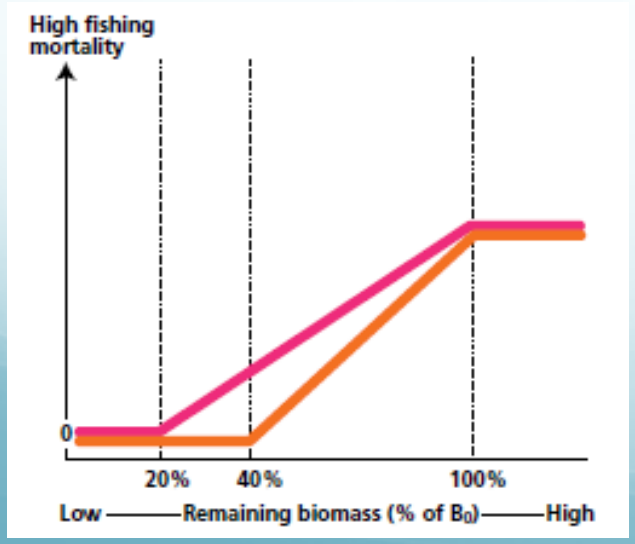
Lenfest Forage Fish Task Force



- Forage species are vulnerable
- Globally, worth 2x in the water what they are in the net
- Recommend:
  - No new fisheries on forage species
  - Major management overhauls:
    - Hockey stick control rule
    - Cutoff biomass > 40% unfished biomass

NY Times Editorial

- "...forage fish are not only more vulnerable than previously thought, but also worth more in the water than in the net because of the many species of larger fish, seabirds and marine mammals that depend on them."
- "Stricter limits will be opposed by many in the forage-fishing industry. But future abundance depends on ending overfishing, a change that will benefit consumers, the ocean environment and fish of all sizes."

April 8, 2012

Figure E5.5

Supportive Contribution of Forage Fish to Ecosystem Predator Production Across all Ecopath Model

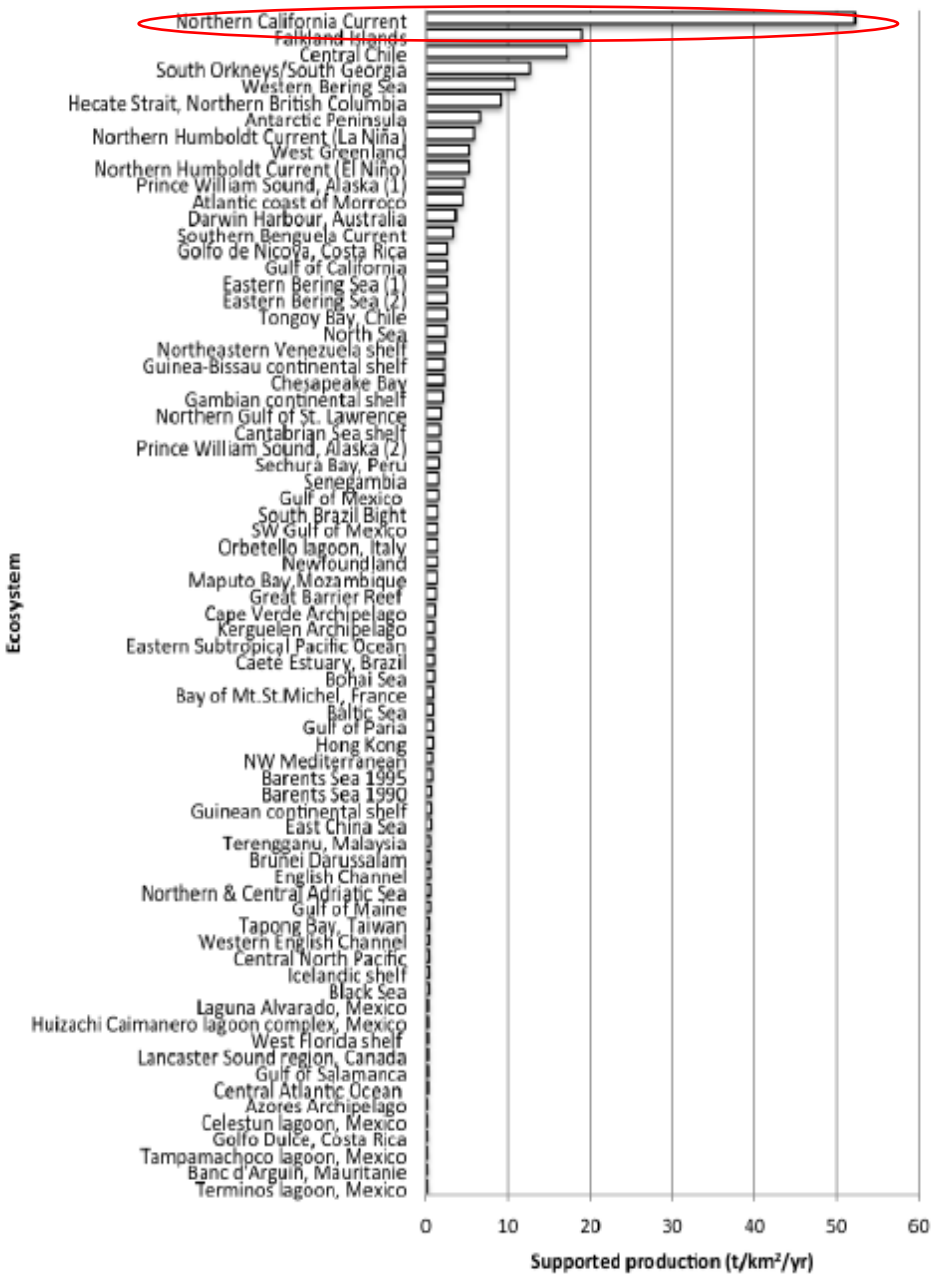
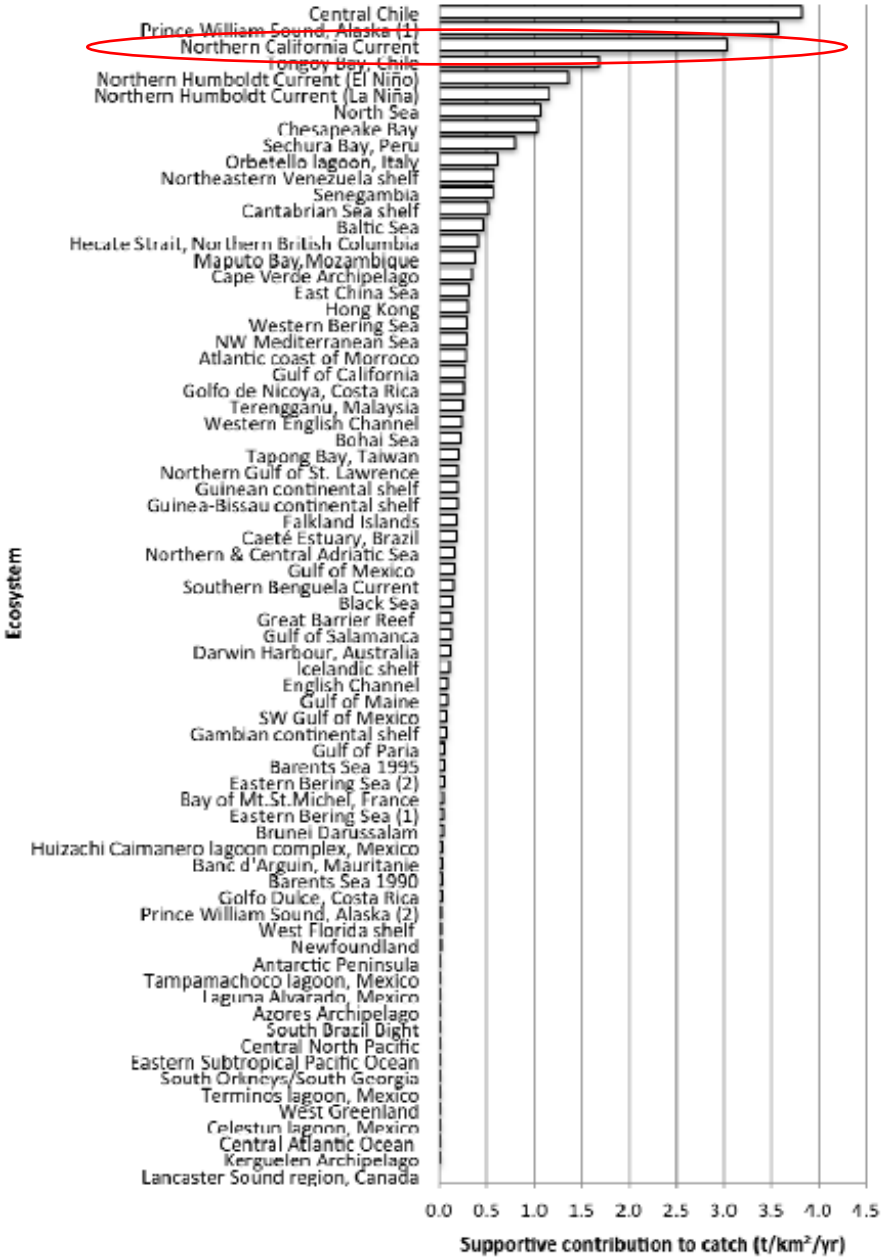


Figure E5.2

Supportive Contribution of Forage Fish to Other Fisheries Across all Ecopath Models by Volu



A three-tiered precautionary approach to the management of forage fish developed by the Lenfest Forage Fish Task Force

(See Chapters 6 and 7 in the report for additional details)

INFORMATION TIER

Based on information needed to project fisheries impacts on forage fish and on the predators that feed on them.

KNOWLEDGE OF . . .

LOW

Forage fish stock dynamics and fisheries

Population status, trends

Limited information on abundance, status, and trends such that there is little certainty about stock status, in particular as to whether the stock is above minimum biomass levels.

Environmental drivers

Environmental drivers have not been examined sufficiently to enable precise predictions of forage fish production dynamics.

Monitoring, enforcement

Fishery monitoring and enforcement is not sufficient to ascertain whether catches are within specified limits.

+ Status, trends, dependencies of predators

Identification of dependent predators

Dependent predators have not been identified on the basis of empirical evidence from the relevant ecosystem.

Status of predators

Insufficient evidence to judge the status and trends of predators either known or likely to be dependent upon forage fish.

Foraging patterns

Spatial patterns of foraging are not known.

= RECOMMENDED MANAGEMENT ACTION

RECOMMENDED MANAGEMENT ACTION

- No new fisheries should be allowed to operate.
- Severely restrict existing forage fisheries so that depletion from fisheries is no more than 20% of unfished population (B_0).
- Implement precautionary spatial closures to protect against localized depletion of forage fish, and to protect potential foraging areas of land-based predators.
- Initiate data gathering to reach intermediate tier.

INTER-MEDIATE

Population abundance, status, and trends are monitored, so that catch control rules are likely to result in population levels within specified biological limits.

Putative environmental drivers of forage fish productivity are identified, providing some ability to predict production dynamics and account for them in the harvest control rule.

There is some monitoring and enforcement of fisheries so that catches are likely to be within specified limits.

Dependent predators have been identified so that effects of forage fish on their abundance can be predicted on the basis of food web models or the PREP equation.

Population status and trends of dependent predators are monitored but with considerable uncertainty.

Spatial patterns of foraging are known and sufficient to support predictions about the effects of localized depletion.

RECOMMENDED MANAGEMENT ACTION

- Apply the "Predator Response to Exploitation of Prey" (PREP) equation, or use data or models specific to the ecosystem, to assess the impacts of forage fish depletion on dependent species (using 95% confidence interval).
- Apply a "hockey stick" harvest control rule with minimum biomass (B_{LIM}) ≥ 40% B_0 and fishing (F) not to exceed 50% of the natural mortality rate or 50% of the level that achieves MSY (F_{MSY}).
- Increase B_{LIM} and decrease F when the ecosystem contains highly dependent predators or when precision of diet dependencies is low.
- Use spatial management to protect predators likely to be adversely affected by localized depletion.

HIGH

Population abundance, status, and trends are known sufficiently precisely and with sufficient lead time to adjust fishing levels according to a harvest control rule, resulting in a high likelihood of achieving management goals.

Environmental drivers of forage fish productivity are well known and are accounted for in the harvest control rule.

High ability to monitor and enforce fisheries regulations at-sea and/or dockside so that catches are highly likely to be within specified limits.

The functional responses of dependent predators to forage fish abundance are well defined based on empirical evidence so that effects of fishing can be determined with a high degree of certainty. Models reflect what is known from the field and are tested and modified with new information.

The population status and trends of dependent predators are measured with high certainty and at frequent intervals.

Localized forage fish requirements of dependent predators can be estimated with high precision, so that effects of localized depletion on dependent predators are well described.

RECOMMENDED MANAGEMENT ACTION

- The harvest strategy must include an upper limit to F and a lower limit below which targeted fishing ceases (B_{LIM}), and F should be reduced as B_{LIM} approached.
- The harvest strategy must include precautionary buffers that account for limits on the ability to predict fisheries and food web dynamics.
- The harvest strategy must—by independent, realistic, quantitative testing—be shown to achieve the Dependent Predator Performance Criterion, protect the forage fish stock from impaired reproduction, and allow it to recover through periods of natural fluctuation in productivity.
- In any case, lower biomass limits should not be less than 30% B_0, and the maximum fishing rate should not exceed 75% F_{MSY} or 75% of natural mortality.
- Apply spatial management to account for localized depletion effects on spatially constrained predators.

Forage Policy Issues Warranting Further Discussion

Oceana

The Ocean Conservancy

National Resources Defense Council

Audubon California

Actively Managed Forage Species

- E.g., market squid, herring, sardines
- Fishing has greatest impacts during periods of low natural productivity
- Additional safeguards to minimize risks to forage stocks and their predators
- Management decisions (e.g., quotas, closed areas) should explicitly account for predator needs
- Explicit consideration of the value to multiple economic sectors of forage species left in the water as prey

Forage Species Not Under Active Management

- E.g. myctophids, Pacific saury, smelts
- Policy: No expansion or new forage species fisheries until scientific criteria are met (policy should be applied consistently)
- Essential Fisheries Information:
  - Forage species status and trends
  - Dependent predators
  - Spatial foraging patterns
  - Oceanic conditions
- Focus on fishery independent data collection
  - Some limited experimental fishing may be warranted, with appropriate safeguards
- Implementation through Pacific Fishery Management Council, followed by parallel state action