	$6,553	$27,018
Beyond	Not offshore	Hoopers	$34,393	$145,152	$142,638	$301,803	$34,222	$53,711
	Not offshore	Divers	$0	$0	$138,539	$163,857	$9,217	$29,147
	Offshore	Hoopers	$8,220	$16,440	$22,263	$32,311	$0	$0
	Offshore	Divers	$179	$876	$223,925	$351,706	$114,467	$507,369
Coastal	Not offshore	Hoopers	$47,201	$180,077	$436,463	$595,724	$99,306	$205,614
	Not offshore	Divers	$8,120	$34,446	$587,765	$950,450	$40,322	$126,447
	Offshore	Hoopers	$13,294	$39,024	$14,180	$29,894	$1,418	$4,484
	Offshore	Divers	$6,970	$22,041	$59,594	$108,607	$0	$0
		Overall	$698,557	$1,733,168	$4,388,555	$3,059,985	$665,455	$1,089,486

Table 9. Estimated Total Recreational Fisherman Annual, Trip, and Grand Total Expenditures, with 95% Confidence Intervals

Home Origin	Location	Gear Type	Annual			Trip			Grand Total		
			Total	95% CI		Total	95% CI		Total	95% CI	
<50	Not offshore	Hoopers	$3,543,861	$2,361,061	$4,726,661	$3,834,313	$3,150,282	$4,518,343	$7,378,174	$6,011,104	$8,745,243
	Not offshore	Divers	$4,017,260	$2,599,456	$5,435,064	$3,985,715	$2,738,220	$5,233,210	$8,002,975	$6,114,130	$9,891,820
	Offshore	Hoopers	$1,276,869	$415,100	$2,138,638	$980,949	$680,996	$1,280,902	$2,257,818	$1,344,622	$3,171,015
	Offshore	Divers	$975,471	$333,234	$1,617,707	$1,548,263	$834,119	$2,262,408	$2,523,734	$1,563,307	$3,484,161
Beyond	Not offshore	Hoopers	$1,816,581	$273,546	$3,359,615	$1,965,233	$730,433	$3,200,033	$3,781,813	$1,804,999	$5,758,628
	Not offshore	Divers	$378,181	$57,898	$698,463	$1,212,433	$629,897	$1,794,968	$1,590,613	$926,116	$2,255,110
	Offshore	Hoopers	$46,888	$4,951	$88,826	$301,277	$168,425	$434,128	$348,165	$208,946	$487,384
	Offshore	Divers	$340,857	$93,260	$588,453	$4,446,683	$3,417,064	$5,476,301	$4,787,540	$3,729,359	$5,845,720
Coastal	Not offshore	Hoopers	$1,285,883	$872,100	$1,699,667	$1,064,607	$759,732	$1,369,482	$2,350,490	$1,836,345	$2,864,636
	Not offshore	Divers	$888,944	$524,635	$1,253,253	$1,470,411	$956,378	$1,984,444	$2,359,354	$1,729,461	$2,989,248
	Offshore	Hoopers	$459,170	$53,438	$864,901	$362,971	$161,455	$564,488	$822,141	$368,839	$1,275,443
	Offshore	Divers	$510,204	$69,977	$950,431	$379,741	$198,481	$561,001	$889,945	$413,520	$1,366,370
		Overall	$15,540,168	$12,752,113	$18,328,223	$21,552,594	$19,103,798	$24,001,390	$37,092,762	$33,381,291	$40,804,233

Table 10A. Estimated Recreational Fisherman Trip Expenditures

Home Origin	Location	Gear Type	Dive/Party Boat		Trip Duration (Days)		Dive Gear Rental		Gas for Boat	
			Total	SD	Mean	SD	Total	SD	Total	SD
<50	Not offshore	Hoopers	$344,214	$2,738,838	0.01	0.06	$0	$0	$1,145,767	$2,382,055
	Not offshore	Divers	$138,689	$573,076	0.11	0.39	$56,439	$311,032	$1,866,268	$4,559,396
	Offshore	Hoopers	$58,720	$262,604	0.05	0.22	$0	$0	$482,671	$512,848
	Offshore	Divers	$357,791	$498,163	0.74	1.03	$14,416	$41,824	$424,303	$1,041,751
Beyond	Not offshore	Hoopers	$110,196	$262,896	0.22	0.55	$0	$0	$586,432	$2,013,328
	Not offshore	Divers	$41,831	$111,676	1.30	2.75	$15,385	$27,500	$111,313	$186,151
	Offshore	Hoopers	$0	$0	0.00	0.00	$0	$0	$37,675	$46,627
	Offshore	Divers	$960,447	$762,612	2.31	1.41	$15,024	$73,601	$233,226	$804,117
Coastal	Not offshore	Hoopers	$45,104	$188,994	0.34	1.13	$28,789	$197,371	$340,833	$590,418
	Not offshore	Divers	$289,563	$920,521	0.22	0.58	$21,424	$74,856	$427,157	$931,467
	Offshore	Hoopers	$0	$0	0.00	0.00	$0	$0	$211,353	$279,208
	Offshore	Divers	$76,670	$181,309	0.35	0.75	$12,546	$26,653	$129,642	$185,872
		Overall	$2,423,223	$3,118,636	0.30	0.19	$164,024	$387,211	$5,996,639	$5,820,325

Table 10B. Estimated Recreational Fisherman Trip Expenditures

Home Origin	Location	Gear Type	Bait		Lodging		Meals and Beverages	
			Total	SD	Total	SD	Total	SD
<50	Not offshore	Hoopers	$550,088	$1,202,154	$29,350	$208,747	$606,951	$951,956
	Not offshore	Divers	$100,145	$401,754	$69,516	$406,371	$788,712	$1,611,999
	Offshore	Hoopers	$40,084	$61,474	$0	$0	$258,148	$338,814
	Offshore	Divers	$0	$0	$199,865	$809,822	$123,195	$184,072
Beyond	Not offshore	Hoopers	$131,687	$290,395	$99,929	$294,769	$357,964	$1,098,757
	Not offshore	Divers	$0	$0	$120,530	$226,806	$156,689	$172,392
	Offshore	Hoopers	$2,466	$2,882	$21,920	$26,846	$75,350	$51,867
	Offshore	Divers	$7,512	$20,770	$263,989	$527,002	$413,869	$729,396
Coastal	Not offshore	Hoopers	$189,079	$275,496	$0	$0	$269,793	$715,548
	Not offshore	Divers	$57,360	$221,558	$31,099	$189,166	$172,494	$274,195
	Offshore	Hoopers	$1,702	$4,474	$0	$0	$105,641	$130,282
	Offshore	Divers	$0	$0	$0	$0	$86,428	$115,243
		Overall	$1,080,122	$1,349,124	$836,197	$1,147,645	$3,415,234	$2,458,166

Table 10C. Estimated Recreational Fisherman Trip Expenditures

Home Origin	Location	Gear Type	Transportation		Harbor Fees		Other Expenditures	
			Total	SD	Total	SD	Total	SD
<50	Not offshore	Hoopers	$953,741	$1,073,774	$125,505	$296,981	$78,697	$286,990
	Not offshore	Divers	$674,139	$1,075,725	$138,386	$537,214	$153,421	$372,181
	Offshore	Hoopers	$79,690	$62,024	$40,737	$69,441	$20,900	$71,281
	Offshore	Divers	$349,141	$416,393	$25,163	$42,923	$54,389	$201,778
Beyond	Not offshore	Hoopers	$666,020	$1,259,517	$13,004	$33,400	$0	$0
	Not offshore	Divers	$713,013	$858,995	$15,953	$31,850	$37,719	$89,981
	Offshore	Hoopers	$153,591	$111,652	$8,905	$12,925	$1,370	$2,740
	Offshore	Divers	$2,474,852	$2,122,295	$52,726	$115,647	$25,040	$76,783
Coastal	Not offshore	Hoopers	$131,013	$306,673	$15,923	$63,522	$44,073	$135,831
	Not offshore	Divers	$318,532	$701,644	$57,152	$269,856	$95,630	$280,999
	Offshore	Hoopers	$36,477	$97,904	$7,799	$17,189	$0	$0
	Offshore	Divers	$62,203	$53,579	$3,346	$10,580	$8,906	$20,991
		Overall	$6,612,411	$3,150,726	$504,599	$690,215	$520,145	$615,246

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Appendix A. Commercial Expenditure Update Survey

Following is the cover letter and the questionnaire used in the key-informant interviews with commercial spiny lobster fishermen. We produced fixed and variable cost questionnaires for each of 3 vessel size class strata – large, medium, and large. Included below are the cover letter and questionnaire used for informants with small vessels.

H. T. HARVEY & ASSOCIATES
ECOLOGICAL CONSULTANTS

15 August 2012

Name of Recipient
1234 Street
City, CA 12345

Dear Commercial Lobster Fisherman:

A fishery management plan is in progress for the spiny lobster fishery, and we are updating expenditure information so that we better understand the positive economic contribution of commercial lobster fishermen to the state and to local economies in California.

In 2007 we did an economic survey of all commercial fishermen in California in order to generate expenditure information and to demonstrate their positive economic contribution. In this brief survey, we are providing you with average annual expenditures by category based on the 2007 survey results. We are asking you whether you feel that these averages are still a reasonable estimate of typical annual costs for a commercial lobster vessel less than 26 feet in length.

As you complete the survey, please note that we are not asking you to compare your expenditures to the averages, as each individual's annual expenditures on categories such as engine purchase will vary quite a bit. Instead we ask whether these averages are a reasonable estimate of typical annual costs for a commercial lobster vessel less than 26 feet in length.

If the answer is yes, then simply indicate that on the sheet. If they are not reasonable, then for a given cost category (such as bait or engine repair), please indicate to us how much higher or lower (in percentage terms) the typical annual expenditure should be.

We will call you within the next two weeks to get your responses. If you have any questions, please contact Sharon Kramer at skramer@harveyecology.com or (707) 822-4141 ext 101.

Please note that your individual responses will be kept confidential, and will be aggregated along with those from others to develop an updated estimate of total expenditures by all commercial lobster fishermen. Our goal is to generate an accurate estimate of the total positive economic contribution from commercial lobster fishing in California.

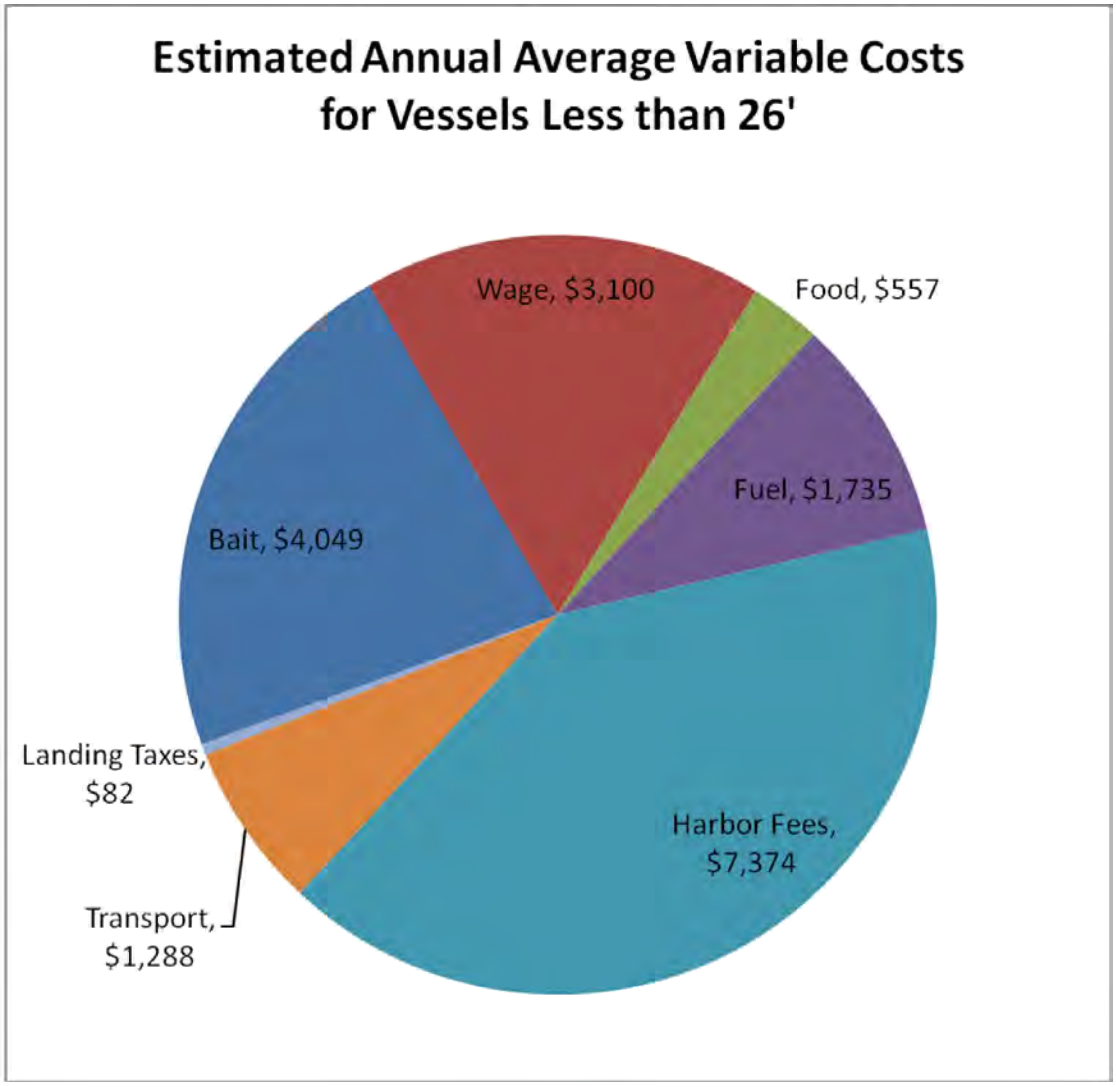
Thank you,

Steven C. Hackett

Dr. Steven C. Hackett
Humboldt State University

Sharon H. Kramer

Dr. Sharon Kramer
H. T. Harvey & Associates



Variable Costs are costs that increase or decrease based on how much you fish. The above estimated annual variable costs (adjusted for inflation) are averaged across all responses to our 2007 survey. These costs imply an average per-trip cost of $849.

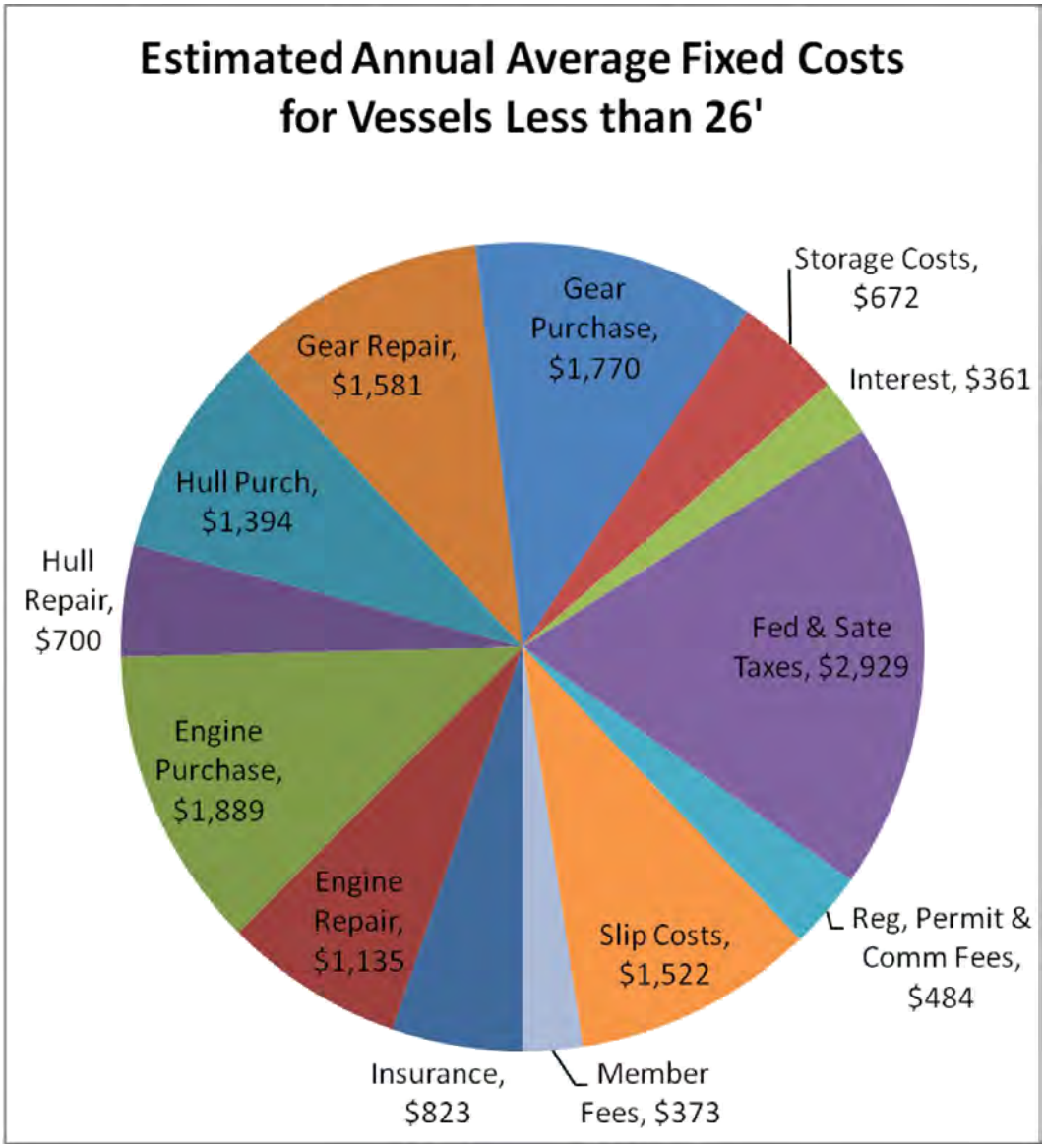
Do you feel that these are a <u>reasonable estimate of typical annual variable costs</u> for a lobster vessel less than 26 feet in length? Yes / No (circle one).

If not, then please correct the cost categories below. Circle whether the cost should increase or decrease, and indicate the correct percentage increase or decrease with an X.

Bait	increase / decrease	by:	___	0% - 20%	___	60% - 80%
Ann. Avg. = $4,049	(circle one)		___	20% - 40%	___	80% - 100%
			___	40% - 60%	___	100% + (specify %)
Crew Wages/Comp.	increase / decrease	by:	___	0% - 20%	___	60% - 80%
Ann. Avg. = $3,100	(circle one)		___	20% - 40%	___	80% - 100%
			___	40% - 60%	___	100% + (specify %)

Food (fishing-related)	increase / decrease	by:	___	0% - 20%	___	60% - 80%
Ann. Avg. = $557	(circle one)		___	20% - 40%	___	80% - 100%
			___	40% - 60%	___	100% + (specify %)
Fuel & Lube (vessel)	increase / decrease	by:	___	0% - 20%	___	60% - 80%
Ann. Avg. = $1,735	(circle one)		___	20% - 40%	___	80% - 100%
			___	40% - 60%	___	100% + (specify %)
Harbor Fees (ex: hoist)	increase / decrease	by:	___	0% - 20%	___	60% - 80%
Ann. Avg. = $7,374	(circle one)		___	20% - 40%	___	80% - 100%
			___	40% - 60%	___	100% + (specify %)
Transportation*	increase / decrease	by:	___	0% - 20%	___	60% - 80%
Ann. Avg. = $1,288	(circle one)		___	20% - 40%	___	80% - 100%
			___	40% - 60%	___	100% + (specify %)
Landing Taxes	increase / decrease	by:	___	0% - 20%	___	60% - 80%
Ann. Avg. = $82	(circle one)		___	20% - 40%	___	80% - 100%
			___	40% - 60%	___	100% + (specify %)

* Transportation related to fishing (truck and auto)



Fixed Cost s are costs that commercial fishermen incur whether they fish or not. The above estimated annual fixed costs (adjusted for inflation) are averaged across all responses to our 2007 survey.

Do you feel that these are a <u>reasonable estimate of typical annual fixed costs</u> for a lobster vessel less than 26 feet in length? Yes / No (circle one).

If not, then please correct the cost categories (ex. "Engine Purchase") needing adjustment. Circle whether the cost should increase or decrease, and indicate the correct percentage increase or decrease with an X.

Insurance (vessel)	increase / decrease	by:	___	0% - 20%	___	60% - 80%
Ann. Avg. = $823	(circle one)		___	20% - 40%	___	80% - 100%
			___	40% - 60%	___	100% + (specify %)

Engine Repair (vessel)	increase / decrease	by:	___	0% - 20%	___	60% - 80%
Ann. Avg. = $1,135	(circle one)		___	20% - 40%	___	80% - 100%
			___	40% - 60%	___	100% + (specify %)
Engine Purch. (vessel)*	increase / decrease	by:	___	0% - 20%	___	60% - 80%
Ann. Avg. = $1,889	(circle one)		___	20% - 40%	___	80% - 100%
			___	40% - 60%	___	100% + (specify %)
Gear Repair	increase / decrease	by:	___	0% - 20%	___	60% - 80%
Ann. Avg. = $1,581	(circle one)		___	20% - 40%	___	80% - 100%
			___	40% - 60%	___	100% + (specify %)
Gear Purchase*	increase / decrease	by:	___	0% - 20%	___	60% - 80%
Ann. Avg. = $1,770	(circle one)		___	20% - 40%	___	80% - 100%
			___	40% - 60%	___	100% + (specify %)
Hull Repair	increase / decrease	by:	___	0% - 20%	___	60% - 80%
Ann. Avg. = $700	(circle one)		___	20% - 40%	___	80% - 100%
			___	40% - 60%	___	100% + (specify %)
Hull Purchase*	increase / decrease	by:	___	0% - 20%	___	60% - 80%
Ann. Avg. = $1,394	(circle one)		___	20% - 40%	___	80% - 100%
			___	40% - 60%	___	100% + (specify %)
Storage (vessel, gear)	increase / decrease	by:	___	0% - 20%	___	60% - 80%
Ann. Avg. = $672	(circle one)		___	20% - 40%	___	80% - 100%
			___	40% - 60%	___	100% + (specify %)
Inter est (vessel)*	increase / decrease	by:	___	0% - 20%	___	60% - 80%
Ann. Avg. = $361	(circle one)		___	20% - 40%	___	80% - 100%
			___	40% - 60%	___	100% + (specify %)
Member/Assoc. Fees	increase / decrease	by:	___	0% - 20%	___	60% - 80%
Ann. Avg. = $373	(circle one)		___	20% - 40%	___	80% - 100%
			___	40% - 60%	___	100% + (specify %)
Federal & State Taxes	increase / decrease	by:	___	0% - 20%	___	60% - 80%
Ann. Avg. = $2,929	(circle one)		___	20% - 40%	___	80% - 100%
			___	40% - 60%	___	100% + (specify %)
Permit, License, Reg.	increase / decrease	by:	___	0% - 20%	___	60% - 80%
Ann. Avg. = $484	(circle one)		___	20% - 40%	___	80% - 100%
			___	40% - 60%	___	100% + (specify %)

Slip Costs	increase / decrease	by:	___	0% - 20%	___	60% - 80%
Ann. Avg. = $1,522	(circle one)		___	20% - 40%	___	80% - 100%
			___	40% - 60%	___	100% + (specify %)

* The annual average cost reported for engine and hull purchases come directly from our 2007 survey. As these expenditures only occur infrequently (thankfully), the cost reported here can be thought of as an annualized cost, somewhat like an annual loan payment absent the interest. Vessel-related interest expenditures from vessel-related loan payments are listed separately above.

Appendix B. Recreational Fishery Expenditure Survey

Following is the telephone interview script used to gather demographic and expenditure information from participants in the spiny lobster recreational fishery. The sample frame was derived from CDFW's spiny lobster report card database of recreational fishery participants. Due to CDFW's confidentiality agreement associated with the report card database, the research team provided a survey methodology and sampling design and the calls were conducted by CDFW personnel.

RECREATIONAL LOBSTER PARTICIPANT SURVEY

Opening Script:

Introduce yourself
Describe purpose of call and of the project
DFG is trying to determine how much money is being generated by the recreational lobster fishery in the state of California. The information that we are interested in collecting goes beyond license sales. This survey will help DFG to accurately characterize the economic contribution of the fishery.

Responses will be protected, interviewee can contact Kristine Barsky for questions or comments [kbarsky@dfg.ca.gov, tel.# (805)985-3114]

Basic Questions Script:

I would like to start with some basic questions about your fishing history and how you fish. I will then turn to the economic questions.

1. How many years have you been fishing for lobster?
2. What is your most common type of access when you fish for lobster?
   Do you fish from a Pier/dock, launch from a beach, use a private boat, go on a party boat, or use a personal watercraft (kayak, etc.)?
3. On average, how many hours or days does the average lobster fishing trip take you, including travel time to and from fishing grounds (fraction of day is ok). I'm only asking about trips that you just fished for lobster. Please tabulate as days (or fraction of days – xx hrs/24).
   Trip definition = the time period in which a fisherman travels to the fishing grounds, seeks lobster, concludes fishing, and returns home
4. Approximately what percentage of your total fishing effort (including all fishing trips) was dedicated to lobster fishing in 2011?

Expenditure Questions Script:

Moving on to the economic questions. The first questions will address annual, seasonal, or one-time expenditures you have made that are linked to your lobster fishing activity. After that I'll ask about typical trip-related expenditures.

Do you own a boat or other water craft that you use for lobster fishing or diving?
If they answered yes, start with question 1, otherwise skip to question 9.

1. Did you purchase your boat or water craft this past year? If so, then how much did you spend?
2. What percentage of your annual boat or water craft usage was for fishing for lobster?
3. How much do you spend per year on boat insurance?

4. Do you keep your boat in the water, (If yes) then how much do you spend in total cost annually on slip fees?
5. How much do you spend annually on DMV registration fees for your boat and trailer?
6. How much do you spend annually on taxes (e.g., property or luxury taxes) on your boat?
7. How much did you spend last year on maintenance (like hull cleaning) or replacement of boat gear & equipment (boat, engine, equipment)?
8. If you own a boat or other water craft, did you purchase any electronic gear (GPS, radio, fish finder, radar, etc) this past year that was used for fishing lobster? If so, then how much did you spend?
9. Did you purchase any lobster fishing gear (dive gear, hoop nets, other lobster equipment) this past year? If so, then how much did you spend?
10. Excluding the cost of fishing licenses and report cards, are there any other annual, seasonal, or one-time expenditures related to recreational lobster fishing that you would like to add in?
    Ask for $$ and category

I would like to finish the survey with some questions about your typical expenditures associated with lobster fishing trips.

1. Did you purchase a spot on a dive boat or a party boat for lobster this last year (2011)?
2. If so, then how much do you typically spend on a single boat trip (just the cost of the trip fare)?
3. Did you rent dive gear for lobster fishing last year? If so, then how much do you typically spend on dive gear rentals per lobster fishing trip?
4. How much do you typically spend on gas for the boat you use (yours or a shared boat) on each lobster fishing trip?
5. How much do you typically spend on bait on a lobster fishing trip?
6. How much do you typically spend on lodging during a lobster fishing trip?
7. How much do you typically spend on meals and beverages during a lobster fishing trip?
8. How many miles (one-way) did you drive to a port, dock, or beach for each lobster fishing trip? [Note: Researchers will double on-way miles you record and multiply by the average total cost per mile driven from the Department of Transportation to get $$ expenditure]
9. If you trailer a boat to a launch facility for lobster fishing trips, then how much do you typically spend on harbor fees (boat launch, docking, or parking) per trip? (Includes smaller craft if relevant (kayak, paddle or surf board….).
   This should be entered as $0 if (i) the fisherman keeps a boat in the water and already provided a cost earlier in the survey, or (ii) they don't use a boat to fish
10. Are there any other expenditures you usually make on a typical recreational lobster fishing trip you would like to add?
    Ask for $$ and category; Examples = power wash, SCUBA tank air refills

Appendix VII: Ocean Science Trust External Scientific Peer Review

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Final Report of the Scientific Review Committee

Scientific review of the reference point thresholds prescribed in the draft Fishery Management Plan for California Spiny Lobster (*Panulirus interruptus*)

Convened by the California Ocean Science Trust

Supported by the California Ocean Protection Council and the California Ocean Science Trust

May 2015

CALIFORNIA OCEAN SCIENCE TRUST

Review Participants

CALIFORNIA OCEAN SCIENCE TRUST

California Ocean Science Trust is a boundary organization. We work across traditional boundaries, bringing together governments, scientists, and citizens to build trust and understanding in ocean and coastal science. We are an independent non-profit organization established by the California Ocean Resources Stewardship Act (CORSA) of 2000 to support managers and policymakers on the U.S. West Coast with sound science, and empower participation in the decisions that are shaping the future of our oceans.

Ocean Science Trust served as the independent appointing agency in alignment with the Procedural Guidelines for the California Department of Fish and Wildlife's Ad Hoc Independent Scientific Advisory Committees. Ocean Science Trust convened the review committee and designed and implemented a scientific review process that promoted objectivity, transparency, and scientific rigor (see Appendix C).

SCIENTIFIC REVIEW COMMITTEE

John Field (chair)
Research Fishery Biologist, Fisheries Ecology Division, Southwest Fisheries Science Center, National Marine Fisheries Service (NOAA)

Michel Comeau
Head of the Lobster Section, Department of Fisheries and Oceans Canada

Robert Muller
Assessment and Modeling, Florida Fish and Wildlife Conservation Commission, Florida Wildlife Research Institute

Pete Raimondi
Chair/Professor, Department of Ecology and Evolutionary Biology, University of California, Santa Cruz

CALIFORNIA DEPARTMENT OF FISH AND WILDLIFE

The Mission of the Department of Fish and Wildlife is to manage California's diverse fish, wildlife, and plant resources, and the habitats upon which they depend, for their ecological values and for their use and enjoyment by the public.

California Department of Fish and Wildlife staff were engaged throughout the review process. They delivered presentations to the review committee and supplied additional data, information, and feedback to Ocean Science Trust as necessary throughout the review process.

Travis Buck	Tom Mason
Julia Coates	Carlos Mireles
Kai Lampson	Anthony Shiao

The California Department of Fish and Wildlife Marine Region Program Manager, Tom Barnes, was the primary management contact for this review. California Wildlife Foundation was the grant manager for this project.

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Recommended citation: Final report of the scientific review committee, scientific review of the reference point thresholds prescribed in the draft Fishery Management Plan for California Spiny Lobster (*Panulirus interruptus*). California Ocean Science Trust, Oakland, CA. May, 2015.

Cover image: Ken Curtis

Background

Spiny lobster (*Panulirus interruptus*) populations support important commercial and recreational fisheries, and play a key role in the southern California kelp forest ecosystem. Over the last three years, the California Department of Fish and Wildlife (the Department) has developed a draft spiny lobster fishery management plan (FMP) to guide management of these fisheries in accordance with the Marine Life Management Act. An FMP assembles information, analyses, and management options, and serves as the vehicle for the Department to present a coherent package of information, and proposed regulatory and management measures to the California Fish and Game Commission (the Commission). The FMP becomes effective upon adoption by the Commission, following their public process for review and revision. Thus, it is important for the scientific underpinnings of the draft FMP to have undergone independent review prior to submission to the Commission.

The Department is committed to incorporating the best scientific information into management decisions. To this end, the Department approached the Ocean Science Trust to convene experts to conduct an assessment of key scientific and technical components within the FMP and supporting spawning potential ratio (SPR) cable model. Ocean Science Trust, an independent organization that works to advance independent science in management decisions, tailored this review to meet the science needs of the Department, and served as the appointed entity to design and coordinate all aspects of this review.

REVIEW SCOPE

Ocean Science Trust, in consideration of the management request, worked with the Department to develop a scope of review focusing on the scientific and technical underpinnings of the FMP and supporting materials. Thus, this was not a comprehensive review of the FMP, or the proposed approach to management contained therein. Rather, the central question of this review was:

Given the Department of Fish and Wildlife's available data streams and analysis techniques, are the technical components, models, and supporting documents that underpin the FMP scientifically sound and reasonable?

The review focused on the following components:

1. The three proposed reference point thresholds (i.e., catch, catch per unit effort (CPUE), and spawning potential ratio) that will serve as signals for when changes within the fishery may warrant management responses;
2. The underlying science that informed the decision to manage the fishery as a single stock;
3. The comprehensiveness of the data supporting the estimate of spiny lobster habitat contained within marine protected areas;
4. Estimates of stock productivity and its ability to support fishing (i.e., calculations for the lobster growth curves adopted in the Parrish Model for setting the spawning potential ratio threshold); and
5. The spawning potential ratio (SPR) model as presented in "DRAFT Report on the Cable-CDFW 1.0 Model and the Calculation of Spawning Potential Ratio" (cable model), including model assumptions, calculations, interpretation, and application of the model results in setting the SPR reference point threshold.

In addition to these specific sections of the FMP, reviewers were asked to identify priority research and monitoring gaps associated with the scientific and technical components of the FMP. Reviewers also provided recommendations for ways to work more closely with the academic community to collect and maintain the most up-to-date essential fishery information (EFI).

SUMMARY OF THE REVIEW PROCESS

This review took place from October 2014 – May 2015. Ocean Science Trust implemented a scientific review process[1] that sought to promote objectivity, transparency, candor, efficiency, and scientific rigor. A multidisciplinary, four-member review committee was assembled, representing international expertise in fisheries science and management, marine ecology, stock assessment, and modeling. Reviewer names remained anonymous until completion of this review to encourage candid feedback. Ocean Science Trust facilitated constructive interactions between reviewers and the Department through a series of remote meetings, where Department staff provided reviewers with the management context, presented an overview of the scientific and technical elements under review, and were available to answer reviewer's questions. In addition, Ocean Science Trust convened reviewers independently to allow the review committee to candidly discuss the review materials and conduct their assessment. Ocean Science Trust worked with the review committee to assemble and synthesize their written and verbal responses to guiding questions, as well as discussion from remote meetings into this final report. This report is publicly available on the Ocean Science Trust website[2].

PROJECT MATERIALS UNDER REVIEW

The following materials were provided by the Department to the review committee for scientific and technical review:

- Draft Spiny Lobster Fishery Management Plan, For Technical Review, 11/4/2014[3]
- Draft Report on the Cable-CDFW 1.0 Model and the Calculation of Spawning Potential Ratio
- Draft Spawning Potential Ratio Cable-CDFW 1.0 Model

Additional data and information were provided by the Department at the request of the review committee to assist with their assessment throughout the review process.

[1] Available at http://bit.ly/1Fd9A6X
[2] Available at http://bit.ly/1Fd9zA3
[3] Draft available on the Department of Fish and Wildlife website at http://bit.ly/1Fda254

Review and Recommendations

Foremost, the review committee valued the opportunity to provide independent scientific recommendations for consideration in management of the California spiny lobster fisheries. They acknowledged the extensive time and resources that went into the development of the FMP and supporting model by both the Department, the Lobster Advisory Committee, stakeholders, and outside experts, including modeler Dr. Richard Parrish. Reviewers appreciated the Department staff's constructive engagement throughout the course of the review, as well as their willingness to thoughtfully consider recommendations from this report. The Department produced an FMP that is user-friendly and readable by broad audiences, is well referenced, and incorporates the effects of no-take marine protected areas for the first time in a state-managed fishery. Reviewers noted that the FMP would complement the fairly robust management measures already in place.

This assessment is organized around the key focal points identified in the scope of review. These recommendations aim to improve the science supporting the proposed reference point thresholds prescribed in the draft FMP. Where possible, insight is provided on the implications of each recommendation.

The main recommendations concern the spawning potential ratio (SPR) cable model, several of which would need to be addressed before this model can provide a sound scientific basis for decision-making. Additional scientific guidance and considerations are included that would produce a more scientifically robust FMP, as well as longer-term recommendations, data and research needs that would strengthen the science contained within the model and FMP and its ability to inform management as new information and analyses become available.

This FMP is the first instance where state fisheries managers in California are employing a technical model (aside from a formal stock assessment) to inform the development of a harvest control rule. As such, reviewers thought it valuable to close the review with some insight into how scientific models are scoped, considered, and reviewed as FMPs are developed for other state fisheries in the future.

1. EVALUATION OF THE PROPOSED REFERENCE POINT THRESHOLDS

Three proposed quantitative reference points and associated thresholds – spawning potential ratio, catch, and catch per unit effort (CPUE) – are meant to serve as metrics to assess the state of the lobster fishery and stock. The FMP states that whenever a stock reaches a threshold reference point, resource managers must investigate the cause and potentially provide a response. The Department has to review the catch, catch per unit effort, and update the spawning potential ratio on an annual basis. This process is designed to monitor the fishery and its stock in order to prevent any of the metrics from reaching a threshold.

Below are the scientific review committee's recommendations for each reference point. For sections 1.1 (SPR) and 1.2 (catch, CPUE), recommendations are divided into those that reviewers suggest the Department address before adopting the FMP, and those that are longer-term considerations, which can be addressed after adoption of the FMP.

1.1 Spawning Potential Ratio (SPR) Cable Model and the SPR Reference Point

Much of the review focused on the SPR cable model, since it is the main measure of the spiny lobster spawning biomass structure and the only biological reference point in the FMP (i.e., it integrates information and assumptions about lobster growth, reproduction, and mortality). The model, starting with 1,000 recruits, calculates an equilibrium SPR value – a ratio of the number of eggs produced by the fished population over the number of eggs produced by the unfished population. Being an equilibrium model, it does not track cohorts or size trends over time, but does provide relative abundance estimates for the fixed number of recruits. Therefore, this SPR estimate is used to estimate an annual fishing mortality rate specific to a given year's observed mean size, with no temporal connection among the annual estimates. The FMP advises that when the $SPR_{CURRENT}$ falls below the "stable and productive" reference period between 2000-2010 ($SPR_{THRESHOLD}$, based on the average SPR value during this period), the Department is required to investigate the underlying cause and potentially provide a management response for the Commission to consider. The model also evaluates the effects that marine protected areas (MPAs) may have on the calculated SPR value of the lobster stock.

During the course of the review, reviewers were provided with three iterations of the SPR model. The model was originally developed by Dr. Richard Parrish, and underwent further development and revisions by the Department. The final version (referred to here as the cable model) is the version intended for use in the management of the fishery, and was the main focus of this assessment. The cable model includes the following revisions from the previous iterations:

1. a new growth model (i.e., changing the model from a von Bertalanffy growth model to a newly developed model)
2. changes to initial time step (i.e., size, age, season)

The draft FMP provided to reviewers for their work was developed based on the original model and did not reflect these revisions. The reviewers were instructed to assume that the draft FMP would be revised to reflect the most recent cable model. Additionally, following initial technical discussions between Department staff and the reviewers, the Department agreed to remove a prescribed value for the SPR threshold in order to allow for the ability to continually improve the model without amending the FMP.

1.1.1 Key Recommendations for Securing a Management-Ready SPR Model

Reviewers agreed that the cable model requires essential revisions before it can provide a scientific basis for management of the lobster fishery, but that these revisions are likely achievable before the FMP is adopted. In the longer term, more substantive data collection and research initiatives to better inform a model comparable to the current model, or an alternative modeling approach, are identified as priorities. Below are the key recommendations for securing a management-ready SPR model, organized around thematic areas.

Growth Model

- ***Rely on the von Bertalanffy growth modeling methods until the newly developed growth model can be robustly validated.***

  The primary revision to the SPR model by the Department was the replacement of a von Bertalanffy growth model, with a new set of Gaussian 4-parameter growth curves that were developed by Department staff. These were based on raw data from three tag-recapture studies in order to estimate male and female lobster growth rates. Growth curves are central to determining a stock's ability to replenish itself. Reviewers acknowledged the inherent difficulties in obtaining reliable growth rates for crustaceans, such as lobsters, that grow through molting. Though von Bertalanffy growth models are widely used and accepted, they represent a generic growth response; the Department examined multiple growth models in an attempt to employ an alternative that better represented the growth of *P. interruptus*.

The reviewer's main concern with the current SPR cable model is with the application of the new Gaussian growth curves. While reviewers recognized that the Gaussian 4-parameter curves may better fit the data, they had concerns that these growth models have not been subject to rigorous scientific discussion. The results of the Gaussian curves are not consistent with the existing literature regarding the growth patterns of lobsters in similar ecosystems, and lead to potentially unrealistic SPR model behavior and results. In particular, they lead to growth rate estimates that are very slow such that mature individuals can reproduce many times prior to being vulnerable to full fishing mortality. Slow growth rates in this particular SPR model implementation translate into lower harvest rates and a reduced impact of fishing on population reproductive output; the slower you make growth, the lower the estimated relative exploitation rate is in the SPR model. This is contrary to what is typically understood about growth rates and stock productivity. The fact that this model estimates a "snapshot" of relative exploitation rate in a given year with assumed constant recruitment, rather than tracking exploitation and cohort strength (and potential feedback to recruitment) over time contributes to this somewhat counter-intuitive result, but the unusually slow growth is the primary driver. The net effect of the Gaussian growth model as applied in SPR cable model is that fishing mortality of most legal lobsters has a reduced impact on the estimated SPR, relative to SPR estimation based on the von Bertalanffy growth model.

von Bertalanffy growth expands the resolution of the SPR model compared to the Gaussian growth curves

These Gaussian growth curves are not necessarily incorrect – in fact, they may well be a more accurate representation of lobster growth – and should be improved with additional research. Reviewers commend the Department for making strides to move beyond the standard growth model. Further studies showing that the approach has some precedent with crustaceans and more investigation of the underlying data is necessary before the Gaussian growth model can be applied with confidence. If and when an alternative growth model is considered to be sufficiently developed to incorporate into the SPR model, the Department should consider whether that model is consistent with growth models of lobsters in other (similar) ecoystems, and ensure that sensitivity analyses are conducted to evaluate the effects of any new growth relationships on SPR model performance.

With current understanding, the von Bertalanffy growth model is more appropriate for a relative metric of exploitation as it is more responsive to changes in exploitation, produces results that are comparable to methods used elsewhere for similar fisheries, and expands the resolution of the SPR model (see Appendix A for further analyses conducted by reviewers). Thus, reviewers recommend that the Department rely on the more standard and widely used von Bertalanffy growth modeling methods, until the newer Gaussian curves can be robustly validated.

Longer-term considerations are included in section 1.1.2, including the need to routinely collect length or other size compositional data (length or weight distributions) and information on actual selectivity and maturity curves, which would provide the basis for a more robust SPR model (e.g., more accurate estimates of fishing mortality). Reviewers recognized that there is inherent variability in the growth data at small sizes using the available tag-recapture studies, and provide some recommendations that may increase comfort with new Gaussian growth curves based on these data.

- ***Use SPR with caution at high exploitation rates.***

It is also important to note that the SPR cable model (with either growth model applied, although the problem is exacerbated at slower growth rates) becomes uninformative at very high exploitation rates (Appendix A). This is partially a result of the confounding of the maturity and selectivity curves described below. This constraint should be recognized explicitly in the SPR model documentation and the FMP, and the Department should be cautious when interpreting results at high exploitation rates.

- ***Reconsider some of the tag-recapture data that were removed from the growth models.***

  The growth models are based on a limited data set, from which some outliers and negative values were removed (per Department presentation to review committee). Juveniles can often show high growth rates in short timeframes, thus some of the data identified and removed might actually be informative. In addition, the Department should consider making the "negative growth" data points zero instead of removing them from the analyses if they are believed to be measurement error. Reconsidering how these data points are treated may reduce variability at small lobster sizes and lead to more accurate estimates of growth.

Model Functionality

- ***Update the vulnerability relationship.***

  In the cable model, the vulnerability function has precisely the same coefficients as maturity. If this is a true coincidence, it should be explained. However, recent data on female lobsters from Hovel et al. (2015) and Kay (2011) indicate that female lobsters may be reproductive at smaller sizes than previously thought. The Department should verify, and if appropriate, update this function in the cable model. In addition, the current function in the cable model is for the commercial fishery that uses traps. Traps have an upper limit based on the throat size of the trap while there is no upper limit in the recreational fishery. Therefore, there should be a separate vulnerability relationship for the recreational fishery in any future model that can account for recreational catch.

- ***Revisit the natural mortality function.***

  The natural mortality function assumes that natural mortality decreases as lobsters grow; however within the current cable model, a minimum rate occurs at an age of 17.92 years and then the rate increases again. This pattern of senescence is unusual, and the Department should provide additional references or data to support the assumption that older, larger lobsters experience higher natural mortality. If the proportion of 'plastered females' (i.e., female lobsters that have mated) is lower at larger sizes, suggesting that large females are not contributing as much to SPR, those data should be presented.

- ***Explain the ramifications of SPR being independent year to year.***

  Each model run begins with exactly 1,000 larvae, and ignores variable and episodic recruitment, and the relationship between spawning biomass and recruitment. The model also assumes constant carrying capacity and a constant function for density dependence, among other considerations. These limitations should be made more explicit in the FMP and model report.

Sensitivity Analyses

- ***Make greater use of sensitivity analyses in explaining the model.***

  Sensitivity analyses are important for understanding the impacts of a model's input variables. They can help identify parameters that are likely to have no effect on the output (and could potentially be removed), as well as variables that have a large effect (where attention should be focused on ways to reduce uncertainty around these values/inputs). The Department should conduct explicit sensitivity analyses each time the SPR cable model is revised, and make this information available in the accompanying report to provide additional credibility to the reasoning behind such revisions. Standard practice is to double and halve the variable of interest and observe the impact to the outputs. The Department should consider assembling and formally communicating the error and uncertainty associated with the cable model results.

1.1.2 Longer-Term Considerations for the SPR Model

The review scope charged reviewers with conducting an assessment of the SPR model based on the Department's currently available data streams that would not require additional information or research. However, the model may benefit considerably from and be more robust as a result of addressing the following longer-term recommendations after adoption of the FMP.

Research Needs

- ***Explore alternative methods to estimate lobster growth.***

  Novel methods for age validation and improved growth estimation continue to emerge and should be explored, either by the Department or by academic and other independent research institutions. For example, direct methods of growth and age determination are now possible for crustaceans by measurements of annual molt-independent growth bands. Detection of growth bands in calcified regions of the eyestalk or gastric mill using the cold cure epoxy resin technique has been reported for cold-water shrimps (*Sclerocrangon boreas* and *Pandalus borealis*), snow crab (*Chionoecetes opilio*) and American lobster (*Homarus americanus*) (Kilada et al. 2012). A similar technique could be used to better estimate growth for the California spiny lobster (even on a spatially explicit basis), and perhaps elaborate or modify the 2011 stock assessment model to include an age-based parameter. Identifying these as key research priorities in the FMP may incentivize outside researchers and funders to pursue this research.

- ***Explore additional technical models that can account for variable recruitment.***

  Given that lobster recruitment is likely highly variable and episodic, a key longer-term research objective should be the development of a more sophisticated modeling approach that can track cohorts over time.

- ***Develop a sampling program to collect individual lobster length or weight composition data from both sectors of the fishery.***

  Estimates of fishing mortality used to obtain a corresponding SPR value each year are currently determined using average weight data from the commercial sector. The relevant parameters are derived using an extrapolation, linking logbook data to fish ticket data. These estimates would be greatly improved by a program in which actual length or weight measurements (by individual) could be collected. The sampling program needs to include the recreational sector as well because it accounts for approximately 30% of the landings and their vulnerable sizes may differ from commercial traps. Such data would be helpful in informing more sophisticated modeling approaches (e.g., that track cohorts over time) in the longer-term as well.

- ***Prioritize obtaining intermediate recapture data, which could be useful for better understanding the dynamics of lobster growth rates.***

  While alternative methods to estimate growth are ultimately necessary, reviewers provided a suggestion that may improve upon the existing estimates in the near term.

  The growth curves were developed from data sets with gaps at important size ranges. Tag-recapture data gaps exist between the Engle (1979) and Hovel et al. (2015) data sets, in the 30 mm and 55 mm size classes. Currently, juvenile data must be extrapolated out in any growth curve model. Additional data would be valuable in "filling in" the points between data sets for a more accurate estimate of California spiny lobster growth.

Model Functionality

- ***Develop a function or method to incorporate recreational catch into the model.***

  Recreational catch is a substantial portion of overall catch and is not accounted for in the SPR model. This sector is potentially harvesting larger lobsters, thus, the vulnerability to fishing differs between the recreational and commercial sectors. It is important to parse out the proportion of the spawning potential coming from larger individuals. If this is the case, the vulnerability curve applied in the SPR cable model for the recreational sector should not be dome-shaped, but rather should be asymptotic, and there may be other facets of the recreational fishery of significance in accurately assessing SPR.

- ***Revisit the SPR model as MPAs reach their full maturity.***

  The SPR cable model assumption that South Coast MPAs have reached full maturity (thus, are having a threshold impact on the fishery) is unlikely given the MPAs are newly established. A number of factors will differ as MPAs reach full maturity, including the possibility of increased density dependence which could affect movement and reproduction as well as that spawning stock (given growth curves) may not yet be optimized through size and density. In other words, the current SPR model inputs may be over- or underestimating the effects of MPAs.

- ***Formalize a process to review, revise, update, and evaluate the SPR model and its effectiveness in meeting management goals as new data, information, or analyses become available.***

  Models like SPR will require continual refinement as new information and data are obtained. Many such improvements can be accomplished within this FMP framework. The reviewers commend the Department for removing a prescribed SPR threshold from the language of the draft FMP. This allows the ability to recalculate an appropriate threshold as the model is improved rather than needing to delay implementing these changes by waiting for the FMP to be formally amended. It would be valuable to formalize a process for considering revisions to the model – which may have substantial implications for the SPR outputs – as changes and updates are made. Reviewers recommend convening fishery managers and biologists with independent experts to evaluate the input data, coding, and effectiveness of the model at regular intervals.

1.2 Catch- and CPUE-based Reference Points

As noted previously, the process of reviewing current seasonal catch and CPUE data should permit the Department to monitor the fishery and its stock, and prevent any of the measures from reaching a threshold. However, reviewer consensus is that the Catch and CPUE-based reference points are not very robust or sensitive to picking up trends or slow declines. There is concern that "sliding" calculations will rarely exceed the established thresholds. Even when a threshold is exceeded, no specific management responses are required, thus these measures act more as indicators than as reference points. Section 1.2.1 contains key recommendations that would allow for a more robust method to monitor the condition or trajectory of the fishery, and should be addressed before adopting the FMP. Section 1.2.2 includes recommendations that could be addressed in the longer-term.

1.2.1 Key Recommendations for Catch and CPUE-based Reference Points

- ***Describe the catch and CPUE thresholds as "fishery indicators" instead of reference points.***

  A more informative approach to identifying declines in the fishery may be to present the proposed catch and CPUE reference points as indicators of fishery condition, and set the thresholds to more conservative levels. This could provide a more sensitive measure (i.e., reference thresholds would be crossed more easily, making for earlier "warning signs") and allow the Department to elicit useful scientific information for interpreting any changes observed in SPR.

  Reviewers conducted some additional analyses to explore the sensitivity of the threshold to detecting changes in the fishery (see Appendix B for a description of the full method). They compared California's proposed approach to a method currently under development for the American lobster (*Homarus americanus*) in Canada. In 2014, Canada established a reference point for the American lobster using commercial catch based on the Precautionary Approach (PA) for the southern Gulf of St. Lawrence fisheries. Employing the PA on a 123-year long data series, American lobster landings were below an upper stock reference point 85 times (Appendix B, Figure 1). However, applying the California spiny lobster approach to the same American lobster data revealed that California's proposed 0.8 catch-based reference point would only be exceeded two times (Appendix B, Figure 2), indicating it may not be a very sensitive measure for detecting fishery declines.

  Reviewers then applied Canada's Precautionary Approach to the California spiny lobster commercial landings data (Appendix B, Figure 3). Based on the PA and using a three year running average for landings, California spiny lobster commercial landings would have dropped below an upper stock reference point 31 times between 1935 and 2013, compared to 11 times as indicated in the draft FMP using the current 0.8 catch-based reference point (FMP Figure 4-6).

Based on these preliminary analyses, the 0.8 thresholds are not very sensitive to picking up trends in the fishery. If catch and CPUE data were used as contextual information for interpreting SPR, the thresholds could be set to more conservative levels to allow for greater sensitivity to detect fishery declines.

Another approach for detecting trends would be to report both a static number for $CATCH_{threshold}$ and $CPUE_{threshold}$ in addition to the moving averages, along with a discussion of the pros and cons of each method and what information they can provide.

- ***Clarify rationale for the use of 0.8 thresholds prescribed in the FMP.***

  The FMP should provide more clarity about how the thresholds were derived. They appear to be derived from the Hilborn 2010 citation referenced in the FMP. That study made the point that a broad range of relative abundance levels are typically associated with a more narrow range of relative yield (e.g., most give 80% or more of theoretical maximum), such that declines below 80% of the theoretical maximum could indicate substantial stock declines (if not driven by declines in effort or markets). This is an important aspect of the Catch and CPUE component, and should be better explained in the text.

- ***Report the CPUE statistic in mass per unit effort.***

  The current approach to calculating the CPUE statistic in the FMP is in numbers of individual lobster, not total weight of catch. Using weight (linked to fish tickets) may be more appropriate and is a more typical metric used in such fisheries.

- ***Include greater discussion of the reliability of recreational catch estimates.***

  Recreational catches are a substantial portion of the total catch for spiny lobsters, but seem to have a different trajectory, and one might expect trends to vary from commercial trends in the future as well. The Department should discuss the uncertainty around these recreational catch estimates in greater detail, and clarify whether they were adjusted or tuned to account for non- or under-reporting. Understanding the magnitude and significance of recreational catch is key in considering control rules.

1.2.2 Longer-Term Considerations for Catch and CPUE Data

Again, the review scope charged reviewers with conducting an assessment of the existing reference points and associated thresholds. However, the model may benefit considerably from, and be more robust as a result of addressing the following longer-term recommendations.

- ***Explore other technical models to obtain additional or alternative biological reference points that account for inter-annual variability in recruitment and other variables.***

  The Department could consider estimating the annual fishing mortality rates with a modified Delury depletion model (González-Yáñez et al. 2006, Puga et al. 2013) rather than the moving average approaches for catch and CPUE from average size used in the FMP. A Delury model includes the total numerical catch, the effort and the index of abundance in number (CPUE) as input data, which also takes into account inter-annual variability in recruitment. This approach would allow for both the commercial and recreational sectors to be modeled and there are extensions of the model that include a stock-recruit relationship for obtaining biological reference points. If size composition data become available in the future, the Department may also want to consider a more robust population dynamics analysis similar to one used for Australian southern rock lobsters (*Jasus edwardsii*) (Punt and Kennedy 1997). Additional age-structured analyses (Muller et al. 1997) or yield or egg production models that account for individual variability in growth (Fogarty and Idoine, 1988) may also be informative and should be explored further.

- ***Standardize commercial and recreational catch data to the same spatial reference points.***

  Commercial and recreational fishermen report location at different spatial scales. In comparing Figures 2-3 and 2-10 in the FMP, it appears that commercial fishermen report by Department of Fish and Wildlife block, while recreational fishermen may report by various specific locations (e.g., each of the Channel Islands has a single location code). This discrepancy will confound comparisons in evaluating questions such as the extent of spatial overlap in the commercial and recreational fisheries (e.g., line 825-26 in the FMP).

2. SCIENCE SUPPORTING THE DECISION TO MANAGE AS A SINGLE-STOCK

The FMP provides evidence to suggest that California spiny lobster larvae are well mixed throughout the Southern California Bight ("…complete population mixing due to the species' protracted larval phase"). Accordingly, the Department proposes considering the entire lobster stock within the U.S. border with one spawning potential ratio (SPR) value and threshold. However, Department data show that individuals in the northern Channel Islands are notably larger than the minimum legal size, while lobsters in the south are generally caught very close to the legal size, suggesting northern lobsters participate in more spawning seasons than southern lobsters before capture.

Reviewer's evaluation of the literature and existing research on the population structure of California spiny lobster suggests there is some potential for localized recruitment, and that the species does not maintain a single homogenous population despite the extended pelagic larval duration (Iacchei et al. 2013). However, reviewers recognize that the decision on single-stock management must take into account social, economic, and other factors in addition to the science. It is ultimately up to the Fish and Game Commission to determine the most appropriate method to manage the stock.

- ***Assess and report any spatially explicit differences between regions of the fishery.***

  Available data suggests there are clear regional differences in size distribution, catch, timing of catch, and effort – several of which are meaningful to the calculation of SPR and to determining how it varies in space and time. There is also evidence that growth and reproduction differ spatially, which could lead to spatially structured source-sink dynamics that may interact with fishing in a way inconsistent with single stock

predictions. While lobsters have an extended larval period with extreme dispersal potential (which could lead to assumptions of complete larval mixing), studies in other lobster species suggest substantial localized recruitment (Iacchei et al. 2013).

Reviewers recommend reporting any spatial differences among regions of the fishery to assist decision-makers with parsing out trends in catch and life history traits across the region, and assess whether current harvest control rules are adequately meeting management goals.

Reporting spatial differences among regions of the fishery can help decision-makers parse out trends in catch and life history traits

- ***Interactions with the Mexican spiny lobster stock should be considered and discussed in greater detail throughout the FMP.***

The reviewers expressed concern about the decision to neglect potential interactions between California and Mexico lobster populations. Given how the biology and management of Mexico's portion of the stock has implications for the entire range of the species, the FMP should include discussion of the potential uncertainty in SPR calculations associated with neglecting potential contributions from the south.

For example, regardless of the genetic structure of California spiny lobster, if the larval pool for California's population includes a large contribution from the Mexican portion of the stock, the actual SPR may be insensitive to management actions in California. The Department should discuss uncertainty around larval transport and reproductive interactions between California and Mexico's lobster populations. This should include a more comprehensive review of the literature (e.g., bolstering literature citations supporting the idea that stock is, or is not, well mixed).

- ***Prioritize longer-term research needs relating to regional differences in the species' biological parameters.***

The Department should prioritize collection of data aimed at better understanding lobster population genetics, plankton connectivity modeling, and the benthic stage. This could provide greater insight into source and sink populations, interactions with Mexican spiny lobster populations, and how management in California will affect the population.

Evidence from multiple lobster fisheries suggests local recruitment processes are possible. A recent microsatellite and mitochondrial DNA study in California spiny lobster suggests that the genetic structure of the *P. interruptus* exhibits genetic patchiness (Iacchei et al. 2013). The species does not maintain a single homogenous population, despite the species' 240-to 330-day pelagic larval duration. Instead, these lobsters appear to either have substantial localized recruitment or maintain planktonic larval cohesiveness whereby siblings more likely settle together than disperse across sites. However, DNA analysis in the Caribbean lobster (*P. argus*) suggest that populations of this spiny lobster are highly interconnected throughout its range, with a single genetic stock structure (Truelove et al. 2014, Lipcius and Cobb 1994; Silberman and Walsh 1994), except for a few sites where self-recruitment is enhanced by persistent offshore gyres. Lastly, a genetic study in the American lobster *(Homarus americanus*) indicated a genetic homogeneity of the northern region of the lobster population (suggesting a single genetic stock) within the Gulf of St. Lawrence (Kenchington et al. 2009). However, a larval transport model for this species also showed an extensive pelagic connectivity with some level of local recruitment (Chassé and Miller 2010) and no physical features that restrict benthic stage exchanges (Comeau and Savoie 2002).

Research suggests California spiny lobster populations exhibit localized recruitment

3. ESTIMATE OF LOBSTER HABITAT CONTAINED WITHIN MARINE PROTECTED AREAS

The FMP factors in the effects of California's network of MPAs by including them as a component of the fishing mortality calculation in the SPR cable model. The model includes an estimate that 14.6% of all available lobster habitat is protected by MPAs. This is based on available hard-bottom habitat data, augmented by proxy information where suitable bottom-type data are not available, for all the areas that comprise lobster habitat. Only areas that prohibit both recreational and commercial take were used for this calculation. In the near term, reviewers would like to see additional discussion in the FMP of the data sources used, and going forward, refinements to these estimates as the model is improved. Given other uncertainties in the spatial analyses, reviewers suggested that an estimate of 15% is likely adequate.

- ***Provide greater discussion of the data sources used to estimate suitable lobster habitat.***

  Reviewers acknowledge the rigor of the hard bottom data set used to generate the estimate, however the Department should provide more clarity on the locations where information was not available from this data set. It would also be informative to report a rough percent of unmapped habitat and percent of the estimate that was calculated using kelp canopy.

- ***Continue to refine the MPA estimate as new information becomes available.***

  The data used to estimate lobster habitat contain critical data gaps within the shallow nearshore regions (typically 10-15 meter depths) where remote sensing techniques are generally infeasible (known as the "white zone"). New research is providing better information to bridge these data gaps.

  Ongoing research through UC Santa Cruz, the California Department of Fish and Wildlife (staff contact: Paulo Serpa), and Ocean Science Trust is making progress on estimating sand versus rocky habitats across the State within this white zone. The first stage has been completed in the North Central coast and may be expanded statewide over the coming years, and could potentially provide an additional data source to incorporate into the Department's MPA estimate. The Seafloor Mapping Lab at California State University, Monterey Bay developed a shallow water mapping vessel, the R/V Kelp Fly, uniquely able to map the white zone. As these new data sources become available, the Department should include them as refinements to the cable model. The Department should also explore the contribution of habitat from breakwaters and artificial jetties.

- ***Consider developing a function or method to consider actual marine protected area sizes in the SPR cable model.***

  The SPR cable model makes coarse assumptions about the size and spacing of MPAs within the lobster range. The actual values of these parameters are well known, and accounting for California's actual MPA sizes and spacing – which differ regionally – could have implications for regional estimates of vulnerability because of the assumptions of movement that interact with the size and location of MPAs.

4. RESEARCH AND MONITORING

- ***Continue to update and prioritize research and data needs in the FMP.***

  The FMP includes Table 5-1, a prioritized list of research and data needs. Throughout this report, reviewers have identified additional research and data needs that would support more robust management of the fishery (some of which parallel those noted in the FMP). Additional recommendations from this review should be incorporated in the table as well. These science needs could provide further impetus for collecting the information identified and prioritized. A resource with up-to-date research and monitoring needs

provides independent researchers (and potential funders), with the basis for assessing the applicability of given research or other proposals to spiny lobster management and/or state information needs. The Department should continue to update this prioritization and guidance.

5. ADDITIONAL RECOMMENDATIONS

This section contains additional recommendations reviewers considered important, but were not clearly outlined in the formal scope of review.

- ***The harvest control rule matrix should include predetermined management options.***

  While reviewers recognized that this recommendation might be outside of the review scope, they agreed that scientific recommendations are most successful when they are accompanied by predetermined management actions. The lack of pre-determined management response options when one or more of the management thresholds are exceeded has the potential for inaction if the indices or data suggest there are troubling in the fishery. Table 4-2 in the draft FMP lists the suggested management response sequence, including four scenarios in which "No response is required," and another four in which a response is required. However, the required response in these scenarios is an investigation of underlying causes and confirmation with multiple models and approaches; if management action is required, the FMP guidance is to "tailor management response to prevailing conditions." The reviewers found these requirements vague.

  One of the key benefits of pre-specified harvest control rules is a higher certainty of the actions that will be taken when reference points are exceeded. This allows models to be used to evaluate the effectiveness of these actions to restore the fishery to the desired condition.

  Other fisheries that have used SPR for developing harvest control rules may provide good resources for identifying appropriate management responses to thresholds that have been exceeded. Consider supplementing FMP Table 4-1 (summary of SPR thresholds for other lobster fisheries) with a discussion of the management response are in those various management scenarios, as well as whether any of those fisheries also include target SPR rates.

- ***Clarify the information required for setting total allowable catch (TAC).***

  Lines 1964-1965 state that "Creating a TAC for the CA lobster fishery would likely require the Department to estimate the total biomass of the stock…". This is not necessarily true. For example the Market Squid fisheries established a TAC based on historical high catch levels in the absolute absence of total biomass estimates or idealized CPUEs. For many groundfish and other exploited fishes, a common practice in the absence of a quantitative guidance for stocks or stock complexes is to set a TAC at some fraction (e.g., 0.5, 0.75) of the peak historical catch. Any TAC that might be implemented should have a rationale, but it does not mean it requires a sophisticated model.

Looking Forward: Considerations for developing scientific models for state fishery management plans

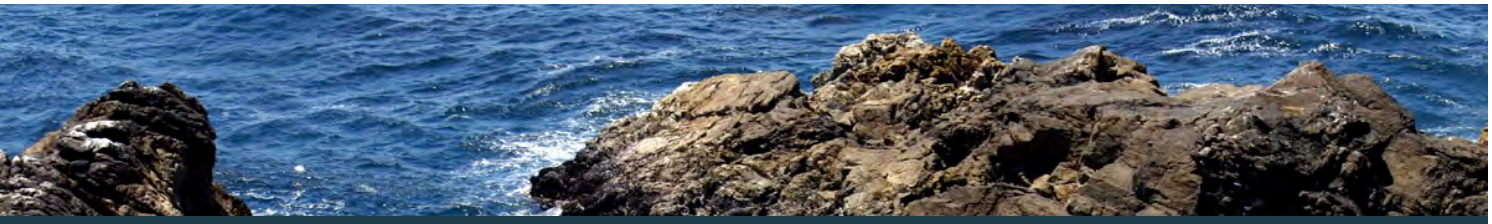
The California spiny lobster FMP represents one of the first examples of a state fishery management plan including the use of a technical model to obtain harvest control rules. The experts who participated in this review have experience developing and using fisheries models at the federal and international levels, and thought it valuable to provide insight into processes employed elsewhere.

When considering the development and use of other technical models going forward, the Department should ensure that the plan for producing the science is decoupled from any management concerns. This will include scoping the objectives, approaches, reporting requirements, and responsibilities of various participants in advance. Model development should take place from a position of academic freedom focused on developing the best model, given the resources and data. The Department should ensure the process is inclusive and transparent from the outset.

Reviewers also suggest decoupling the review of technical models from review of the FMP that such models inform. Future model reviewers should have the responsibility of ensuring that the models represent the best available science and the most robust methods. This review committee acknowledges that ideally an in-person, multi-day review workshop with the model development team would allow more detailed technical discussion and model improvement. It is advantageous to have several days to review, so that modelers can be given "homework" on sensitivity tests or alternative analyses that come up during the review and report back. Any future review team should include scientists from outside the region and fishery, and if possible, international expertise. A goal should be to ensure that the model is clearly understandable to those with no background in the particular fishery under consideration. Only models that have been accepted by reviewers as the best available science are advanced to managers. This way, managers can make recommendations and develop harvest control rules based on a model that has been independently recognized as scientifically rigorous.

As noted in this report, models like SPR will require continual refinement and review to ensure they are effectively meeting management goals. Formalizing a process to periodically review the model coding and configuration, and incorporate recent information is recommended. Groups like SouthEast Data, Assessment and Review[1] (SEDAR) and NOAA PFMC Stock Assessment Review (STAR) Panels may provide informative examples of successful approaches that vary in detail and level of time and analyses required.

[1] More information at http://sedarweb.org/



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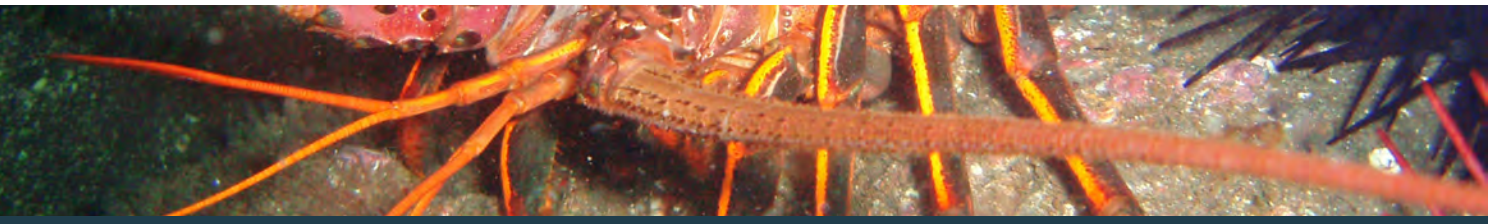


Appendices

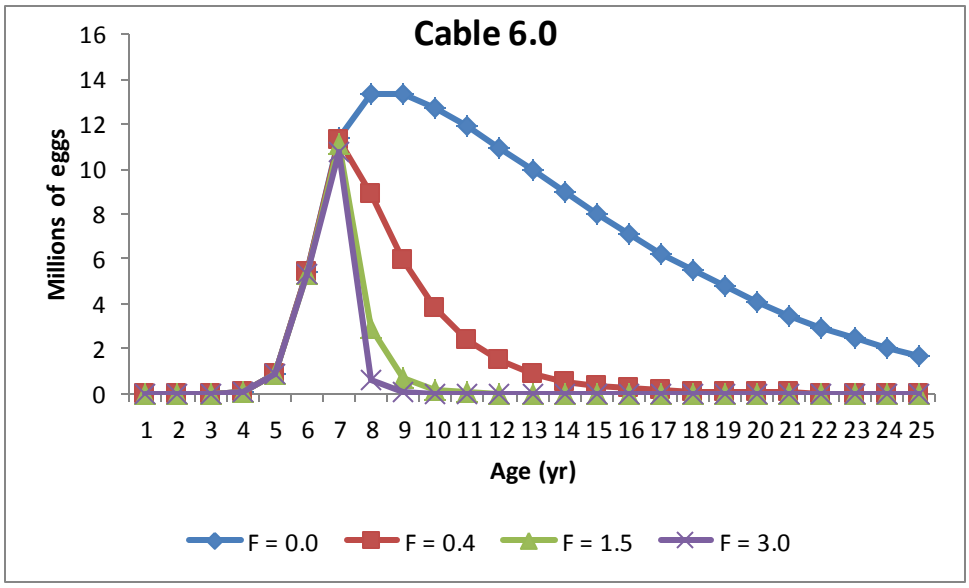
Appendix A: von Bertalanffy and Gaussian Growth Curve Comparison, and *Appendix B: Applying the Canadian Precautionary Approach to California Department of Fish and Wildlife Commercial Landings* contain additional analyses that were conducted by the review committee as part of their assessment in support of the recommendations contained within this report.

Appendix C: Scientific and Technical Review Process details the process Ocean Science Trust developed and implemented for this review.

APPENDIX A: VON BERTALANFFY AND GAUSSIAN GROWTH CURVE COMPARISON

We (the review committee) compared the von Bertalanffy and Gaussian growth models to determine which would be most appropriately applied in the SPR model. The first step was to examine the cumulative fecundities, in millions of eggs, over the projected 25-year lifetime. The age-specific fecundities from the Cable 6.0 model, which uses a von Bertalanffy growth curve, and those from the CDFW 1.0 model, that uses their new growth model, are shown in Figure 1 plotted at the same scale. The main difference is the levels of fecundity. In the Cable model, the cumulative fecundity at F = 0 is 147.2 million eggs while the fecundity at F = 0 in the CDFW model is 46.4 million. At high fishing mortality rates, the fecundities are similar (17.7 vs. 15.8 million eggs at F = 3.0) which means that the SPR ratio will be much higher in the CDFW model; the higher SPR is just the result of the much lower unfished cumulative fecundity (Figure 2).

A.



B.

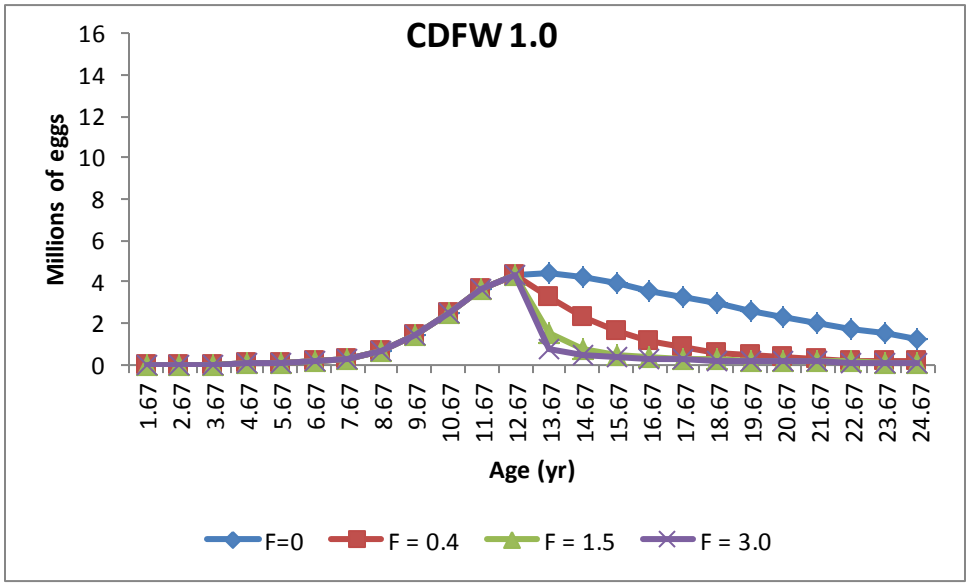


Figure 1. Fecundity by age for the two SPR models: a) the Cable 6.0 and b) CDFW 1.0 for a range of fishing mortality rates.

Even for a high fishing mortality rate of 3.0 per year, the CDFW model still has a SPR value of 34%. However, when we plotted the corresponding average lobster weight against fishing mortality (Figure 3), which is the basis of the control rule, we found that neither model would be a very sensitive way of determining fishing mortality and the corresponding fishing mortality rate that would be used to obtain the SPR value each year. Note that the axes in Fig. 3 are plotted to reflect that the average weight is what is measured so as to estimate the fishing mortality rate. With the current SPR model, fishing mortality would be undefined at average weights less than 1.40 lb. For comparison, the average weight at legal size (82.5 mm CL is 1.25 lb for males and 1.38 lb for females).

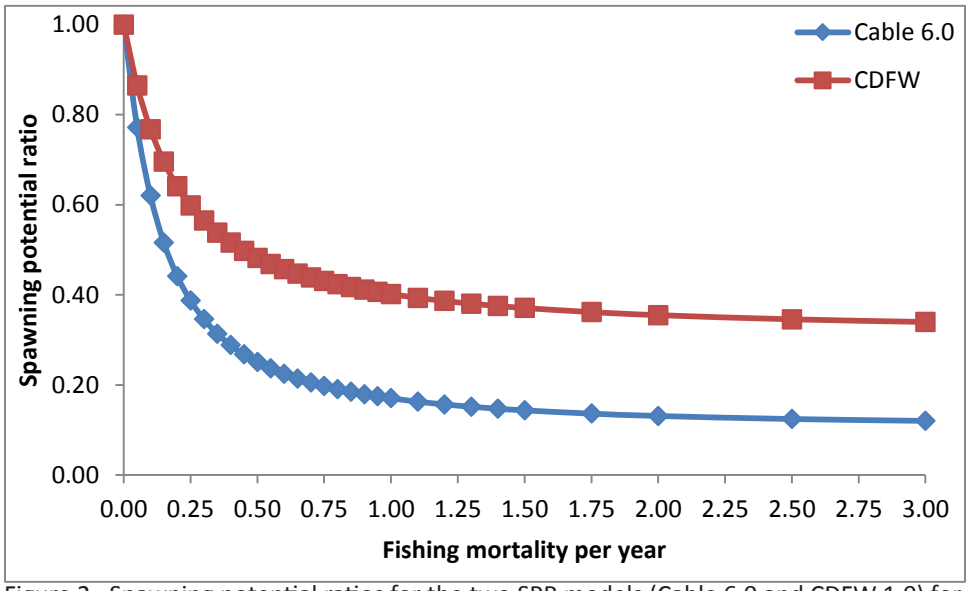


Figure 2. Spawning potential ratios for the two SPR models (Cable 6.0 and CDFW 1.0) for a range of fishing mortality rates.

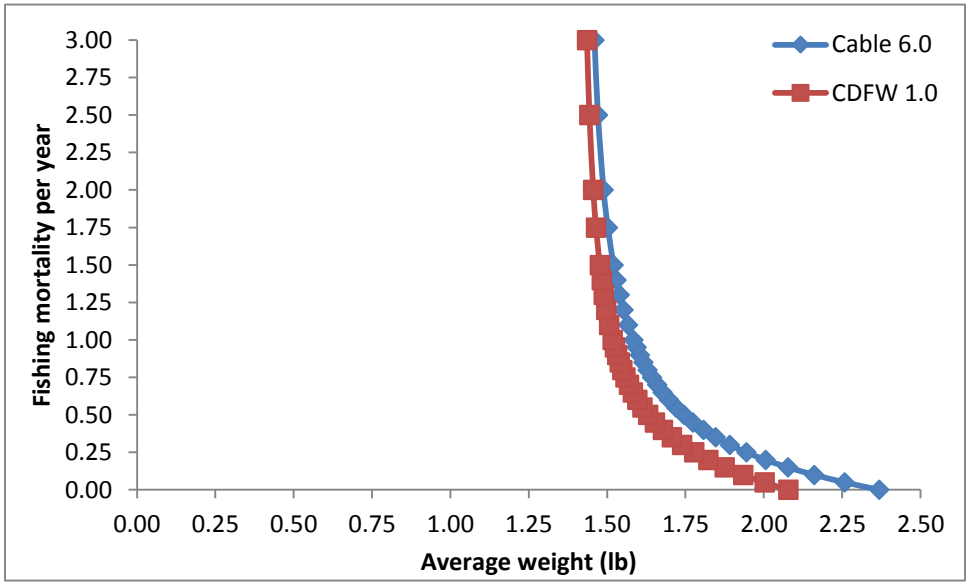


Figure 3. Average spiny lobster weights and the corresponding fishing mortality rates from the two SPR models (Cable 6.0 and CDFW 1.0).

APPENDIX B: APPLYING THE CANADIAN PRECAUTIONARY APPROACH TO CALIFORNIA DEPARTMENT OF FISH AND WILDLIFE COMMERCIAL LANDINGS

We compared the sensitivity of the Department's proposed catch-based threshold approach with another strategy in use for the American lobster in Canada. In 2014, Canada established a reference point for their southern Gulf of Saint Lawrence lobster fisheries using commercial catch based on the Precautionary Approach. Based on this approach, if landings are between an upper stock reference (USR) and the limit reference point (LRP, i.e., the caution zone) it automatically triggers management considerations. These harvest control rules are pre-set management actions aimed at exiting the caution zone and re-entering the healthy zone (i.e., above the upper stock reference point). Based on a 123-year data series for the southern Gulf of Saint Lawrence, management considerations would have been triggered for the American lobster 85 times, and 12 times in a recovery mode (i.e., drastic reduction of effort to a no fishing situation) (Figure 1). However, applying the California spiny lobster approach to the same American lobster data revealed that California's proposed 0.8 reference point would only be exceeded two times (Figure 2).

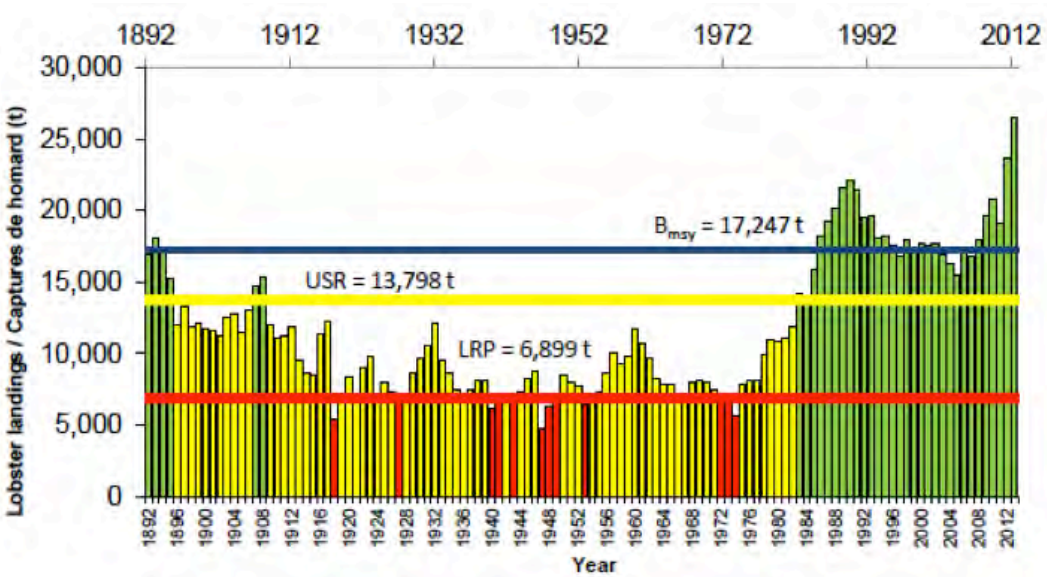


Figure 1. American lobster landings (1893-2013) in the southern Gulf of St. Lawrence; years in the healthy zone (i.e., above the upper stock reference [USR]) in green, caution zone (i.e., between the USR and the limit reference point [LRP]) in yellow, and below LRB in red. The biomass for the maximum sustainable yield (B_{msy}) is estimated at 17,247 t.

We then applied Canada's Precautionary Approach to the Department's California spiny lobster commercial landings data. To do this, we calculated a hypothetical biomass at maximum sustainable yield (B_{msy}) based on a time period from low landings followed by a "recovery" to higher and more sustained landings. Based on the information in the draft spiny lobster FMP, the lowest landings (with information available on effort) were observed in 1974 followed by increasing landings (with fluctuations) until 2013. Based on the trap pull haul (webinar presentation fig. 2.6), it seems that the effort level (traps hauled) increased 4 times: 200,000-400,000 between 1973-1979; 400,000-600,000 (with a drop in 1991-2) between 1980-94; ±800,000 between 1995-2011; and above 1 million in 2012-3. A reasonable assumption is that the stock could sustain the 800,000 trap haul level (16 years) since the landings did not drop during the time. Hence, the time period could be established between 1974 and 2011. However, please note that based on the CPUE reference values (see fig. 4.7 in FMP document), one could reasonably argue that the stock does not seem to react well to the level of effort in the last 7 years and that the time period should/could be 1974-2007. Nevertheless, using the 1974-2011 period

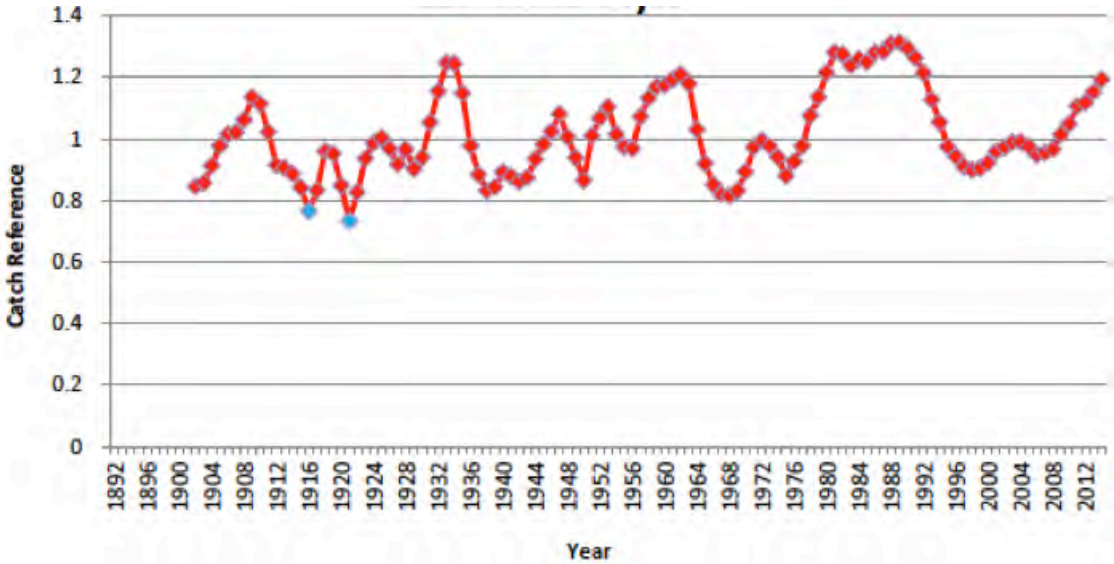


Figure 2. Catch reference for the American lobster landings (1892-2013) in the southern Gulf of St. Lawrence using the California spiny lobster catch-based threshold approach.

the B_{msy} is estimated at 587,409, given an upper stock reference (80% of B_{msy}; USR) of 469,927, and the limit reference point (40% of B_{msy}; LRP) of 234,963 (Figure 3). The draft FMP (Figure 4.6) indicates that between 1935 and 2013 management considerations would have been trigged 11 times, mostly between 1960-74. Based on the precautionary approach and using a 3-year running average for landings, the spiny lobster fishery was below LPR in 1975-6 (critical zone; normal because the time period stated at low values), which would trigger a recovery period (i.e., drastic reduction of effort to a no fishery situation). Since 1935, landings were between LRP and USR (caution zone) 31 times (latest 1977-87) that would have triggered immediate management actions from pre-established harvest control rules (mainly effort reductions) to, hopefully, exit the caution zone and re-enter the healthy zone. Landings between USR and Bmsy was observed 9 times (latest 1993-5) but does not trigger urgent management considerations, but could be used by managers to start a dialogue with the industry (e.g., to be cautious).

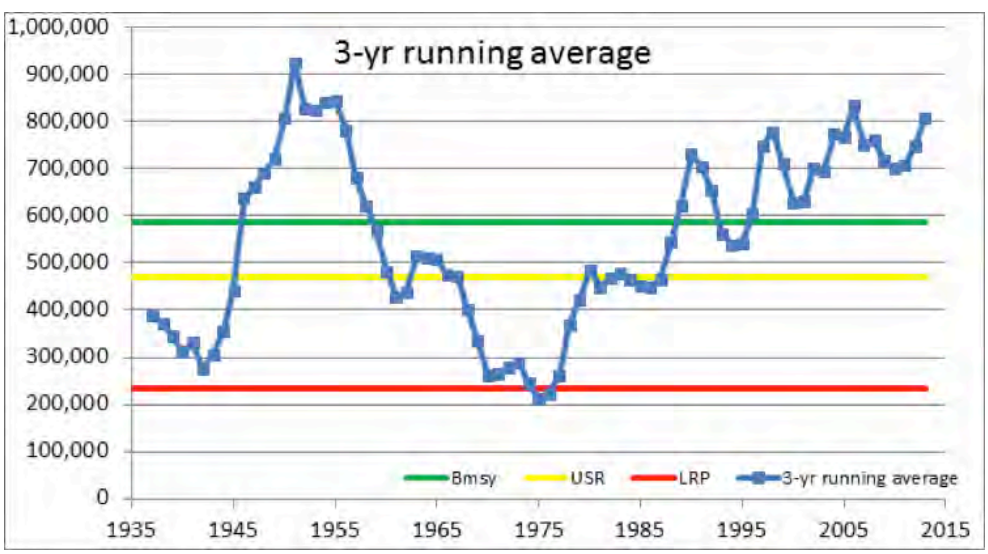


Figure 3. Application of Canada's Precautionary Approach to California spiny lobster commercial landings data; years in the healthy zone (i.e., above the upper stock reference [USR; yellow line]), caution zone (i.e., between the USR [yellow line] and the limit reference point [LRP; red line]), and below LRP. The biomass for the maximum sustainable yield (B_{msy}) is estimated at 587,409 lbs.

APPENDIX C: SCIENTIFIC AND TECHNICAL REVIEW PROCESS

The California Department of Fish and Wildlife (the Department) asked California Ocean Science Trust to coordinate an external scientific and technical review of the reference point thresholds prescribed in the California Spiny Lobster Fishery Management Plan (FMP) and supporting materials. Specifically, the Department sought an independent assessment of whether the technical components, spawning potential ratio model, and supporting documents that underpin the proposed reference point thresholds prescribed in the FMP are scientifically sound and reasonable given the Department's currently available data streams and analysis techniques. See the "Scope of Review" for details on the charge to reviewers.

Ocean Science Trust designed and implemented all aspects of the review process, including compiling appropriate background materials, drafting instructions to guide reviewers throughout the process, scheduling and hosting remote meetings as appropriate, and working with reviewers to produce a written final summary report, among other activities. Upon completion of the review, the final report was delivered to the Department and made publicly available on the Ocean Science Trust website. Throughout, Ocean Science Trust facilitated constructive interactions between the Department and reviewers as needed in order to ensure reviewers provide recommendations that are valuable and actionable, while maintaining the independence of the review process and outputs

Scientific Review Principles

In any review, it is our intent to provide an assessment of the work product that is balanced, fairly represents all reviewer evaluations, and provides feedback that is actionable. When building a scientific and technical review process, we seek to balance and adhere to six core review principles. These principles help guide the design and implementation of each review, and shape the final outputs:

- **Scientific rigor:** the process must yield an evaluation of whether scientific and technical components contained within products are valid, accurate and thorough.
- **Transparency:** given the context for the review, the process must include the appropriate level of information disclosure and openness in order to facilitate social recognition and accountability.
- **Legitimacy:** the process must yield an output that is viewed as authoritative in the eyes of scientific community, the requesting agency, and other constituents.
- **Credibility:** the process will seek to be unbiased and incorporate the best available science.
- **Salience:** the process will consider the most relevant scientific information while balancing management needs and timelines.
- **Efficiency:** the process will be as cost-effective as possible, and utilize time, resources, and effort in a proficient manner to create the most robust output possible.

Review Process

The review took place from October 2014 through May 2015. A timeline of each task is provided below.

	2014			2015				
Milestone	**Oct**	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**
Task 1 - Review Preparation								
Scope and process development; budget and administrative preparation; reviewer solicitation and selection process; collateral material development	X							
CDFW delivery of draft FMP to Ocean Science Trust		X						
Task 2 – Conduct Review								
Webinar 1: Initiation of Review (Attendees: CDFW, Review Committee, Ocean Science Trust)			X					
Webinars 2: FMP Assessment (Attendees: Review Committee, Ocean Science Trust)				X				
CDFW delivery of draft SPR model and report to Ocean Science Trust						X		
Webinar 3: SPR Model Assessment *(Attendees: CDFW, Review Committee, Ocean Science Trust)*						X		
Webinar 4: Cont. SPR Model Assessment, Develop Review Recommendations *(Attendees: Review Committee, Ocean Science Trust)*							X	
Task 3 – Finalize Summary Report								
Deliver final report to CDFW and make available online; publish membership of review committee; present findings to the Fish and Game Commission								X

Assembling the Review Committee

Ocean Science Trust implemented a reviewer selection process to assemble a review committee composed of four external scientific experts. Ocean Science Trust consulted with and accepted reviewer recommendations from the Ocean Protection Council Science Advisory Team (OPC-SAT), as well as Ocean Science Trust's own professional network among the academic and research community. Membership included experts from academia, research institutions, and government entities in order to deliver balanced feedback and multiple perspectives. Reviewers were considered based on three key criteria:

- **Expertise:** The reviewer should have demonstrated knowledge, experience, and skills in one or more of the following areas:
    - Fisheries biology, stock assessments and modeling, including spawning potential ratio analyses and application
    - Invertebrate ecology and/or population biology, with an understanding of California's coastal ecosystems, and how invertebrate stocks respond to fishing pressure, climate change and marine protected areas
- **Objectivity:** The reviewer should be independent from the generation of the product under review, free from institutional or ideological bias regarding the issues under review, and able to provide an objective, open minded, and thoughtful review in the best interest of the review outcome(s). In addition, the reviewer should be comfortable sharing his or her knowledge and perspectives and openly identifying his or her knowledge gaps.
- **Conflict of Interest:** Reviewers will be asked to disclose any potential conflicts of interest to determine if they stand to financially gain from the outcome of the process (i.e. employment and funding). Conflicts will be considered and may exclude a potential reviewer's participation.

Final selections for the review committee were made by the Ocean Protection Council Science Advisor (Ocean Science Trust Executive Director). Ocean Science Trust selected one member of the review committee to serve as chair to provide leadership among reviewers, help ensure that all members act in accordance with review principles and policies, and promote a set of review outputs that adequately fulfill the charge and accurately reflect the views of all members.

Series of Review Webinars

All meetings took place via a series of remote online meetings (webinars) and phone calls. At the outset of the review, Ocean Science Trust worked with the Department to develop detailed reviewer instructions that encouraged focused scientific feedback throughout the process. Instructions included directed evaluation questions and delegated tasks for reviewers based on their individual areas of expertise. The instructions were used to guide the development of meeting agendas, and track progress throughout the course of the review. For each meeting, advanced work was required of participants (e.g., conducting analyses, drafting responses to guiding questions, preparing presentations) in order for all parties to come prepared for meaningful discussions. Ocean Science Trust notified CDFW of additional requested materials and data prior to the first "Initiation of Review" webinar in mid-November.

- **Webinar 1: Initiation of Review (*December 2014*)**

Ocean Science Trust hosted an initial remote meeting (webinar) to provide the review committee and Department staff an overview of the scope and process, and clarify the roles and responsibilities of each participant. The Department provided a summary of the relevant management context to ensure reviewers understood the role of the review in the FMP development process, and how the outputs would be considered. The bulk of the webinar focused on a presentation by the Department of the scientific and technical components

of the draft FMP. The webinar was an opportunity to develop a shared understanding of the tasks and allow reviewers to ask the Department any clarifying questions about the review materials before they convened independently to conduct their technical assessment.

- **Webinars 2-4: Reviewers convened with Ocean Science Trust to conduct review (*January through April 2015*)**

Ocean Science Trust convened three remote one- to two-hour webinars with the review committee to conduct an in-depth evaluation of the components identified in the Scope of Review. In advance of each webinar, reviewers were asked to prepare responses to guiding evaluation criteria questions from the review instructions. During each webinar, reviewers discussed their findings and developed conclusions and recommendations. Outputs from each webinar, as well as reviewer responses to the questions, guided the development of the final report.

Final Summary Report

Ocean Science Trust worked with the review committee to synthesize reviewer assessments (responses to the review instructions and input during webinars) into a cohesive, concise final report. The final report was delivered to the Department in May 2015, and made publicly available on Ocean Science Trust's website along with the identities of the review committee members. Ocean Science Trust presented the review results on behalf of the review committee at the June 10, 2015 California Fish and Game Commission public meeting in Mammoth, California.

Contact Information

For information related to the scientific review process:

Hayley Carter
Project Scientist
California Ocean Science Trust
hayley.carter@oceansciencetrust.org

For information related to the spiny lobster FMP, and other management inquiries:

Tom Barnes
Marine Region Program Manager
California Department of Fish and Wildlife

Tom Mason
Marine Sr. Environmental Scientist Supervisor
California Department of Fish and Wildlife

California Ocean Science Trust

1330 Broadway, Suite 1530
Oakland, California 94612
oceansciencetrust.org

Appendix VIII – CA Lobster FMP Edits in Response to Scientific Peer Review Comments

The scientific foundation for the California Spiny Lobster Fishery Management Plan (CA lobster FMP) underwent an independent, external peer review by a panel of academic and government scientists, expert in lobster fisheries and marine invertebrates. Reviewers focused on the reference points used within the harvest control rule (HCR), the model used to calculate spawning potential ratio (SPR), methods for incorporation of the effects of marine protected areas on the stock and fishery, and the decision to manage CA lobster as a single stock. The primary changes to the previous draft of this FMP in response to peer review include:

- A von Bertalanffy growth model was used to describe lobster age at a given size within the model used to calculate SPR.
- Catch and catch per unit effort (CPUE) reference points were made more sensitive by setting the threshold levels at 0.9 rather than 0.8.
- Expanded discussion of possible reference points and associated models was added to the FMP along with increased explanation of the selected approach.
- Information on regional differences within the stock was added and better understanding of these differences was highlighted as an information need.

The responses below address each specific recommendation made by the panel and highlight what changes, if any, were made to the draft FMP in response. California Department of Fish and Wildlife (CDFW) responses to comments follow the same outline structure within the panel's final report (Appendix VIII to the CA lobster FMP). The Cable model was originally developed by Dr. Richard Parrish under contract with the South Bay Cable Liaison Committee (Parrish 2013), and ongoing revision of it has been necessary to address some panel recommendations. References to the CDFW-Cable model in this document are for the most recent version that was developed through collaboration among CDFW staff and CDFW contractors, including assistance from Dr. Parrish.

1 Evaluation of the proposed reference point thresholds

1.1 Spawning Potential Ratio (SPR) Cable Model and the SPR Reference Point

1.1.1 Key Recommendations for Securing a Management-Ready SPR Model

Growth Model

<u>Comment</u>: Rely on the von Bertalanffy growth modeling methods until the newly developed growth model can be robustly validated.
<u>Response</u>: CDFW fit a von Bertalanffy model to existing growth data from tag-recapture studies generating a new equation to relate size and age within the CDFW-Cable model. Separate male and female equations resulted in greatly underestimated maximum size, which lead to unrealistic model results. Given this, von Bertalanffy parameters derived for the Mexican CA spiny lobster stock were taken from Vega (2003). Equations with separate parameters for males and females were input to the CDFW-Cable model (see Appendix VII to the CA lobster FMP).

Comment: Use SPR with caution at high exploitation rates.
Response: Discussion of the limitations to the CDFW-Cable model at high exploitation rates were added to the FMP within section 4.3.1 and the corresponding Figure 4-9.

Comment: Reconsider some of the tag-recapture data that were removed from the growth models.
Response: Growth increments of 0 mm were retained as recommended. The occurrence of negative growth increments as well as outliers was re-examined. After accommodating the data filtering requirements designed to ensure a molt had occurred between lobster measurements (>150 days at liberty and measurements before and after the molting season) negative values fell out of the data set. Two extreme outliers remained and were removed. As stated above, the resulting von Bertalanffy model was unrealistic and was not used.

Model Functionality

Comment: Update the vulnerability relationship.
Response: Lobster vulnerability to traps is described by a size-dependent equation within the CDFW-Cable model. This equation simulates low vulnerability for small lobsters that are able to escape through escape ports, grows to high vulnerability for legal-size lobsters, then low vulnerability again for very large lobsters that are too large to enter trap funnels. Parameters determine the rate at which vulnerability increases then decreases again. Equations for vulnerability and female sexual maturity are of a similar form because maturity also increases quickly as females increase in size. The parameter guiding this increase was the same in an earlier model version by coincidence. The parameter for female maturity was set based on published observations of sizes of berried females. The parameter for vulnerability was set based on sizes of lobsters typical in traps. That parameter was then "tuned" within the model to produce a simulated percentage of shorts in the catch that matched this percentage from commercial log data. This tuning procedure was repeated on the most recent model version, which utilizes a different growth model, resulting in slightly different vulnerability parameters.

Comment: Revisit the natural mortality function.
Response: The CDFW-Cable model natural mortality function is size-based and results in high natural mortality for young lobsters which decreases to a value of 0.17 for most size classes before increasing again for large lobsters. CDFW performed a sensitivity analysis to examine differences in model output using natural mortality equations with and without increasing natural mortality for old, large lobsters (senescence). Senescence had little impact on model results because few lobsters live to achieve the size at which senescence is relevant. Therefore simulated senescence was removed from the natural mortality function. Additional references were added to the FMP within section 5.2, subsection on total mortality. The referenced studies also used natural mortality rates of approximately 0.17 although typically used a constant rate rather than size-based. Temperature and von Bertalanffy parameters were also used to calculate an estimate for natural mortality following methods described in Hearn (2008) and again achieved a result of approximately 0.17.

Comment: Explain the ramifications of SPR being independent year to year.
Response: Additional discussion of the drawbacks to equilibrium modeling was added to section 4.3.1.3. The constant recruitment used within the CDFW-Cable model, and therefore lack of a stock-recruitment relationship, is described as the reason for using an SPR threshold based on a set of reference years rather than knowledge of a sustainable spawning stock biomass based in MSY. Additional discussion of this issue has been added to CDFW's report on the Cable-CDFW Model.

Sensitivity Analyses

Comment: Make greater use of sensitivity analyses in explaining the model.
Response: In response to requests by the review panel for additional sensitivity analyses during the review process, CDFW analyzed model sensitivity to natural mortality equations of multiple forms, MPA and movement related parameters, vulnerability parameters, and ghost fishing. Results from these analyses have been added to CDFW's report on the model. Results of further sensitivity analyses on changes in model output resulting from growth model changes requested by the review panel were also added. CDFW will continue to use these analysis techniques when future model changes are considered.

1.1.2 Longer-Term Considerations for the SPR Model

Research Needs

Comment: Explore alternative methods to estimate lobster growth.
Response: This was identified as a research priority in section 5.2 on Essential Fisheries Information (EFI) and subsection on age and growth. Emerging techniques for direct identification of crustacean age were described and referenced. Available tag-recapture data and modeling efforts of CDFW to date were also described. The CDFW-Cable model report provides more detail. A statement that CDFW will look to collect more growth data and develop new models was added to the natural history section (3.2) subsection on growth. The importance of regionally specific growth information, if the CDFW-Cable model is to be used in a regionally specific way, was added to section 4.3.1.3.

Comment: Explore additional technical models that can account for variable recruitment.
Response: There are currently no adequate data on lobster recruitment that can be used to develop a stock-recruitment relationship for CA lobster. This is one of the reasons for the choice to use equilibrium modeling to estimate SPR. However, CDFW recognizes the drawbacks of equilibrium modeling and will seek to improve understanding of CA lobster recruitment in the future. CDFW has demonstrated a relationship between CA lobster landings and the abundance of phyllosoma larvae in CalCOFI samples (Koslow et al. 2012) but this may not translate into a relationship between landings and recruitment. The MSE model has options for the use of either a Beverton-Holt or Ricker recruitment curve and CDFW hopes to further improve the MSE model and use it to provide context for future management decisions. Models for calculating reference points that incorporate stock-recruitment relationships are noted in section 4.2.4.

Comment: Develop a sampling program to collect individual lobster length or weight composition data from both sectors of the fishery.
Response: This is noted as a research priority in section 5.2 covering EFI, subsection on stock composition. Improvements that these data could provide to models are noted in section 4.3.1.3.

Comment: Prioritize obtaining intermediate recapture data, which could be useful for better understanding the dynamics of lobster growth rates.
Response: This was noted as a priority in section 5.2 on EFI, subsection on age and growth.

Model Functionality

Comment: Develop a function or method to incorporate recreational catch into the model.
Response: The CDFW-Cable model calculates SPR based on input data on average weight of individuals in the commercial catch. Currently, there are not adequate data on average weight of lobsters taken in the recreational fishery. Other aspects of the model, such as vulnerability, are based on data describing the vulnerability of lobsters to traps and not to hand take. An intensive research program and annual monitoring would be required to generate appropriate equations, parameters, and input data for recreational take. Additionally, improvement in recreational catch estimates as report card return rates improve would be necessary for confident inclusion of recreational dynamics in models. Additional data sources, such as as annual telephone surveys of fishermen who did not return their report card would help, but require additional capacity and resources to undertake.

Comment: Revisit the SPR model as MPAs reach their full maturity.
Response: Additional discussion of the "credit" given to the simulated lobster stock from MPAs was added to section 4.3.1.3. CDFW agrees that MPAs are unlikely to have achieved their full potential and may not for some time and now state within the FMP "… it is unlikely that the MPAs, implemented in 2012 as a result of the south coast MLPA process, have actually achieved equilibrium and their full potential. Given that the average weight during the 2014-15 fishing season was above the average of the reference years, $SPR_{CURRENT}$ for 2014-15 was also above $SPR_{THRESHOLD}$ with or without the model benefit from MPAs. CDFW will monitor average weight and SPR closely until further research illustrates substantial benefit of MPAs to CA lobster and that the model-simulated enhancement to reproductive potential is warranted."

Comment: Formalize a process to review, revise, update, and evaluate the SPR model and its effectiveness in meeting management goals as new data, information, or analyses become available.
Response: Section 4.3.1.3 notes that equations and parameters in the model will be revised as information becomes available. Section 6.2.2 on the amendment process states that revising calculations within the Cable-CDFW model to include new EFI would not require an amendment but removal or addition of a different reference point would.

1.2 Catch and CPUE-based Reference Points

1.2.1 Key Recommendations for Catch and CPUE-based Reference Points

Comment: Describe catch and CPUE thresholds as "fishery indicators" instead of reference points.
Response: The Canadian precautionary approach described in the peer-review report as well as other reference point approaches were explored. Discussion of these approaches relative to the approach used in the CA Lobster FMP was added to sections 4.2.4, 4.2.5, and 4.3.1.3. CDFW asserts the catch and CPUE reference points play a valuable role in the HCR and therefore were not removed from the HCR or reclassified as "indicators." However, as recommended by the review panel, the effects of making the catch and CPUE reference points more sensitive were explored and threshold levels were increased from 0.8 to 0.9. Descriptions of stock history relative to those thresholds are given in sections 4.3.1.1 and 4.3.1.2. Previously the FMP stated that investigations would be initiated if the catch or CPUE declined for seven consecutive seasons. This was intended to bring additional attention to declining catch or CPUE even if they remain above the reference point threshold. In recognition that consistent declines have not been seen previously, investigations will instead be initiated if the catch or CPUE reference points decline for six consecutive seasons. This adds additional sensitivity to the reference points and is better aligned with stock history.

Comment: Clarify rationale for the use of 0.8 thresholds prescribed in the FMP.
Response: Additional explanation of the rationale for using moving averages and the revised threshold values of 0.9 for the catch and CPUE reference points was added to sections 4.3.1.1 and 4.3.1.2.

Comment: Report the CPUE statistic in mass per unit effort.
Response: CPUE is calculated as number of lobsters caught per trap pull because both of these data are collected on the commercial log. Reporting mass per unit effort would require linking logs to landing receipts which requires a variety of assumptions and results in removal of a large amount of data. Therefore no change was made in response to this comment.

Comment: Include greater discussion of the reliability of recreational catch estimates.
Response: Additional discussion of the reliability of these data was added to section 2.2. Table 2-1 was updated with new estimates of the total weight of recreational landings and 95% confidence intervals, as well as the percent of total landings represented by recreational landings. However, these confidence intervals cannot reflect uncertainty "due to poaching or the potential that catch on returned report cards is not representative of catch on un-returned report cards."

1.2.2 Longer-Term Considerations for Catch and CPUE Data

Comment: Explore other technical models to obtain additional or alternative biological reference points that account for inter-annual variability in recruitment and other variables.
Response: Discussion of, and references to, other types of models for generating reference points was added to sections 4.2.4, 4.2.5 and 4.3.1.3. CDFW is open to further exploration of these model options. These options, particularly a Delury depletion model which may not require new data streams, could be useful if prompted to investigate stock status by the HCR.

Comment: Standardize commercial and recreational catch data to the same spatial reference points.
Response: CDFW commercial fishing blocks, which are 10 x 10 nm, are a long-standing reporting requirement on commercial logs. This level of detail is not tractable on a recreational report card. Existing report card catch locations can be overlaid with and attributed to commercial blocks. However a variety of assumptions are required where boundaries are not well aligned. In the future, CDFW will seek to better define recreational take locations so that they align well with commercial blocks, where possible.

2. Science Supporting the Decision to Manage as a Single-Stock

Comment: Assess and report any spatially explicit differences between regions of the fishery.
Response: A new section (3.10) was added to the natural history chapter to describe what is known about regional differences within the stock. The spatial limitations of the CDFW-Cable model and the concerns of using the model to produce regionally specific results are discussed in section 4.3.1.3. Some analyses of differences in effort and catch were performed as part of an effort to refine our analyses of average weight. This helped inform the discussion of regional differences in section 3.10. Another new section (3.4) was added to describe existing literature on genetic population structure. This literature suggests that management as a single stock is appropriate and that while mixing across the border with Mexico occurs, it likely doesn't dominate CA dynamics.

Comment: Interactions with Mexico's spiny lobster stock should be considered and discussed in greater detail throughout the FMP.
Response: A new section (4.4.1) was added to describe Mexico's stock status and management. Additional discussion of how recruitment from Mexico would affect our use of SPR as a reference point was added to section 4.3.1.3.

Comment: Prioritize longer-term research needs relating to regional differences in the species' biological parameters.
Response: Additional description and references for larval recruitment data were added to section 5.1.2 in the larval collectors subsection. The potential use of these data to understand regional differences and population sources and sinks is noted in section 5.2 on recruitment. The importance of understanding regional differences in age at maturity and fecundity is noted in section 5.2, subsection on reproduction. Regionally-specific estimates of fishing mortality were already given the highest research priority in section 5.2, subsection on Mortality. The importance of information in all these categories if the CDFW-Cable model is to be used for regionally-specific results is noted in section 4.3.1.3. Genetic population structure/larval mixing was added as a data type in Table 5-1.

3. Estimate of Lobster Habitat Contained within Marine Protected Areas

Comment: Provide greater discussion of the data sources used to estimate suitable lobster habitat.
Response: Sources for different lobster habitat categories were foot noted in section 3.1. Table 4-2 was added to provide the relative areas of hard and soft habitat types and unknown regions, as well as their mapping resolution within regions of the Southern California Bight (SCB). The amount of hard bottom area estimated using kelp canopy as a proxy was also noted.

Comment: Continue to refine the MPA estimate as new information becomes available.
Response: Improvement of habitat information is given the highest priority in section 5.2 and Table 5-1. Its importance to calculation of SPR within the CDFW-Cable model is noted.

Comment: Consider developing a function or method to consider actual marine protected area sizes in the SPR cable model.
Response: The CDFW-Cable model was designed as an equilibrium model. It is run only a single time under each scenario with no stochasticity or variability in parameters. MPA size and spacing represents an average of the actual variation along the entire SCB coast. One method for incorporating a range of MPA parameters could be to average outputs from multiple runs using different MPA parameter settings. However, using the CDFW-Cable model to produce regionally-specific results based on MPA parameters without including regionally specific biological parameters for many of the functions may not be appropriate. A much more complex model would be more appropriate for inclusion of realistic MPA size and spacing and could concurrently include variable recruitment and other regional differences. An individual-based model like the MSE model is better structured for these functions and CDFW hopes to continue improvement of that model in the future.

4. Research and Monitoring

Comment: Continue to update and prioritize research and data needs in the FMP.
Response: The data needs and research priorities outlined in Chapter 5 of the FMP were closely reviewed. CDFW is undergoing a systematic review of data needs and existing data streams for the lobster fishery as well as all other fisheries. CDFW is also working towards developing a public-facing repository for our research and data needs.

5. Additional Recommendations

Comment: The harvest control rule matrix should include predetermined management options.
Response: The HCR was designed to be discretionary as predetermined management options were not supported by the LAC. Inclusion of multiple reference points was intended to help provide a more complete picture of stock status and influences. Based on these relatively nuanced reference points, management responses can be flexible because of multiple toolbox options and also because investigations prompted by the HCR should provide further guidance on stock influences. Edits were made to both Table 4-3: Harvest Control Rule Matrix and Table 4-4: Control Rule Toolbox to clarify potential reasons for reference point positions and suggested responses.

Comment: Clarify the information required for setting total allowable catch (TAC).
Response: Additional description of TACs, methods for their determination, and references were added to section 4.3.3.

Appendix IX: LAC Regulatory Recommendations and CDFW Memorandum to the Commission on LAC Recommendations

The following appendix provides historical documents related to the lobster advisory committee (LAC), which was a constituent body tasked with developing management recommendations to be associated with the fishery management plan. The documents are 1) a description of regulatory proposals for the commercial fishery, 2) a description of regulatory proposals for the recreational fishery, and 3) a memorandum from the Department of Fish and Wildlife (CDFW) to the Fish and Game Commission requesting direction on preparation of a regulatory package based on LAC recommendations. Only those proposals achieving full consensus from LAC members were presented to the Commission. Two proposals achieved near consensus but did not receive agreement from members representing the recreational fishery. Those were 1) a recreational seasonal limit of 70 lobsters per person and 2) a ban on the use of conical hoop nets in the recreational fishery. At the direction of the Fish and Game Commission, two proposals that did achieve consensus from the LAC were not carried forward. Those would have restricted the use of mechanized pullers to only disabled recreational fishermen and would have provided a three-year phase in period to commercial fishermen to reduce their trap use to the trap limit.

In addition to regulatory proposals, the LAC also came to consensus on a broad policy statement regarding allocation between the commercial and recreational fisheries and generated the following objectives:

- Identify current effort levels for each sector, and establish controls to prevent unrestricted growth.
- Identify the proportion of overall catch and or effort from each sector, and, if necessary, take corrective action to maintain those proportions if the percent of total catch and or effort by sector deviates significantly from a pre-determined base period.
- Recognize the current differences between sectors in traditional fishing grounds and time of day fished, and seek to maintain those differences.
- If increases or decreases to the fishery are required due to application of the control rule, those changes should seek to maintain equitability and not give an advantage to either sector unless biological triggers require a change to allocation.
- End illegal commercialization.

California Department of Fish and Wildlife

CDFW Feedback on Implementation Details of the Lobster Advisory Committee Commercial Recommendations:

The California Department of Fish and Wildlife (CDFW) recently met with the Lobster Advisory Committee (LAC) Commercial Representatives to discuss details regarding implementation of the proposed regulatory changes to the commercial lobster fishery recommended by the LAC. Input from CDFW Marine Region and Law Enforcement Division (LED) is provided in Blue Font below. This information is being disseminated to refine the details prior to the formal regulatory process which takes place after the Fisheries Management Plan (FMP) has been adopted in 2015. The LAC recommendations will part of the Lobster FMP implementing regulations that will be formally introduced to the Fish and Game Commission in mid-2015. Any new regulations that are adopted would not be implemented until the 2016-2017 lobster season.

LAC Commercial Proposal

Table 1. COMMERCIAL TRAP LIMIT

CATEGORY	NUMBER OF TRAPS	PROVISIONS
"300" Transferable Permit (T) "300" Non-transferable permit (NT)	300	• May stack another permit for a maximum of 2 permits (2 x 300 traps = 600 trap maximum) • The second permit remains transferable • Death provision applies only to transferable permits (NT permits are not transferable – even due to death)
CDFW supports the proposed LAC trap limit of 300 traps with the ability to stack another permit for a maximum of 2 permits (2 permits X 300 traps = 600 trap maximum). The second permit remains transferable, and the death provision only applies to transferable permits.		
Phase-In Stacking Permit	300	• Available to either transferable or non-transferable permittees • Non-transferable permit • Only available for three years (must be renewed annually) • Permit funds would go for commercial lobster research & monitoring – ($5,000 - $10,000 annual permit fee) • Would become effective when trap limits go into effect
CDFW recognizes that a "Phase-In Stacking Permit" may no longer be necessary given the projected timeline for the proposed implementing regulations. New regulations would become effective for the 2016/2017 season.		

Table 2. GENERAL PROVISIONS
▪ Death provision applies only to transferable permits **CDFW Proposed Details:** ▪ non-transferable permits can never be transferred - even upon death ▪ All traps must be tagged (on trap or buoy or both)(must be purchased annually); details to be worked out with LED **CDFW Proposed Details:** ▪ Traps shall be tagged w/ Dept. issued trap tags ▪ 300 trap tags shall be issued once a year to each permittee before the start of the season ▪ Program costs to be incorporated into permit fees, and tags will not be purchased separately ▪ Catastrophic gear loss provision; details to be worked out with LED (application would include requirement to report details of loss)(Information could be shared with permitted recovery projects) **CDFW Proposed Details:** ▪ The Department is considering defining catastrophic loss as the loss of 75 or more tags per permit. Catastrophic loss claims will be formally submitted to the Department for approval. LED will determine whether to approve or deny catastrophic loss claims. Claim information must include a detailed description of the circumstance that caused the loss, date of loss, number of traps lost along with their tag numbers, and location of lost traps (Latitude and Longitude coordinates). ▪ Catastrophic loss tags would be uniquely identifiable. ▪ Allow scuba equipment on board commercial vessels to retrieve lost traps or remove line from prop (not allowed to "fish" when on scuba) **CDFW Proposed Details:** ▪ Scuba gear already allowed per T14 122. Cannot be used for "take" ▪ Provide clarification that no lobsters can be taken or possessed w/scuba gear, or any other underwater breathing apparatus (including hookah). However, this equipment can be used to locate and secure (retrieve) traps ▪ Provide clarification that lobsters contained in a trap that has been secured using scuba gear, or any other underwater breathing apparatus equipment (including hookah), can be possessed after the trap has been serviced aboard the vessel ▪ More than one permittee may operate from a single vessel; each permittee whose traps are being pulled must be aboard **CDFW Proposed Details:** ▪ Dual Permittee on board – both permittees will be responsible for any violation found on vessel ▪ 7 day soak time using "Federal Rules" regarding weather **CDFW Proposed Details:** ▪ Adopt similar language to CFR Title 50 §660.230(3) ▪ Traps must be attended at least once every 7 days. No specific weather exemption. If traps cannot be pulled due to weather, fishermen will be responsible for burden of proof (e.g. NOAA weather advisory, or other formal documentation from a government weather agency)

- Limit use of "note" to fish traps by other than permit holder. May open (and retain the lobsters within) or retrieve traps belonging to another lobster fisherman with a note and notification to DFW LED (details to be worked out with LED); may not bait or fish traps for another permittee

  CDFW Proposed Details:
- Formalize the "note" process by requiring permittees to submit a waiver request to the Department. Waiver should be similar to the Dungeness Crab Waiver to Pull Traps
- Specific protocol and procedures for the Lobster Waiver to be established by LED
- CDFW will determine each waiver request on individual case basis. The information submitted in the waiver request will be used to determine the conditions. Lobsters may not be retained unless specified by CDFW as a condition on the waiver
- Department to be notified in advance
- Responsibility for violations is transferred to the individual permittee that has permission to pull
- Traps need to be either removed from water or wired open as specified by CDFW as a condition on the waiver.
- Establish provision to allow other fishermen targeting other species to recover lost or derelict gear (if found more than 9 days after the close of lobster season). This would be modeled after the existing provision for the recovery of up to 6 Dungeness crab traps.

- Allow commercial fishermen to start hauling their traps to sea before the season starts on the Monday before opening week (9 days before the commercial opener) and allow traps with doors open to remain in the water not more than 9 days after the close of the season

  CDFW Proposed Details:
- Allow traps to be deployed (unbaited and doors wired open) 9 days before the commercial opener, and allow traps to remain in the water (unbaited and doors wired open) not more than 9 days after the close of the season. Traps must be out of the water no later than 9 day after the close of the season.
- "Bait day" remains the same

- Branding of floats allowed (details to be worked out with LED)

  CDFW Proposed Details:
- This is already allowed under current regulations and so a regulatory change is not necessary to implement it. Therefore, the following clarification is provided as guidance to encourage effective compliance. Each buoy identifying a lobster trap would display the commercial fishing license identification number of the lobster operator permit holder followed by the letter P. The commercial fishing license number and the letter P would be at least one (1) inch in height and at least one-eight (1/8) inch in width, and either branded on the buoy in a way that is clearly readable or painted in a color that contrasts with that of the buoy. All lobster permit holders would maintain lobster trap buoys in such a condition that buoy identifying numbers are clearly readable.

- **Additional Issue (Not addressed by the LAC):** Traps that are wired open and unbaited still need to be serviced every 96 hours per FG9004

  CDFW Proposed Details:
- Traps that are wired open and unbaited would be exempt from the trap service requirement for a period up to 14 days. Traps that have not been serviced after 14 days will be considered

abandoned.

CDFW Staff

Bob Puccinelli – Captain, Law Enforcements Division

Craig Shuman – Regional Manager

Tom Barnes – Manager of State Managed Species

Kai Lampson – Lobster FMP Coordinator

Representatives on the LAC

Rodger Healy – Commercial Fishing Representative

Shad Catarius – Commercial Fishing Representative

Jim Colomy – Commercial Fishing Representative

Josh Fisher – Alternate Commercial Fishing Representative

Spiny Lobster Fishery Management Plan
Lobster Advisory Committee
Recreational Lobster Fishery Management Recommendations

The California Department of Fish and Wildlife (CDFW) recently met with the Lobster Advisory Committee (LAC) Recreational Representatives to discuss details regarding implementation of the proposed regulatory changes to the recreation lobster fishery recommended by the LAC. Input from CDFW Marine Region and Law Enforcement Division (LED) is provided in Blue Font below. This information is being disseminated to refine the details prior to the formal regulatory process which takes place after the Fisheries Management Plan (FMP) has been adopted in 2015. The LAC recommendations will be part of the Lobster FMP implementing regulations that will be formally introduced to the Fish and Game Commission (Commission) in mid-2015. It is expected that any new regulations adopted by the Commission would be implemented at the start of 2016-2017 lobster season.

Please Note: Proposals to prohibit or "ban" the use of conical hoop nets or to establish a seasonal limit were not part of the LAC's consensus recommendations for the recreational fishery. CDFW will not be forwarding these proposals to the Commission as part of the LAC recommendations.

Full consensus was achieved by the Lobster Advisory Committee for the following:

Issue: Lobster caught by recreational fishermen is being illegally sold in the commercial market place. Requiring sport fishermen to clip or punch the center tail flap makes it possible for law enforcement to identify lobsters caught in a recreational fishery that end up in the market and take appropriate legal action. This proposal will give law enforcement a tool to address buyers and markets that purchase lobster from recreational fishermen.

Proposal: Recreationally caught lobsters are to be tail-clipped (removing the bottom half of the central tail flap) or tail-punched in the central tail flap (Australia requires a 10 mm minimum hole). Additional details will be worked out with LED (e.g. clipped when landed?).

LAC Action: The LAC achieved consensus on the tail-clipping proposal above.

CDFW Proposed Details:

- Allow both tail clipping and tail punching as an option: remove at least the bottom half of central tail fin or single hole punch the center tail fin with a hole no less than ¼ inch in diameter

- The tail must be clipped or punched at the same time the catch information is reported on the report card (T14 29.91(C): When the cardholder moves to another location code, or finishes fishing for the day, he or she must immediately record on the card the number of lobster kept from that location

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Issue: Use of mechanized pullers has made it easier to rob from commercial traps.

Proposal: Restrict the use of mechanized pullers only to persons in possession of proof of disability/medical (Disabled Mechanized Hoop Net Puller Permit). This restriction would only pertain to power driven mechanized pullers and not hand operated davits with single pulley systems.

> Clarification: This restriction only applies to individuals targeting or in possession of lobster, not persons solely targeting crab.
>
> Proposed CDFW Disabled Mechanized Hoop Net Puller Permit Form:
> The following conditions must be met to qualify for issuance of a Disabled Mechanized Hoop Net Puller Permit: "For the purposes of this permit a disability means a permanent loss, significant limitation, or diagnosed disease or disorder, which substantially impairs an individual's ability to physically pull by hand and retrieve a hoop net for the purpose of targeting lobster." A medical physician must sign the permit application form.

LAC Action: The LAC achieved consensus on the mechanical puller restriction proposal above.

Some members noted that the broad wording of the disability option could render the management measure ineffective and suggested that the LAC work with LED to ensure the new rule has "teeth" when it is applied.

CDFW Recommendation:

- Mechanized pullers should not be restricted beyond current legal use
- The potential for illegal use given the circumstance is not viewed as a reasonable justification for restriction
- Illegal use of mechanized pullers is not a commonly observed problem. LED reported one case over ten years ago, with four lobsters taken from a commercial trap using a mechanized puller
- The creation of disabled hoop net puller permit creates an unnecessary burden on disabled persons through the potential added expense and time to obtain the necessary note from a physician in order to obtain a permit

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Issue: The midnight opener creates a "rush" mentality that fuels conflicts between recreational users and poses a safety risk. The current lobster opener date and time can be difficult to understand (confusion regarding when the season actual "starts") and constituents are having trouble following the law. CDFW has been asked to consider an alternate start time.

Proposal: Make the lobster opener 6:00 a.m. on Saturday instead of 12:01 a.m. on Saturday.

Key discussion points:

- New time is workable for LED
- Proposal improves safety conditions
- Regulatory change has no impact on the resource
- Commercial season dates would not change

LAC Action: The LAC achieved consensus on the lobster opener proposal above. The group acknowledged concerns regarding the economic impact this proposal may have on some dive charters.
LAC recommendation is for a 6:00 a.m. Saturday start time (lobster opener)

CDFW Recommendation:

- Proposed 6:00 am Saturday start time is easier to facilitate enforcement patrols
- Promotes a safer environment for both boaters and divers on opening day
- Reduces the "rush" mentality which fuels negative diver/hoop netter interactions at harbors and jetties

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Issue: Marking hoop net floats will improve accountability and safety among recreational fishermen, and may help reduce illegal commercialization.

Proposal: Hoop net floats should be marked with unique ID (DL, Go ID, etc. — details to be worked out with LED).

LAC Action: The LAC achieved consensus on the marked hoop net proposal above.

CDFW Proposed Details:

- Buoy identification should be required with GO ID number. This number shall be legible, but there will be no size or color specification. Go ID number helps maintain fishermen's confidentiality, and minimizes the risk of identity theft
- LED can easily verify this number in the field as it can be cross referenced with the fishing license

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Issue: Spear fisherman have been harassed or cited for carrying a spear gun while in the pursuit of lobster. Constituents have asked for clarity on the definition of a "hooked" device.

Proposal: Keep change simple. Ensure regulatory language focuses on how lobster can be taken (i.e. "skin and scuba divers may take lobsters by hand only") and not how it cannot be taken; remove "hooked device" term from current regulations. The proposal allows for possession of a spear gun or pole spear underwater while hunting lobsters. Misuse of this equipment to take lobster (lobster can only be taken by hand) would remain illegal.

LAC Action: The LAC achieved consensus on the hooked device proposal above.

CDFW Recommendation:

- Remove "hooked device" for clarification

MEETING PARTICIPANTS

CDFW Staff

Bob Puccinelli – Captain, Law Enforcements Division

Craig Shuman – Regional Manager

Tom Barnes – Manager of State Managed Species

Kai Lampson – Lobster FMP Coordinator

Representatives on the LAC

Jim Salazar – Recreational Fishing Representative

Michael Gould – Recreational Fishing Representative

Al Stasukevich – Recreational Fishing Representative

Paul Romanowski – Recreational Fishing Representative

State of California
Department of Fish and Wildlife

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2015 MAY 29 PM 2:55

Memorandum

Date: May 22, 2015

To: Sonke Mastrup
Executive Director
Fish and Game Commission

From: Charlton H. Bonham
Director

Subject: **Briefing Binder Submission for the June 10-11 Fish and Game Commission Meeting Regarding the Spiny Lobster Fishery Management Plan**

Background

An extensive public scoping process was used by the Department of Fish and Wildlife (Department) to develop implementing regulations for a Spiny Lobster Fishery Management Plan (FMP). The Department established the Lobster Advisory Committee (LAC) as a formal stakeholder group who met over a period of two years to make management recommendations, including regulation changes. The LAC consisted of seated representatives from a broad spectrum of constituencies. Through consensus, the LAC approved a management framework that established proposed mechanisms to promote an orderly fishery while assuring sustainability and also taking into account the economic implications of that same framework. The Department supports the efforts of the LAC, and has made every effort to recommend FMP regulations that are consistent with the LAC consensus-based proposals. The Department and LAC regulatory recommendations were transmitted to the Commission for consideration at its April 8th, 2015 meeting.

The Department is requesting direction from the Commission on options to include in a regulatory package that is associated with the FMP. The enclosed table summarizes the LAC and Department commercial and recreation spiny lobster regulatory recommendations. This table provides a summary of the recommendations transmitted to the Commission at its April 8th, 2015 meeting. The Department will also be requesting direction from the Commission on four additional Department recommendations for the commercial spiny lobster fishery that are included in the table.

The additional recommendations include:

1. Require each lobster operator permit holder to report the number and location of traps lost at the end of each season. This will allow the Department to estimate gear loss for the fishery and help facilitate recovery efforts.

2. Extend the lobster operator permit death provision transfer period from one to two years. This is recommended by the Department's License and Revenue Branch (LRB) to provide families or estates an extra year to transfer a permit.
3. Add a prohibition on the transfer of lobster operator permits to include pending violation(s). Current regulations allow permits to be transferred when a permit holder has pending violations. This recommendation was added at the request of LRB and Law Enforcement Division to prevent transfers from occurring before results of the pending violation(s) are known.
4. Require a Department application for the transfer of lobster operator permits.

If you have any questions or need additional information, please contact Dr. Craig Shuman, Regional Manager of the Marine Region, by telephone at (805) 568-0216 or by email at craig.shuman@wildlife.ca.gov.

Attachment

ec: Dan Yparraguirre, Deputy Director
Wildlife and Fisheries Division
Dan.yparraguirre@wildlife.ca.gov

Craig Shuman, D.Env., Manager
Marine Region (Region 7)
craig.shuman@wildlife.ca.gov

Tom Barnes, Program Manager
Marine Region (Region 7)
tom.barnes@wildlife.ca.gov

Captain Bob Puccinelli
Law Enforcement Division
robert.puccinelli@wildlife.ca.gov

Tom Mason, Senior Environmental Scientist
Marine Region (Region 7)
tom.mason@wildlife.ca.gov

Summary Table of the Lobster Advisory Committee and Department of Fish and Wildlife spiny lobster regulatory recommendations

Background: The Department of Fish and Wildlife (Department) is requesting direction from the Fish and Game Commission (Commission) on options to include in the regulatory package that is associated with the Spiny Lobster Fishery Management Plan. This table provides a summary of the Lobster Advisory Committee (LAC) and Department commercial and recreation spiny lobster regulatory recommendations transmitted to the Commission at its April 8th, 2015 meeting. The table also includes additional Department recommendations not addressed by the LAC.

	LAC Consensus and Department Recommended Lobster Regulatory Changes	
1	Regulations to implement the lobster Fishery Management Plan (FMP).	Identifies the purpose and scope, harvest control rules, management responses, and lists definitions specific to the FMP.
	Recreational Recommendations	
	Change Summary	**Purpose**
2	Require the hole-punching or fin-clipping of all retained lobsters.	To reduce illegal commercialization of sport caught lobsters.
3	Change recreational season opener from 12:01 am to 6 a.m. on Saturday.	To increase safety during the season opener.
4	Require hoop net operators to mark hoop net floats with GO-ID numbers.	Allows Enforcement to easily identify the owner of a hoop net.
5	Clarify methods of take for crustaceans.	Clarifies that spear gear can be possessed by divers while targeting or in possession of lobsters so long as the gear is not used in the taking of lobster.
	Commercial Recommendations	
	Change Summary	**Purpose**
6	Trap limit of 300 traps per permit with the ability to purchase a second permit for a maximum 600 traps.	To improve the commercial fishery and create a more orderly fishery.
7	Add fees and forms associated with trap tag program.	Required to add new fees and other administrative requirements for the trap tag program.
8	Catastrophic trap tag loss provision. Catastrophic loss defined as the loss of 75 or more tags per permit.	To allow for the replacement of tags lost over a season.
9	Clarify use and possession of SCUBA equipment from commercial lobster vessels.	Amended for clarification purposes.
10	More than one permittee may operate from single vessel.	Added for clarification purposes. Each permittee whose traps are being pulled must be aboard and both permittees will be responsible for any violation found on vessel.
11	Require traps to be serviced at least every 7 days (currently 4 days).	Proposed as part of the trap limit proposal.
12	Waiver requirement for allowing lobster operator permit holders to service another fishermen's traps.	To formalize the process to meet enforcement and fishermen's needs.
13	Add a provision to allow fishermen to recover up to 6 lost traps.	To allow for the retrieval of lost gear.
14	Extend the period (from 6 to 9 days) for deploying and retrieving traps before and after the season.	Proposed as part of the trap limit proposal.
15	Allow branding of trap buoys.	**No regulatory change needed**: Already covered by existing regulations and will be clarified.

Summary Table of the Lobster Advisory Committee and Department of Fish and Wildlife spiny lobster regulatory recommendations

Additional Department Recommendations Not Addressed by the LAC		
	Change Summary	**Purpose**
16	Define abandoned traps. Traps considered abandoned if not retrieved 14 days after the season ends.	To define when a trap is considered abandoned.
17	Improving fishery dependent data collection.	Department recommends modifying lobster logbooks and landing receipts to gather essential fishery information to better manage the fisheries.
18	Prohibit the transfer of a lobster operator permit when there are pending violation(s).	Added as an enforcement need.
19	Extend the lobster operator permit death provision transfer period from 1 to 2 years.	Added at the request of the Departments Licenses and Revenue Branch to allow more time to transfer a permit.
20	Require an application for the transfer of lobster operator permits.	Require an application to transfer a permit. Add appeal requirements when a transfer is denied. Add criteria for transfer of permit under a tag system.
21	Reporting of commercial trap loss.	At the end of each season, require commercial fishermen to report the number and location of traps lost over the season.
LAC Consensus Recommendations Not Supported by the Department		
	Change Summary	**Rationale for not Supporting**
22	Restrict the recreational use of mechanized pullers to only disabled fishermen.	Proposed by the LAC due to concerns of the illegal use of mechanized pullers to poach commercial traps. Law Enforcement Division indicates that illegal use of mechanized pullers is not a commonly observed problem. Proposed regulation would penalize the lawful anglers using mechanical pullers due to the very few anglers that may abuse the use of mechanized pullers.
23	Three-year phase-in trap limit approach.	The Department does not support this recommendation as the projected timeline for the proposed implementing regulations is later than anticipated by the LAC. This gives industry more time to prepare for the proposed new trap limit. In addition, it will be difficult for the Department to implement and administer the program as proposed by the LAC.

Appendix X: Cable-CDFW Model Report

The Cable-CDFW Model Report is available at https://www.wildlife.ca.gov/Conservation/Marine/Lobster-FMP. Report revisions may be made to present updated model results based on future fishing seasons or to present model modifications resulting from improved information on lobster biology. Updated versions will be available at the same web address.

From: Mike Conroy [redacted]
Sent: Wednesday, March 30, 2016 1:53 PM
To: Ashcraft, Susan@FGC
Subject: FInal Comments of CLTFA re Spiny Lobster FMP

Susan,

Attached are the final comments of the CLTFA regarding the Spiny Lobster Fishery Management Plan.

Thanks again!

Mike Conroy, Esq.
President, West Coast Fisheries Consultants, LLC

March 17, 2016

Mr. Eric Sklar, President
Mrs. Jacque Hostler-Carmesin, Vice President
Mr. Anthony C. Williams, Member
California Fish and Game Commission
1416 Ninth Street, Suite 1320
Sacramento, CA 95814
fgc@fgc.ca.gov

Comments on the January 6 Draft of the Spiny Lobster Fishery Management Plan

Dear Commissioners,

We thank you for the opportunity to comment on the aforementioned Fishery Management Plan ("FMP"). We apologize for not commenting earlier; and offer the following explanation for why that wasn't possible. The first public draft was released in November of 2014 and contained the following notice, "Please Note: public feedback is not being solicited on the preliminary draft, as sections of the FMP could be revised as a result of the scientific peer review." The next draft was released in late November of last year. The FMP was delivered to the Commission in December and discussed in February. Each of these occurred while the fishery was open. We had planned to attend the December meeting; but mother nature had other ideas. A large swell was forecast to arrive shortly after the December 9 date and our members had to take advantage of the weather window to move our gear to depths where gear loss would be minimized. Regarding the February meeting, we had difficulty assembling a quorum; and as such, were unable to provide the comments that follow. We appreciate that some of our members were able to attend and offer their views on certain aspects of the FMP.

Against that backdrop, we would first, and foremost, like to offer the Department some much deserved accolades for putting together a document that demonstrates its commitment in ensuring this fishery is responsibly managed while continuing to provide opportunities for fishermen (commercial and recreational alike) to harvest from a sustainable and healthy stock. We also appreciate how the Department credited the fishery for loss of fishable habitat as a result of the MPA process. We also wonder how the Department will accurately account for those areas restricted to commercial fishing (Santa Monica Bay, frontside of Catalina, inside of harbors

and within 750 feet of a publically-owned pier/wharf/jetty/breakwater or within 250 feet of certain specific navigation channels[1]) which are freely accessible by the recreational sector and non-consumptive users. We believe it will be beneficial to structure our comments as follows. First, we will expand on those items which have been previously brought to the Commission's attention – and based on prior drafts of the FMP. Secondly, we have several other issues, recommendations and areas of concern we would like to highlight. Thirdly, pointing out some discrepancies which appear in the text of the FMP. Before concluding, we will address some of the written concerns submitted in advance of the February Fish and Game Commission ("FGC") meeting.

Items previously commented on

During the December FGC comments were given on the following items: Economic Overfishing, Catch per Unit Effort ("CPUE"), Spawning Potential Ratio, Reference Point Thresholds and Data deficiencies in developing the FMP. With your indulgence, we would like to further develop our concerns and propose possible solutions for each of above.

Economic Overfishing

This is one of the more troubling aspects of the FMP in our opinion. We are familiar with a number of FMPs – State and Federal – and have never come across this concept in any of those. Ex-commissioner Rogers made a very prophetic statement in a past Marine Resources Committee meeting that went something like this, "We (the FGC) are very good at managing the resource; but not so good at managing the business of harvesting the resource." This concept is directly related to the business of harvesting the resource.

The FMP cites to an article written by Ola Flaaten entitled *Fisheries Economics and Management*. The References portion of the FMP states that the 2010 version of Flaaten's paper was utilized, we could only locate the May 2011, Revised version. The paper makes a number of assumptions which do not apply to the California Spiny Lobster fishery. For example, it assumes homogenous vessels in an open access fishery (trawl) with a stable price for the product. Our fishery has great variety in terms of vessel size, range, crew berthing, preferred bait, etc. While one harvester may run a solo operation day-fishing the coast, another may have a crew of four and be out for a week fishing Cortes or Tanner Bank and multiple islands. Many of the paper's recommended tools to guard against economic overfishing have already been implemented for the commercial lobster fishery: limited entry, closed seasons, closed areas, size limits that allow for reproduction before capture, and escape ports.

At the February FGC meeting we were told that this FMP was going to be the template for all of the State's FMPs going forward. While there may be a fishery to which the concept of economic overfishing is applicable; it certainly is not the lobster fishery.

[1] See 14 CCR §122(o)

For the reasons stated above, we recommend removing references to economic overfishing within the FMP. We do think that some inclusion of an economic element will prove informative; but under the CPUE analysis.

CPUE

The FMP points out that commercial fishing effort has increased in recent years. The FMP attributes this to the following: (1) debt resulting from permit transferability, and (2) the rise in ex-vessel price is making the fishery more appealing to harvesters who formerly contributed little effort. We would add the following as additional reasons for the increase in effort: (a) dramatic increase in the amount of traps being robbed and/or vandalized (doors being left open or bait jars removed); (b) the higher ex-vessel price has made it economically beneficial; (c) loss of access to lobster habitat; (d) new entrants to the fishery and (e) the growing populations of predators, California sheephead in particular.

Trap robbery and/or vandalism:

This was brought up during the LAC process; but was deemed a non-issue based on Enforcement's inability to verify. Most, if not all, harvesters who fish the coast will be able to confirm this is a problem which has been growing in recent seasons. Between doors being left open, bait jars having been completely removed and encounters with divers seen pulling lobster from a commercial fisherman's traps – we can assure you this is a major problem which has necessitated some harvesters pull their traps on a daily basis.

Increase in ex-vessel price:

As the FMP correctly points out, ex-vessel price has increased dramatically. The 2015-16 season, saw a high landing price of almost $30/lb. However, the landing price was volatile and fluctuations of $5/lb in a given week was not unheard of. In order to capitalize on the high prices, harvesters will increase their effort as economic feasibility can be realized with less total pounds.

Loss of access to lobster habitat:

Much of the area closed to fishing, via the MPA process, was prime lobster habitat. The FMP states "CDFW currently estimates the percentage of lobster habitat protected by MPAs to be 14.6%." While we believe this percentage to be low, we do not challenge it here. Additionally, dredging/beach replenishment activities along Orange and Northern San Diego Counties has caused lobster habitat to be destroyed or seriously altered. As harvesters are pushed out of their traditional fishing areas, they are forced to fish new grounds. In order to figure out how to best fish a new area, a harvester is forced expend additional effort until they learn the area. Additionally, there will be more harvesters competing for the productive areas that are still open to the fishery. This has led to an increase in effort as harvesters are in competition to set their gear closer to those productive areas.

New entrants to the fishery:

As the FMP properly points out, acquisition of a permit will saddle the transferee with additional debt. Prior to the development of this FMP, most permits were transferred to new entrants in the fishery. As one would expect, there is a learning curve associated with the commercial lobster fishery. A new entrant would be more likely to expend more effort as they tried to learn the fishery. With the development of this FMP, and the high likelihood of trap limits and ability to stack two permits – we are seeing a higher percentage of permit transfers going to existing permittees.

Predator populations:

California sheephead are top predators of spiny lobster. We are seeing noticeable increases in sheephead populations, especially at the offshore islands. Some of our members also have nearshore permits and target sheephead when that fishery is open. When it used to take three or more days to catch their quota, they are now able to reach that in 2 or fewer days. Sheephead are adept at taking the legs and/or antennae off a lobster which is in a trap. A lobster missing a leg or antennae is worth significantly less when sold. This has caused many harvesters, especially those fishing the islands, to pull their traps more frequently in order to maximize their economic benefit.

Based on the preceding, we contend that CPUE as described in the FMP paints an incomplete picture. Except for recent years, there has been no economic incentive for harvesters to expend considerable effort. We believe a variation of CPUE can be a valuable tool for the Department and Commission moving forward. If ex-vessel price could be indexed and made part of the CPUE determination, it would reduce the chances of taking management actions restricting the fishery, when such is not biologically warranted.

Spawning Potential Ratio

With regard to SPR, we would like to reiterate the recent results of tagging studies which have shown berried females at sizes smaller than previously thought. Therefore, it is likely that sublegal female lobster may reproduce once or twice before being available to the fishery.

We also note the FMP's statement that "A current limitation of the Cable-CDFW model is its decreasing sensitivity in estimation of F and SPR as average weight decreases." We agree with the FMP authors that "collection of age and growth information is a high priority."

Reference Point Thresholds

We appreciate the desire to establish thresholds which will ensure the long-term sustainability of the resource. We question the decision to change the reference point thresholds from 0.8 to 0.9. The initial draft FMP set the reference point thresholds at 0.8. After peer-review, this ratio was changed to 0.9. We feel this 0.1 variation is overly

conservative and will likely result in the Department having to spend valuable time and money investigating something that may be no more than natural variability.

In reviewing the peer review report, we are having difficulty understanding the reviewer's rationale for recommending the 0.9 value. Page 12 of the Final Report of the Scientific Review Committee contains the following, "Based on the PA[2] and using a three year running average for landings, California spiny lobster commercial landings would have dropped below an upper stock reference point 31 times between 1935 and 2013, compared to 11 times as indicated in the draft FMP using the current 0.8 catch based reference point." Based on that, we are assuming, the more sensitive 0.9 would have flagged an additional twenty seasons for further scrutiny. Page 2 of the FMP refers to the 2011 stock assessment stood for the proposition that the "lobster population is at a sustainable level where surplus production provides the majority of the harvestable CA lobster each season" - thus neither overfished nor subject to overfishing. As such, it appears that 0.8 is an adequate indicator as it would provide the Department with notice of possible trends on the health of the stock.

Data Deficiencies

We have pointed to a number of gaps in the data above. The FMP and peer review report also highlight the many data deficiencies. We hope that the Department will prioritize filling these gaps so that we eventually have an FMP based on science rather than assumptions and extrapolations.

We also would like to reiterate that the recreational component of the fishery has not provided data to inform proposed management – total catch is unknown, a true CPUE is unknown, etc. Additionally, how these measures are calculated differ based on user group. For example, "CPUE is typically defined as the number of legal (or sublegal-sized) lobsters per trap pull for the commercial fishery, and number of legal lobsters retained per fishing trip for the recreational fishery." How many pulls the recreational sector makes is unknown. In order to truly be able to measure variations in CPUE, etc – we believe an apples-to-apples approach is preferred to the apples-to-oranges approach currently contemplated.

Other items which warrant further discussion

Percentage of recreational harvest

The executive summary of the January 6, 2016 Draft states, "CDFW estimates that recreational fishermen harvested 31% of the total catch (commercial + recreational) during 2014-15 fishing season". This directly conflicts with Table 2-1 which shows that percentage to be 26%.

Requiring consensus on management measures proposed and discussed by advisory committees

As both President Sklar and Commissioner Williams pointed out during the February FGC meeting, only those management recommendations which received full consensus during the

[2] the Precautionary Approach (PA) for the southern Gulf of St. Lawrence (Canada) American Lobster fisheries

Lobster Advisory Committee ("LAC") process were presented. We believe it was Commissioner Williams who noted that any individual and/or group had effective veto power if he/she/they decided to vote against an item which would have received consensus but for that vote (see footnote 3 below for an example of that actually occurring). In addition, we have heard from a number of individuals who provided public testimony during both the December and February FGC meetings; this was a reality. As the Department moves forward with FMPs for other fisheries, it should seriously reconsider the consensus requirement for management recommendations.

Specific to this FMP, the following proposed management items were not presented to the Commission for while receiving wide support by most LAC members, full consensus was not reached:

1. Banning the use of conical hoop nets in the recreational fishery.
2. Establishing a seasonal limit per spiny lobster report card[3].

Marine Mammal Mortality/Entanglements

The lobster fishery participants are concerned about the increasing number of whale entanglements observed in fixed gear fisheries over the last couple of years. To that end, the lobster fishermen will be holding three separate first responder training workshops with National Marine Fisheries Service ("NMFS"). This is intended to mirror the training given to the California Dungeness Crab fishermen in 2015. The first of these will take place April 7 in San Diego. Other workshops are planned for Long Beach and Santa Barbara which will afford an opportunity for all permitted fishermen to take advantage of the opportunity given them. The Commission should be mindful of the fact that imposing trap limits on the commercial fishery will reduce the amount of gear in the water, thus minimizing opportunities for interactions.

The FMP, on page 12, makes the following statement, "Since the year 2000, there have been four reported incidences of gray whales, one humpback whale, and one unidentified whale entangled in lobster gear". Citing - Carretta et al., 2014; National Marine Fisheries Service stranding database. We would point out the use of the word "**reported**" rather than "confirmed". This past October, a humpback whale was spotted entangled off Newport Beach. Based on reports from an on scene Orange County Sheriff, the news media originally

[3] Interestingly, one of the recreational advisors on the LAC made the following statement, "The seasonal limit is not a problem...it's how you set the number... Here's a little back story...The Recreational Reps all agreed that a seasonal was a good idea to entice the commercials to take a trap limit...so we started at 100 in a closed recreational and DFW meeting (we started high, knowing it was going to go down)...then the DFW presented the proposed seasonal number and it had magically changed to 70...when it was first proposed to the LAC the Commercials thought that was too high and something along the lines of 45 or 35 was more appropriate and then the ecos chimed in and they thought that number was high especially when multiplied by the 30,00+ card holders. It was a low bidding war with no chance of winning for the Recs... So... Al and I voted NO when it was brought up to an LAC vote, thereby keeping it from receiving concensus and being presented to the Commission..." Jim Salazar. See - http://www.bdoutdoors.com/forums/threads/december-9th-fish-and-game-commission-meeting.613511/ last accessed on March 15, 2016.
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attributed the entanglement to a "lobster pot net". After it was later confirmed that the offending gear was not from the lobster fishery, the storyline was changed; but the damage to the lobster fishery from the initial assignment of blame could not be undone. How many of the "reported incidences" were not lobster gear at all? We recommend the FMP be updated to reflect positively identified interactions or in the alternative point out that reported incidences are not confirmed interactions and should be of lesser evidentiary value.

We do not support previously submitted public comments which suggests some portion of entanglements not assigned to a specific fishery be attributed to the lobster fishery. A blanket statement to that effect neglects to consider:

- The geographically limited area the lobster fishery operates,
- Does not consider that lobster gear is fished in much shallower waters compared to other trap fisheries operating off the west coast,
- Ignores that the lines linking the buoy to the trap are of a smaller diameter and not as lengthy as lines used in other trap fisheries, and
- Fails to account for the fact that lobster traps weigh less than most other traps fished off the west coast.

We also strongly disagree with the claim raised in those comments that the California spiny lobster fishery should be a Category II fishery under the List of Fisheries ("LOF"). The proposed 2016 LOF, correctly, lists the California spiny lobster fishery as a Category III fishery – which means there is a remote likelihood of/no known interactions which result in incidental mortality or serious injury of marine mammals.

The lobster fishery remains committed to minimizing interactions with marine mammals. We would remind the Commission that these last two seasons have been anomalies in that we had an extreme El Nino event coupled with the warm water "Blob" off the US West Coast. It is thought, amongst the scientific community, these dual extreme environmental events have caused a lack of offshore forage which has caused certain whale species (humpback, fin and blue) to forage much closer to the coast than they normally would. And while there has been an increase in reported interactions, we are aware of only one which has been positively assigned to the lobster fishery. CLTFA, and its members, are open to working with concerned eNGOs in coming up with mitigation measures that are realistic in terms of utility and effectiveness. One of the public commenters specifically referenced RFID equipment tested in the lobster fishery off the east coast. We note, the following statement from the cited paper, "Of the 16 microchips that were originally installed in the rope, 2 were lost at sea. Of the 14 that returned, 6 of the microchips were not functional".

Economic Impacts

We appreciate the time and effort which went in to creating this baseline analysis. We note that the questionnaires used to make the estimations appeared to measure different costs and thus we aren't sure this presents a report than can a true comparison amongst the different sectors. Additionally, many recreational trips – especially those to the offshore islands – have dual purposes: target fin fish species during daylight hours and lobster at night. The

Recreational Lobster Participant Survey attached to the FMP does not appear to have been designed to address these dual purpose trips and how to apportion those costs.

Further, we agree with the FMP authors where they state, "However, several areas of the report could be improved and revised. The total net income for the fishery was only estimated to be $11,188,354 which is unexpectedly low given 151 active permit holders in 2011. Communication with active commercial lobster fishermen suggests that the cost of commercial lobster fishing may have been overestimated in the report, which likely led to the low estimate for net income."

Clean-up Items

Section 4.2.4 – Fishery Management Reference Points:

On Page 36, under "ii) Catch (total catch per season)" the following statement is made, "However, the fact that a significant change in catch appears is itself a clear indicator that, at a minimum, an impact at a biological, ecological, or anthropogenic level is occurring." This is not a true statement. It could be that market factors have caused the price to drop to such levels that fishery participants participate in other fisheries.

Glossary Specific:

"*F*" is described as two measures: Fishing mortality and Instantaneous fishing mortality. Since these measures could theoretically be different, they should be proscribed a different acronym.

"*Landings*" in the Glossary is differentiated from "*Catch*" and "*Harvest*". Neither of these terms are defined in the Glossary.

We appreciate removing the following from the definition of "*Maximum Economic Yield*", "An open entry policy usually results in too many fishermen so profits are barely higher than opportunity costs." As we noted above, because this fishery is limited access, this concept is not applicable.

We request the following be added to end of the definition for "*Recreational fishery*", "profit, trade or barter." Many CLTFA members are personally aware of recreational anglers who actively trade and/or barter sport caught lobster for goods and/or services.

We have also noticed a number of terms defined in the Glossary which don't match the definition given them in the Fish and Game Code or Title 14 of the California Code of Regulations.

Discrepancies within the FMP or when compared to prior versions

The second sentence of Section 1.1 starts, "CA lobsters have long supported major commercial and recreational fisheries" this counters the statement in the Executive Summary which points

out the rec fishery is relatively new. "The recreational sector has traditionally been dominated by divers, but in the early 2000s, the popularity of boat-based hoop nets began to rise." Also, there is no scientific data which supports the claim that lobsters have long supported a major recreational fishery. As highlighted above, there is a serious deficiency in data from the recreational sector.

On the bottom of page 4, the following statement is made, "The majority of CA lobsters caught by the commercial fishery have reached legal size within the last year, although larger lobsters are still landed." It should be noted that markets prefer the smaller legal sized lobsters. The commercial sector is offered a lower price for larger lobster. This may result in commercial fishermen not retaining larger lobster, especially if his/her vessel is limited in how much it can keep alive pending delivery. Perhaps this statement should be amended to read, "The majority of CA lobsters caught and landed by the commercial fishery have reached legal size within the last year, although larger lobsters are still landed."

We thank you for your consideration of the comments raised herein. We realize the timing of these comments may be problematic; but hope you are cognizant of the difficulty it was for us to get the CLTFA board together for the purposes of providing input to and approving these comments.