



Toward an Ecosystem-Based Pacific Herring Fishery Management Plan in California

Pacific herring are an essential prey source in the California Current Large Marine Ecosystem for a wide suite of predators, including marine birds and mammals, and commercially and recreationally important fish. Pacific herring are consistently among the top five forage species in terms of their proportion in predator diets, making them an essential food source for predators on the West Coast.

There are at least three major and nine minor discrete herring spawning sites in California. San Francisco Bay hosts by far the largest herring spawning stock in the state and is among the largest spawning stocks in the California Current with a long term mean spawning biomass of 51,000 tons (1980-2015). The Pacific herring commercial fishery is an integral part of the history and culture of San Francisco Bay and nearby Tomales Bay.

In recent years in California, commercial fishery management has been precautionary due to concerns over stock collapse and recovery, decreased participation in the fishery, and the recommendations of current leaders within the herring industry. However, in the absence of a Fishery Management Plan (FMP), herring are vulnerable to losing this precautionary management. Protection of spawning habitat in California is currently inadequate and conducted in an ad hoc manner due to a lack of coordination across agencies and other factors.

Protecting herring through a Fishery Management Plan

Now, a diverse group of stakeholders and the Department of Fish and Wildlife are poised to undertake a collaborative, streamlined, and transparent process through a public-private partnership to develop a Pacific Herring Fishery Management Plan in California. A unique six-member group has developed a full blueprint and funding proposals, and will serve as the Steering Committee for the full FMP process. This group represents the California herring fishing industry, the California Department of Fish and Wildlife, the National Audubon Society, and Oceana. Key to the success of this process is early agreement among this group regarding a frame for a Harvest Control Rule (HCR). Preliminary agreement within the Herring Discussion Group is to maintain harvest rates within a precautionary range and include a CUTOFF threshold stock biomass under which no fishing is allowed. A fishery model is currently in development to better assess the San Francisco Bay herring stock and contribute to the analysis of alternative harvest control rules.

Building on Precautionary Management and Collaborative Research with the Fleet



For the past decade, harvest rates in San Francisco Bay have been set below 5% of total spawning biomass, which provides for sustainability under conditions of uncertainty and for a stock that has not met all conditions for full recovery. There is an extensive array of closed areas throughout San Francisco Bay and the fishery has specific gear restrictions to minimize impacts on young fish and bycatch of non-target species. While herring were previously fished in other estuaries in Northern California, no fishing has occurred outside San Francisco Bay in recent years. The

California Department of Fish and Wildlife works hand in hand with herring fishermen to conduct spawning surveys and develop annual biomass estimates.

A New Model for FMPs: The State of California is now endeavoring to get more marine species under active management, and testing new models for Fishery Management Plans is a key part of this effort. The Pacific Herring FMP will serve as a testing ground for new ways to develop these plans more efficiently. This project was initiated by stakeholders who developed a consensus proposal, in order to minimize agency costs and workload by securing external funding, contributions by stakeholders, and outside experts.



Surf scoters are highly dependent on herring roe for overwinter success and reproductive fitness.



FMP Steering Committee members from Industry, the California Department of Fish and Wildlife, and conservation organizations.

California's Pacific Herring Fishery Management Plan will:

- Codify existing precautionary fishing practices, including a harvest control rule with a "cutoff" biomass under which no directed fishing is allowed, to account for the needs of predators and reduce risk to the herring stock.
- Develop cooperative research protocols for resuming herring fishing in unassessed areas outside San Francisco Bay.
- Identify essential spawning habitats and best approaches to protecting these areas, and enhance agency coordination needed to steward herring into the future.
- Improve overall management efficiency.
- Provide for sustainability, stability and profitability of a viable herring fishery under foreseeable conditions.
- Compile Essential Fishery Information (EFI) for Pacific herring including:
 - physical factors;
 - oceanographic conditions;
 - the effects of fishing on forage species' dependent predators;
 - the availability of alternative prey;
 - spatio-temporal foraging hotspots for predators; and
 - existing management, including marine protected areas.



Brant geese in Humboldt Bay rely on herring eggs and eelgrass for their 3,000-mile migration. Brant are coveted by waterfowl hunters and are a subsistence species for Native Alaskan Communities in the Yukon-Kuskokwim Delta, Alaska.



An adult humpback whale can eat over two tons of herring per day.

Implementing California's Forage Species Policy:

"The [California Fish and Game] Commission recognizes the importance of forage species to the marine ecosystem off California's coast and envisions management of forage species that:

- *optimizes their ecological, economic and social values;*
- *accounts for the benefits rendered by forage species to other species, fisheries, wildlife, and the overall ecosystem; and*
- *considers recreational and commercial fishing interests and other economic sectors."*

<http://fgc.ca.gov/policy/p2fish.aspx#FORAGE>

FMP Process Timeline:

2015: Secure funding and initiate FMP process and scoping.

2016: Drafting and public review.

2017-18: Adoption and Implementation.

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Herring roe in Richardson Bay, the heart of herring spawning within the San Francisco Bay estuary.