

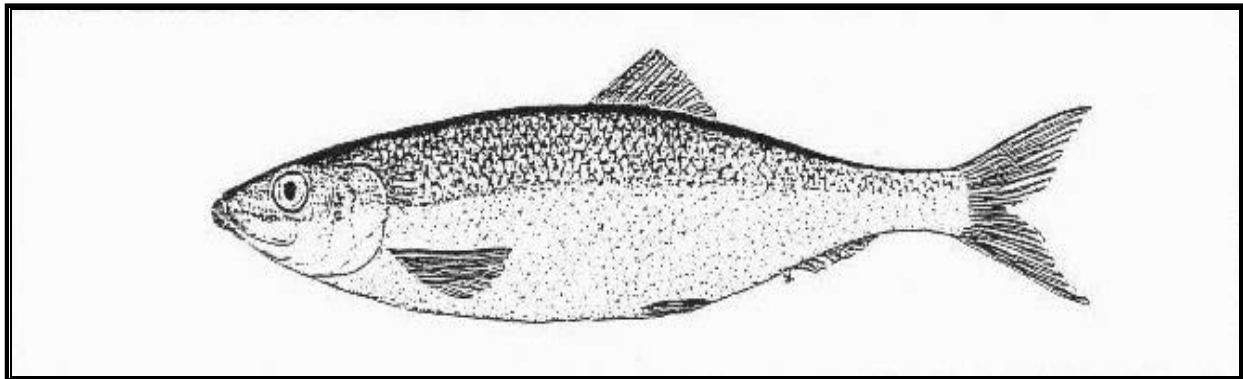
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DRAFT

SUPPLEMENTAL ENVIRONMENTAL DOCUMENT

**PACIFIC HERRING
COMMERCIAL FISHING REGULATIONS**

(Sections 163 and 164, Title 14, California Code of Regulations)



**2015
STATE OF CALIFORNIA
THE NATURAL RESOURCES AGENCY
DEPARTMENT OF FISH AND WILDLIFE**

DRAFT SUPPLEMENTAL ENVIROMENTAL DOCUMENT PACIFIC HERRING COMMERCIAL FISHING REGULATIONS

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SUMMARY

S.1 Introduction

This Draft Supplemental Environmental Document (DSED) to the Final Environmental Document (FED), Pacific Herring Commercial Fishing Regulations, 1998, provides review and analysis as required by the California Environmental Quality Act (CEQA) Guidelines (Section 15000 et seq., Title 14, California Code of Regulations [CCR]). This review and analysis will assist the California Fish and Game Commission (Commission) in regulating the commercial harvest of herring throughout the State's ocean and estuarine waters. Specifically, the DSED reviews and evaluates proposed regulatory changes for the 2015-16 fishing season, supplementing, and in some cases replacing, aspects of the proposed project described in the 1998 FED and the Final Supplemental Environmental Documents (FSED) of 1999, 2000, 2001, 2002, 2004, 2005, 2006, 2007, 2008, 2009, 2010, 2011, 2013, and 2014. A Notice of Preparation (NOP) notified and provided opportunity for the public, resource and regulatory agencies, and the fishing industry to offer input on the scope of the environmental document.

The DSED includes six chapters. Chapter 1 discusses the authorities and responsibilities under which the DSED was developed and describes its intended use. Chapter 2 describes the proposed project and alternatives, as well as options for regulating the commercial harvest of herring. Chapter 3 describes the existing environment where the California Pacific herring (herring), *Clupea pallasii*, fisheries occur. Chapter 4 addresses the impacts of the proposed project and cumulative effects. Chapter 5 describes the impacts of the alternatives to the proposed project and Chapter 6 identifies consultations with other agencies, professionals, and the public.

The proposed project has been selected as the preferred alternative based on the analysis in this DSED. The proposed project is identified as the preferred alternative because it provides a set of regulations most likely to achieve the CEQA requirements with respect to the conservation, sustainability, maintenance, and utilization of the herring resource.

S.2 Proposed Project

The proposed project is a body of regulations governing the commercial harvest of herring for roe products, bait, as fresh fish, and the harvest of herring eggs on kelp. It also includes regulations from Section 163.1 (herring permit transfers) and 163.5 (penalties in lieu of suspension or revocation-herring permittees), Title 14, CCR that were adopted by the Commission on March 2006 and October 2002, respectively. The proposed project takes the form of recommendations for continuation, amendment, or change to an existing body of regulations in effect since October 13, 2014 (Sections 163, and 164, Title 14, CCR).

The proposed regulatory changes will establish season quotas for fishing operations in San Francisco Bay for the 2015-16 herring fishing season, based on the most recent assessments of the spawning population. The specific regulatory changes proposed for the 2015-16 season will provide the Commission a quota option range between zero (0) and five percent of the most recent San Francisco Bay, 2014-15, spawning biomass estimate. The Department of Fish and Wildlife's (Department) recommendation is a five percent harvest for the 2015-16 season in San Francisco Bay. In San Francisco Bay the Department's recommendation is to increase the herring eggs on kelp (HEOK) quota allocation from 0.79 to 1.0 percent and change HEOK permit renewal dates to conform to gill net permit due dates. Previously established quotas for Tomales Bay, Humboldt Bay, and Crescent City area fisheries are not affected by these regulatory changes

S.3 Project Alternatives

Three alternatives to the proposed project are considered in this DSED. These alternatives include: (1) a no project alternative; (2) a no change alternative, which uses existing regulations; and (3) establishing individual vessel quotas for gill net vessels in the herring fishery. Refer to Section 2.4, Project Alternatives, and Chapter 5 of this DSED, and Chapter 6 of the 1998 FED, Analysis of Alternatives, for a thorough description of alternatives and analysis of their impacts.

S.4 Existing Environment

The environment most likely to be affected by the regulatory revisions outlined in this DSED is San Francisco Bay. Although the proposed project consists primarily of regulatory changes for San Francisco Bay fisheries, the existing environment potentially affected by the proposed project and alternatives also includes the open ocean and other bays in which herring occur. Historically, herring fisheries have occurred in Tomales Bay, Humboldt Bay, and Crescent City area; however these fisheries are not currently active. Refer to Section 3.3 of the FED, Specific Biological and Environmental Descriptions, for a thorough description of these environments and Chapter 3 of this document for a description of the environmental setting for these areas.

S.5 Environmental Impacts

S.5.1 Proposed Project

An analysis of the potential impacts of the proposed project is described by this DSED. The FED identified the area with the highest potential for adverse impacts associated with the proposed regulatory changes as the San Francisco Bay area, which supports the largest herring fishery in the State. The following localized, short-term and less than significant impacts were identified in the FED for several areas of potential concern including: (1) boat and vehicle traffic circulation; (2) water and air quality; (3) housing and utilities; (4) geology, scenic quality, recreation; and (5) noise. The FED found biological impacts to have the greatest potential for significant environmental impact, but found these impacts to be localized, short-term, and less than significant, with mitigation provided by the current management strategy and herring population monitoring. Refer to Chapter 4 of the FED for a thorough environmental impact analysis of the proposed project. Any adverse impacts associated with the regulatory changes proposed by this DSED are addressed within this document.

S.5.2 Alternatives

Three alternatives to the proposed project are considered. These alternatives have been examined as they apply to this DSED. A thorough analysis of the impacts of these alternatives is provided in Chapter 6 of the FED. A summary of impacts associated with these alternatives is provided below.

S.5.2.1 Alternative 1 (no project)

Localized, short-term, and less-than-significant impacts to vessel and vehicle traffic circulation, water quality, air quality, housing and utilities, scenic quality, recreational opportunities, and noise levels identified for the proposed project would be eliminated or redistributed in an unpredictable manner.

S.5.2.2 Alternative 2 (existing regulations)

In most regards, the environmental impacts associated with this alternative would be comparable to those of the proposed project. This alternative allows for adjustment of the season year, but does not address certain fishery-related problems considered in amendments or changes to existing regulations. The existing regulation alternative would maintain the herring fishery regulations as amended through 2014 and would not provide for consistent adaptive management of the State's resources.

S.5.2.3 Alternative 3 (individual vessel quota)

As addressed in detail within the FED, individual vessel quotas, rather than the platoon-based quota system currently used in the herring gill net fishery, could potentially increase impacts due to an increase in the number of days fished. However, these impacts are still expected to be short-term, localized, and less than significant for most environmental categories.

Misuse of the resource could result from sorting catches to remove males from the catch or discarding unripe fish to achieve higher roe content, and therefore, higher ex-vessel prices. However, competition between permittees for a share of the quota is greatly lessened under an individual quota system, and may result in fewer nets likely to be lost, thus reducing impacts from "ghost" net fishing as explained in Section 4.2.6.1 of the FED.

S.5.3 Cumulative

An analysis of the cumulative impacts of the proposed project revealed no additional impacts to those addressed in the FED. The proposed regulatory changes addressed by this DSED are for an existing ongoing project. An analysis of cumulative impacts is provided in Chapter 5 of the FED.

A variety of factors have the capacity to influence the herring population status in California, in addition to the proposed project including: (1) biological events; (2) competitive interactions with other pelagic fish and fisheries; (3) oceanographic events; (4) habitat loss; and (5) water quality. However, as with potential impacts from the on-going commercial harvest of herring, continued monitoring of the herring resource and oceanographic conditions should help identify any trends that would signal that the stock's reproductive potential is in jeopardy.

S.6 Areas of Controversy

Status of the herring population in San Francisco Bay has been identified as the only area of controversy regarding commercial herring fishing and is addressed in Chapter 3 of this DSED.

S.7 Issues to be Resolved

At issue is whether or not to provide for commercial fishing as an element of herring management in California. If commercial herring fishing is authorized, decisions to specify the areas, seasons, fishing quotas and other appropriate special conditions under which fishing operations may be conducted are required. As discussed, one aspect of managing this and other fishery resources is the understanding that a no project alternative is considered a management tool. This document, the 1998 FED, the 1999 FSED, the 2000 FSED, the 2001 FSED, the 2002 FSED, the 2004 FSED, the 2005 FSED, the 2006 FSED, the 2007 FSED, the 2008 FSED, the 2009 FSED, the 2010 FSED, the 2011 FSED, the 2013 FSED, and the 2014 FSED include a review and discussion of the proposed project as well as alternatives.

Chapter 1. INTRODUCTION

1.1. Background

This Draft Supplemental Environmental Document (DSED) presents the review and analysis necessary to assist the California Fish and Game Commission (Commission), the lead agency pursuant to the California Environmental Quality Act (CEQA), in taking action regarding the regulation of the commercial harvest of Pacific herring (herring), *Clupea pallasii*, in California. It was prepared by the Department of Fish and Wildlife (Department) for the Commission following CEQA Guidelines (Section 15000 et seq., Title 14, California Code of Regulations [CCR]). The project being considered consists of proposed changes to the regulations for the 2015-16 herring commercial fishing season.

This DSED was prepared as a supplement to: (1) Final Environmental Document (FED), Pacific Herring Commercial Fishing Regulations, certified by the Commission in August 1998; (2) the Final Supplemental Environmental Document (FSED), certified by the Commission in August 1999; (3) the FSED, certified by the Commission in August 2000; (4) the FSED, certified by the Commission in August 2001; (5) the FSED, certified by the Commission in August 2002; (6) the FSED, certified by the Commission in August 2004; (7) the FSED, certified by the Commission in September 2005; (8) the FSED certified by the Commission in October 2006; (9) the FSED certified by the Commission in October 2007; (10) the FSED certified by the Commission in September 2008; (11) the FSED certified by the Commission in September 2009, (12) the FSED certified by the Commission in September 2010; (13) the FSED certified by the Commission in September 2011, (14) the FSED certified by the Commission in August 2013, and (15) the FSED certified by the Commission in August 2014. The FED outlines the full proposed project consisting of the operation and management of California's herring commercial fisheries and can be found on the Department's website at: <http://www.dfg.ca.gov/marine/herring/ceqa.asp>.

The FSEDs of 1999, 2000, 2001, 2002, 2004, 2005, 2006, 2007, 2008, 2009, 2010, 2011, 2013, and 2014 provide for revisions of the proposed project contained in the FED and regulatory revisions necessary for the 1999-2000, 2000-01, 2001-02, 2002-03, 2004-05, 2005-06, 2006-07, 2007-08, 2008-09, 2009-10, 2010-11, 2011-12,

2013-14, and 2014-15 herring commercial fishing seasons, respectively. Environmental documents (DSED and FSED) were not prepared in 2003 or 2012. This DSED supplements the existing certified environmental documents and provides revisions to the regulations for the 2015-16 herring commercial fishing season.

The Department and Commission hold the public trust for managing the State's fish and wildlife populations, including herring. That responsibility is fulfilled by a staff of experts in marine resource management and enforcement issues related to California's herring resource. The knowledge and training represented by that expertise qualifies them to perform the review and analysis of the proposed revisions of the commercial herring harvest regulations that are contained in this document.

1.2. The Functional Equivalent

CEQA requires all public agencies in the State to evaluate the environmental impacts of projects that they approve or carry out. Most agencies satisfy this requirement by preparing an Environmental Impact Report (EIR) if there are potentially significant environmental impacts. If no potentially significant impacts exist, a Negative Declaration (ND) is prepared. However, an alternative to the EIR/ND requirement exists for State agencies for activities that include protection of the environment as part of their regulatory program. Under this alternative, an agency may request certification of its regulatory program from the Secretary for Natural Resources. With certification, an agency may prepare functional equivalent environmental documents in lieu of EIRs or NDs.

The regulatory program of the Commission has been certified by the Secretary for Natural Resources. A functional equivalent, FED for Pacific Herring Commercial Fishing Regulations, was certified by the Commission on August 28, 1998. A new FED is required: (1) when subsequent changes are proposed in the project requiring important revisions of the previous FED due to new significant environmental impacts not considered in a previous FED; or (2) when new information of substantial importance to the project becomes available (Section 15162, Title 14, CCR and Public Resources Code (PRC) Section 21166).

The CEQA lead agency may choose to prepare a supplement to a FED instead of a new FED, if only minor additions or changes are necessary, to make the previous

FED adequately apply to the project in the changed situation. The draft supplemental document is given the same notice and public review given to a draft environmental document, and may be circulated by itself without the previous FED. When deciding whether to approve the proposed project, the lead agency considers the previous FED as revised by the supplemental environmental document (Section 15163, Title 14, CCR). A Notice of Preparation (NOP) for the DSED was circulated to interested parties on March 27, 2015. Following the release of the NOP, the 30-day public comment period pursuant to CEQA for the proposed project ended April 27, 2015. Pursuant to CEQA regulations, a 45-day public comment period for reviewing the DSED is from May 8, 2015, to June 22, 2015.

This is the fifteenth DSED to the FED prepared by the Department. The first FSED was certified by the Commission in August 1999; the second FSED was certified by the Commission in August 2000; the third FSED was certified by the Commission in August 2001; the fourth FSED was certified by the Commission in August 2002; the fifth was certified by the Commission in August 2004; the sixth was certified by the Commission in September 2005; the seventh was certified by the Commission in October 2006; the eighth was certified by the Commission in October 2007; the ninth was certified by the Commission in September 2008; the tenth was certified by the Commission in September 2009; the eleventh was certified by the Commission in September 2010; the twelfth was certified by the Commission in September 2011; the thirteenth was certified by the Commission in August 2013; and the fourteenth was certified by the Commission in August 2014. As provided for by CEQA, the Department will continue to use this method of revising Sections 163 and 164, Title 14, CCR, until the Department prepares a new environmental document or a Fishery Management Plan (FMP).

1.3. Scoping Process

Pursuant to CEQA, the Department distributed, for the Commission, a NOP to interested parties on March 27, 2015. In addition, the Department received input on the proposed project at a Director's Herring Advisory Committee (DHAC) meeting held on April 1, 2015, in Sausalito, County of Marin. The DHAC consists of 26 representatives from the herring fishery, including buyers and fishermen. They are appointed by the

Director and serve at his or her pleasure. In addition, members of the public, interested organizations and herring fishing industry members were in attendance at the DHAC meeting to provide input.

Historically, during the scoping process, several issues have been raised including: the need for determining unfished biomass, developing a harvest control rule, developing a simulation model for herring management, accounting for herring's importance as a forage species, genetic comparisons of the Tomales Bay and San Francisco Bay populations, the cost of managing the fishery, simplifying existing gill-net regulations, amending herring eggs on kelp regulations, permit stacking and establishing a limited voluntary individual quota herring fishery. A FMP would address all of these issues. FMPs are prescribed for all marine fisheries pursuant to the Marine Life Management Act. FMPs typically contain a comprehensive environmental and economic analysis of the fishery along with clear objectives and measures to ensure sustainability of that fishery. In addition to the primary requirements below, the Department seeks advice and assistance in developing FMPs from participants in the affected fishery, marine scientists, marine conservationists, and other interested parties. The primary requirements of an FMP pursuant to Fish and Game Code (FGC) Section 7072 are as follows:

- To the extent practical, each sport and commercial marine fishery under the jurisdiction of other states shall be managed under an FMP. FMPs will be developed in priority order.
- Each FMP shall be based on the best scientific information and other relevant information that is available, or that can be obtained, without substantially delaying the preparation of the plan.
- To the extent that conservation and management measures in an FMP provide guidelines for overall harvest, FMPs shall allocate those increases or restrictions of harvest fairly among sport and commercial fishing interests participating in the fishery.

Specifically, each FMP shall include:

- A summary of the fishery which includes historical data, economic and social information related to the fishery, habitat and ecosystem role of the species,

natural history and population dynamics, number of participants, and a history of conservation and management measures affecting the fishery.

- A fishery research protocol that includes past and ongoing monitoring, essential fishery information, identification of additional information, resources and time needed, and procedures for monitoring the fishery and for obtaining essential fishery information.
- Measures necessary for the conservation and management of the fishery which includes limitations of the fishery, creation or modification of a restricted access program that contributes to a more orderly and sustainable fishery, procedures to establish, review and revise a catch quota, and requirements for permits.
- Measures to minimize adverse effects on habitat caused by fishing.
- Information and analysis of amount and type of bycatch if associated with the fishery and measures taken to minimize bycatch and mortality of discards.
- Criteria for identifying when the stock is overfished and measures to address overfishing, if occurring.
- A procedure for review and amendment of the plan.

When an FMP is completed, it is subject to CEQA and is considered functionally equivalent to an EIR. Until an FMP can be developed the 1998 FED and subsequent FSEDs will serve as the primary management tools for herring.

In the interim and to address some of the issues raised during the scoping period, the Department offers the following information. The Department is currently working with the Centre for Environment, Fisheries and Aquaculture Science (CEFAS) to develop a stock assessment model for herring. This model is a critical step in the development of an FMP and will help address many of the concerns regarding biological reference points and harvest control rules, as well as providing a valuable tool for managing the herring fishery. CEFAS is experienced in using stock assessments in the development of fisheries management plans and has completed a stock assessment model on the Atlantic herring (*Clupea harengus*). Preliminary modeling results were provided to the Department in November 2013, and September 2014. After completing an internal review, the Department plans to subject the model to an independent peer review prior to using it for management decisions. In addition, the

Department, in partnership with several conservation organizations and the commercial fishing industry, is currently working to identify funds for development and implementation of an FMP.

Regarding herring as forage, it has been identified as a key forage species in the California Current Ecosystem. However, due to the complexity of this system and biological interactions, it is difficult to quantify all predator/prey relationships or to quantify all oceanic conditions and factors that affect herring recruitment and persistence in the spawning population. As a result, the Department manages for herring's importance as a forage species by recommending conservative harvest percentages. Since 2010, as a conservation safeguard, the Department has recommended harvest percentages for herring at or below five percent of the most current spawning biomass estimate. This precautionary management approach has allowed, on average, more than 95 percent of the spawning stock (which represents only the portion of the total stock that leaves oceanic waters to spawn during a given season) to go unfished and remain available as forage or to meet other ecosystem functions, including stock rebuilding.

1.4. Report Availability

This DSED is available at the Commission office and Department Marine Region offices. It will also be posted on the Department's website at:
<http://www.dfg.ca.gov/marine/herring/>.

1.5. Authorities and Responsibilities

The California State Legislature formulates the laws and policies regulating the management of fish and wildlife in California. It is the policy of the State to ensure the conservation, sustainable use, and where feasible, the restoration of California's living marine resources for the benefit of all the citizens of the State (FGC Section 7050). It is also the State's policy to promote the development of local and distant-water fisheries based in California in harmony with international law respecting fishing and the conservation of the living resources of the oceans and other waters under the jurisdiction and influence of the State (FGC Section 1700, Appendix 1 of the FED).

The Legislature provides further policy direction regarding herring management in FGC Sections 8550 et seq. FGC Section 8553 delegates authority from the

Legislature to the Commission, whose members are appointed by the Governor, to regulate the commercial harvest and possession of herring. The Department has jurisdiction over the conservation, protection, and management of fish, wildlife, native plants, and habitat necessary for biologically sustainable populations of those species. The Department, as trustee for fish and wildlife resources, provides requisite biological expertise to the Commission on impacts arising from regulating the commercial harvest of herring (FGC Section 1802). The remaining FGC sections related to herring provide for a limited entry fishery and require periodic review of regulations and policies.

The Commission holds public meetings at its discretion to consider and adopt revisions to these regulations. Recommendations and comments from the Department, other agencies, and the public are typically received at two public Commission meetings each year prior to the herring commercial fishing season. These meetings will be held for the 2015-16 season on August 4-5, 2015, in Fortuna, California, and on October 7-8, 2015, in Los Angeles, California. The authority to prepare a supplemental environmental document is given in PRC Section 21166.

Chapter 2. PROJECT DESCRIPTION

2.1. Project Objectives

The proposed project, as defined in the FED certified by the Commission on August 28, 1998, is the regulation of herring fisheries under the State's jurisdiction. The regulations are considered for inclusion in the CCR to implement the State's policies for managing the commercial use of herring (Sections 163 and 164, Title 14, CCR). The proposed project and alternatives addressed in this DSED take the form of recommendations for amendment or change to the existing body of regulations. The recommendations and alternatives are based on biological assessments of existing stock conditions and comments received from interested individuals, non-government organizations, commercial fishermen, and from the DHAC. The Commission has legislatively-delegated authority to act on these recommendations.

The project goal is to maintain healthy herring stocks in California.

Objectives for achieving this goal include:

- Safeguard herring as an important forage species for all living resources of marine and estuarine ecosystems that utilize herring as a food source;
- Use precautionary principles when setting harvest targets;
- Manage the commercial harvest of herring to achieve a sustainable fishery;
- To the extent possible, maintain and/or restore healthy age structures to stocks;
- Avoid and/or minimize the harvest of two and three-year-old herring, many of which are first-time spawners;
- Set commercial harvest targets that conserve sufficient herring to support recreational take.

Under existing law, herring may be taken for commercial purposes only under a revocable permit, subject to such regulations, as the Commission shall prescribe (FGC Section 8550). Current regulations specify: permit qualifications, permit validation procedures and requirements, permit limitations, permit areas, vessel identification requirements, seasons, fishing quotas, gear restrictions, landing and monitoring requirements, permit categories and conditions, royalty fees, permit performance deposit requirements, fishing and harvesting restrictions, processing requirements, and permit suspension conditions and procedures.

The proposed project addressed by this DSED consists of amendments and changes to existing regulations for the 2015-16 commercial herring fishing season. The proposed project would establish the season quotas for fishing operations in San Francisco Bay, would increase the herring eggs on kelp (HEOK) quota allocation from 0.79 to 1.0 percent, and make minor changes to permit due dates in the HEOK fishery. Quota recommendations for San Francisco Bay are primarily based on the most recent assessments by the Department of the estimated spawning population of herring in San Francisco Bay. The recommendation also takes into account additional data examined each season, including age structure, growth and general condition, predicted size of incoming year-classes (*i.e.*, recruitment), biological aspects of the catch, and ocean and bay conditions.

2.2. Project Locations

Permits are issued for commercial herring fishing in four geographically distinct areas of estuarine waters under the jurisdiction of the State of California (Figure 2.1). Many of the regulations considered by this document are specific to an area and type of fishing operation. This section describes each area in which regulatory changes are proposed, including current commercial fisheries for herring, seasons, proposed quotas, and geographical restrictions for those fisheries. A complete description of commercial herring fishing areas is provided in Section 2.2 of the FED. The environmental setting for each geographical fishing area is detailed in Section 3.3 of the FED.

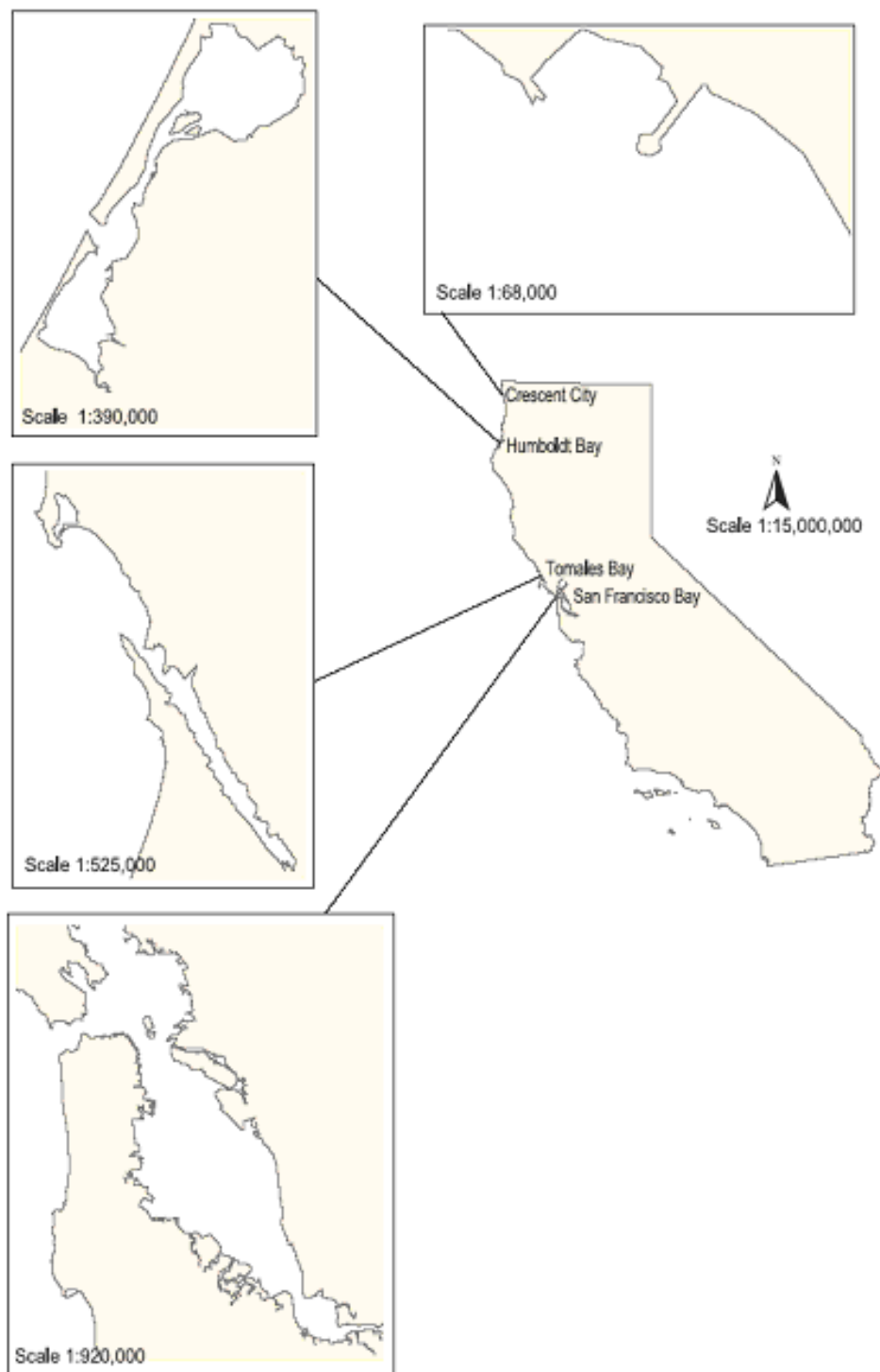


Figure 2.1 Locations of commercial Pacific herring fisheries.

2.2.1. San Francisco Bay

The proposed commercial herring fishing quotas for San Francisco Bay are as follows:

2.2.1.1. Herring Fishery

Season: 5:00pm on January 1, until noon on March 15. If January 1 falls on a Friday or Saturday, fishing shall commence on the first Sunday following that date at 5:00pm. If the closing date of the fishery falls on a Saturday or Sunday, fishing shall close on the Friday immediately preceding March 15 at noon.

Gill net permittees with odd numbered permits shall be permitted to fish first in odd numbered years and then alternating weeks with even numbered permits until the close of the season.

Gill net permittees with even numbered permits shall be permitted to fish first in even numbered years and then alternating weeks with odd numbered permits until the close of the season.

Note: Herring fishing is not permitted from noon on Friday through 5:00pm on Sunday (Section 163 (h)(5), Title 14, CCR).

Quota: The proposed total take of herring in San Francisco Bay for commercial purposes shall be set between zero and five percent of the most current biomass estimate for San Francisco Bay. The total take of herring in San Francisco Bay for commercial purposes shall not exceed 834 tons for the 2015-2016 season. For the 2015-16 season the Department recommends a conservative harvest option of 834 tons or five percent of the 16,674 ton 2014-15 spawning biomass estimate. This quota range is based on the determination of the Department's assessment of the stock status and utilizing the best science available. The best available science includes, but is not limited to, recent fishery-independent field surveys, commercial catch and age composition analysis, and environmental data.

Note: The quota for the herring gill net fishery will be reduced by an allocation to the herring eggs on kelp fishery quota (See Section 2.2.1.2).

Area: Waters of Districts 12 and 13 and that portion of District 11 lying south of a line extending from Peninsula Point (the most southerly extremity of Belvedere Island) to the easternmost point of the Sausalito ferry dock.

1) Regulations prohibit the setting or operating of nets within 300 feet of the following piers and recreation areas: Berkeley Pier, Paradise Pier, and San Francisco Municipal Pier (between the foot of Hyde Street and Van Ness Avenue), Pier 7 (San Francisco), Candlestick Point State Recreation Area, the jetties in Horseshoe Bay, and the fishing pier at Fort Baker. Regulations also prohibit the setting or operating of nets within 70 feet of Mission Rock Pier.

2) Regulations prohibit the setting or operating of nets in Belvedere Cove (north of a line drawn from the tip of Peninsula Point to the tip of Elephant Rock). Regulations also prohibit the setting or operating of gill nets from November 15 through March 17, in the area bounded by a line drawn from the middle anchorage of the western section of the Oakland Bay Bridge (Tower C) to the Lash Terminal buoy #5 to the easternmost point at Hunter's Point (Point Avisadero), from Point Avisadero to the Y "A" buoy to Alameda NAS entrance buoy #1 (entrance to Alameda Carrier Channel) to the Oakland Harbor Bar Channel buoy #1, and then from the first Bar Channel buoy to Tower C of the Bay Bridge.

3) Other closures affecting the fishery include United States Coast Guard enforced Homeland Security Zones: 25 yards around all Golden Gate and Bay Bridge abutments and piers; 100 yards around and under any High Interest Vessels; and Naval Vessel Protection Zones which extend 100 yards around all Naval Vessels at all times and a 500 yard slow zone surrounding all Naval Vessels. The United States Coast Guard will also enforce Rule 9 of the Code of Federal Regulations (CFR) regarding channel and harbor blockages.

2.2.1.2. Herring Eggs on Kelp (HEOK) Fishery

Season: December 1 to March 31

Quota: The total amount of HEOK that may be harvested by each permittee shall be based on the previous season's spawning population assessment of herring in San Francisco Bay, as determined by the department. This assessment is used to establish the overall herring fishing quota. Each HEOK permittee is currently allocated a quota equal to approximately 0.79 percent of the quota. For the 2015-16 season the Department recommends increasing the HEOK permittee allocation from 0.79 to 1.0 percent of the overall San Francisco Bay quota.

Area: Waters of Districts 11, 12, and 13, and that portion of District 2 known as Richardson Bay.

Note: The area open to the HEOK fishery is further restricted. Rafts and lines may not be placed in any waters or areas otherwise closed or restricted to the use of herring gill net operations, except the areas known as Belvedere Cove and Richardson Bay or except where written permission is granted by the owners or controlling agency (e.g., Navy, Coast Guard). When rafts or lines are placed in Belvedere Cove or Richardson Bay, they must be tied to a permanent structure (e.g., pier or dock).

2.2.2. Tomales Bay

There are no proposed changes to commercial herring fishing quotas for Tomales Bay.

2.2.3. Humboldt Bay

There are no proposed changes to commercial herring fishing quotas for Humboldt Bay:

2.2.4. Crescent City Area

There are no proposed changes to commercial herring fishing quotas for the Crescent City Area.

2.2.5. Open Ocean

As of January 1, 2010, all commercial fishing for herring in ocean waters is prohibited, except as specified in Section 163 (f)(1), Title 14, CCR. An incidental take of no more than 10 percent herring by weight of any landing composed primarily of other coastal pelagic fish species or market squid may be landed.

2.2.5.1. Open Waters Fishery (closed)

Area: Ocean waters are limited to the waters of Districts 6 (excluding the Crescent City area), 7, 10 (excluding Tomales Bay), 16, and 17.

2.3. Project Characteristics

The proposed project recommends continuation of the existing regulations as modified by changes discussed below for the San Francisco Bay fishery. These regulations, as amended, will assist in the control of the commercial harvest of herring at a level that meets the State's policy with respect to the use of aquatic resources. This section states the specific purpose of the regulations and summarizes the factual basis for the regulation.

The commercial herring fisheries are closely regulated through a catch-quota system to provide for adequate protection and utilization of the herring resource. The Department conducts annual assessments of the spawning herring population in San Francisco Bay as part of its ongoing monitoring and management of the fishery. The Department also examines age structure, growth and general condition, biological aspects of the catch, and environmental conditions (Section 3.2.2.1, FED). These data serve as the basis for establishing fishing quotas for the following season. The principal regulatory changes proposed for the 2015-16 season included: (1) provide the Commission a quota option range between zero (0) and five percent of the most recent

San Francisco Bay, 2014-15 spawning biomass estimate; (2) increase the HEOK permittee allocation from 0.79 to 1.0 percent of the overall San Francisco Bay quota; and (3) adjust the permit renewal date for the HEOK fishery to align with the gill net fishery due date.

Annual herring spawning population estimates from biomass surveys in San Francisco and Tomales bays have been conducted by the Department since 1973, but were discontinued in Tomales Bay after the 2005-06 season. Spawning ground surveys in Humboldt Bay were conducted during the 1974-75, 1975-76, 1990-91, and 2000-01 through 2006-07 seasons. Spawning ground surveys assess the total number of eggs spawned, and these data are used to calculate the parental population size (Section 3.2.2.1.1 of the FED). A general herring survey was completed in Humboldt Bay in early 2015 to identify spawning waves, spawn areas, length frequency composition and to update herring fecundity data, this effort did not however provide a biomass estimate.

Since the 1973-74 herring season, the Department has conducted annual spawning biomass estimates for San Francisco Bay using spawn deposition surveys. From 1990 through 2003, the Department derived the spawning biomass estimate in San Francisco Bay from a combination of the spawn deposition and hydroacoustic surveys. Beginning with the 2003-04 season, the Department reverted to spawn deposition surveys as the primary assessment tool to estimate the spawning biomass. This decision was based on a California Sea Grant peer review of the management of the commercial fishery that indicated the spawn deposition survey method tended to provide a better estimate of herring biomass. Currently, the spawn deposition survey is used in conjunction with trawl surveys to determine age and population structure of herring schools entering San Francisco Bay. Spawning biomass estimates for San Francisco Bay from the 1979-80 through the 2014-15 seasons are shown in Figure 2.2. As a result of state-wide reduced fishing effort as well as reduced staffing and budget constraints; the Department is not able to conduct spawning biomass surveys in Tomales Bay, Humboldt Bay, or the Crescent City area. It should also be noted that no commercial fishery has taken place in Tomales Bay since 2007, since 2005 in Humboldt Bay, and since 2002 in Crescent City.

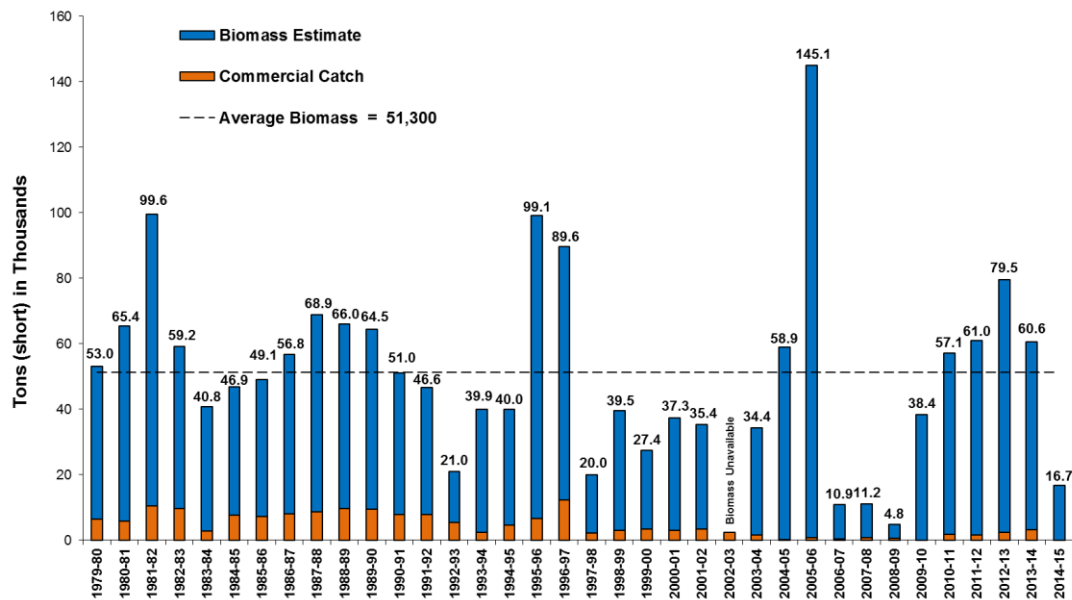


Figure 2.2 San Francisco Bay Pacific herring biomass estimates and commercial catch from the 1979-80 season to 2014-15 season.

Annual fishing quotas are intended to provide for a sustainable fishery and have historically been limited to a total catch not to exceed 20 percent (harvest percentage) of the previous season's estimated spawning biomass. This harvest percentage was selected, based upon model simulations, to help ensure adequate protection of the herring resource while taking into account accidental overages and other management uncertainties. This model, however, assumes stable environmental and biological conditions. In an attempt to account for potential season-to-season variability in these conditions, the Department has set even more conservative harvest percentages. In 2003, due to exploitation rate concerns, the Department requested a peer review of its fishery management activities. The Department worked with California Sea Grant to assemble a team of scientists with demonstrated expertise in modeling and fish population assessment. A key recommendation resulting from this peer review was that a harvest rate in the range of 10-15 percent would be sustainable and that a lower level would provide a desirable target for stock rebuilding (California Sea Grant Extension Program 2003). Based on this assessment, the Department has continued to

recommend low harvest percentages to the Commission, and since the 2010-11 season, the Department has recommended quotas less than or equal to five percent of the previous season's estimated spawning biomass. Actual exploitation rates (catch percentages) by the commercial fishery have equaled an average of approximately four percent of the total spawning biomass since the 2003-04 season and have equaled an average of less than 10 percent of the spawning biomass since the 1979-80 season (Figure 2.2).

Quotas are the principal regulatory tool used to establish adequate protection of herring as an important forage species and to provide for the long-term yield of the commercial fishery. Each year, the Department recommends a harvest percentage that is not determined by a fixed mathematical formula; rather, the recommendation is based upon modeling results and takes into account additional data collected each season, such as ocean productivity and bay conditions, growth rates of herring, strength of individual year-classes, and predicted size of incoming year-classes (*i.e.*, recruitment). In response to poor recruitment, indication of population stress, and/or unfavorable oceanographic conditions, harvest percentages beginning in 2003 have been set at or below 10 percent. Since the 2003-04 season, harvest percentages on average have allowed over 90 percent of the spawning biomass to return to the ocean after spawning in the bay. The Department and DHAC recommended a no fishery option (zero ton quota) for the 2009-10 season, when the herring spawning biomass in 2008-09 fell to a new low of 4,833 tons. The Commission adopted this recommendation and the commercial fishery was closed in San Francisco Bay for the 2009-10 season. Since the re-opening of the fishery for the 2010-11 season, the Department has recommended harvest percentages at five percent or less of the spawning biomass. Based on accepted fishery management principles these harvest percentages are conservative and represent a precautionary approach to safeguard the population as forage and to provide a robust reproductive base to allow for stock rebuilding.

In addition to annual changes in quotas, management recommendations to improve or provide for the efficient harvest and orderly conduct of the herring fisheries are solicited from interested fishermen, individuals at public meetings, and DHAC. The proposed amendments to Sections 163 and 164, Title 14, CCR, addressed by this DSED, reflect both Department and the public recommendations.

2.3.1. Herring Fisheries

2.3.1.1. San Francisco Bay 2015-16 Quota

The spawning biomass estimate for the 2014-15 season was 16,674 tons. This was the fourth consecutive year of above average biomass following the record low in the 2008-09 season of 4,833 tons (Figure 2.2). The Department is providing the Commission the option to consider a quota range between zero (0) and five percent of the 2014-15 spawning biomass estimate of 16,674 tons. Due to the ongoing recovery of the herring population, the Department recommends a conservative quota option of 834 tons or five percent harvest rate for the 2015-16 season. The Department's recommendation would maintain fishing mortality at a comparatively low level, which is beneficial for stock recovery. This approach would also help maintain a sustainable fishery while continuing to support herring's integral role in both ocean and bay ecosystems.

Preliminary age composition analysis, based on length frequencies for the 2014-15 season indicates that age 4- and 5-year old herring continued to persist in the population (Figure 3.2). This is important to a healthy age-class structure; for this reason, one of the Department's longstanding management objectives has been to reduce the harvest of 2- and 3-year old herring, many of which are first-time spawners. The Department considers appropriate harvest controls and precautionary harvest percentages as the primary means of assuring a sustainable fishery. The Department considers that a conservative quota maintains sustainability while safeguarding sufficient numbers of herring for stock rebuilding. Additionally, fishing effort in the San Francisco Bay herring fishery has decreased significantly during the past several years. During the 1990s, the number of herring permits peaked at over 450 with over 120 vessels participating. In contrast, during the 2014-15 season there were only 171 herring permit renewals and only two vessels elected to participate in the gill net fishery.

From the total quota for San Francisco Bay, separate permit quotas are established for each gill net platoon (i.e., Odd and Even fishing groups). The overall quota is allocated among the platoons in proportion to the number of permits assigned to each platoon. Adjustments to quotas for each fishing platoon are calculated annually to offset permittee attrition and the use of herring permits in the HEOK fishery. HEOK fishing occurs only in San Francisco Bay, and the fishery is regulated under Section

164, Title 14, CCR. Individual HEOK quotas depend on the total herring fishery quota for San Francisco Bay established by the Commission under Section 163, Title 14, CCR. In 1994, the Commission provided HEOK permittees possessing “CH” permits with a HEOK quota equal to approximately 0.79 percent of the overall quota. The Department is recommending increasing the allocation from 0.79 to 1.0 percent for the 2015-16 season. All HEOK permittees must hold a herring permit. To fish HEOK, permittees must waive herring fishing privileges under Section 163 and “exchange” their “share” of the herring quota for an equivalent HEOK quota. The current factor used to convert an equivalent amount of whole fish to the herring eggs on kelp fishery is 0.2237. This factor was derived from the round haul to gillnet conversion ratio allotted during the 1988-89 season.

2.3.1.2. Tomales Bay, Humboldt Bay, and Crescent City Area 2015-16 Quotas

The quotas for Tomales Bay, Humboldt Bay, and Crescent City area are not to exceed 350 tons, 60 tons, and 30 tons, respectively. No changes to quotas are proposed for these fishing areas for the 2015-16 season. It should be noted that these areas have not been subjected to any fishing pressure for a number of seasons. No commercial fishing activity has taken place in Tomales Bay since 2007, in Humboldt Bay since 2005 and in the Crescent City area since 2002. For the 2014-15 season, Tomales Bay had nine permit renewals and Humboldt Bay and Crescent City had three renewals combined. Permit renewals have fallen over the past several years, reducing the fleet capacity in these areas. Poor market conditions and unique site constraints at each location further constrain the viability of herring fisheries in the near term for these areas.

2.4. Project Alternatives

Three alternatives to the proposed project are considered and are examined as they apply to this DSED. Two of these alternatives take the form of additional changes to the existing regulations that could feasibly be joined. The third alternative is a no project (no fishery) alternative. In evaluating alternatives, the comparative merits and impacts of individual alternatives that could be logically and feasibly joined should be considered as so joined unless otherwise stated. The alternatives to be considered under this DSED are:

- Alternative 1 (no project, i.e. no fishery). Under this alternative, the commercial harvest of herring would be prohibited.
- Alternative 2. The existing regulation alternative would maintain the herring fishery regulations as amended through 2014.
- Alternative 3 (individual vessel quota for gill net vessels in herring fishery). Under this alternative, the proposed regulations would be modified by establishing an individual vessel quota for all gill net vessels. The proposed individual gill net vessel quota would equal the overall gill net quota divided by the number of permittees using gill net gear.

The following section states the specific purpose of the alternatives and summarizes the factual basis for determining that the alternatives are reasonably necessary.

2.4.1. Alternative 1 (no project)

This is a CEQA required alternative. It provides a reference for comparison to the proposed project and alternatives 2 and 3.

2.4.2. Alternative 2 (existing regulations)

The existing regulation alternative would maintain the herring fishery regulations as amended through 2014 and would not provide for adaptive management of the State's resources. The only amendment or change suggested allows for updating the season year.

2.4.3. Alternative 3 (individual vessel quota)

This alternative would establish an individual herring quota for each San Francisco Bay gill net permittee. Under existing regulations [Section 163(g)(4)(C), Title 14, CCR] an overall herring quota is established for each of the three gill net groups (platoons) in San Francisco Bay, allowing individual permittees to take and land as much fish (tonnage) as they are capable of until the overall quota for their respective group is reached. However, there has never been a clear consensus of support among industry members about this issue. The Department is concerned about the level of enforcement effort that would be necessary to effectively monitor and enforce this alternative. See Section 2.4.3 of the FED for a full description of this alternative.

Chapter 3. ENVIRONMENTAL SETTING

3.1. General

Herring are found throughout the coastal zone from northern Baja California on the North American coast, around the rim of the North Pacific Basin and Korea on the Asian coast (Hart 1973). In California, herring are found offshore during the spring and summer months foraging in the open ocean. Beginning as early as October and continuing as late as April, schools of adult herring migrate inshore to bays and estuaries to spawn. Schools first appear in the deep water channels of bays to ripen (gonadal maturation) for up to two weeks, then gradually move into shallow areas to spawn. The largest spawning aggregations in California occur in San Francisco and Tomales bays. San Francisco Bay is also near the southern end of the range for herring fishing (Miller and Schmidtke 1956).

Herring are a food source for many species of birds, fish, invertebrates, and mammals. Predation is particularly high during spawning when adult fish and eggs are concentrated and available in shallow areas. Predation by birds and fish during the egg stage, when eggs are deposited in the intertidal and shallow subtidal zones, is a significant cause of natural mortality for herring.

Spawning occurs in the intertidal and shallow subtidal zones. Males release milt into the water column while females extrude adhesive eggs on a variety of surfaces including vegetation, rocks, and man-made structures such as pier pilings, boat bottoms, rock rip-rap, and breakwater structures. Embryos (fertilized eggs) typically hatch in about 10 days, determined mainly by water temperature. Larval herring metamorphose into juvenile herring in about 10 to 12 weeks. In San Francisco Bay, juvenile herring typically stay in the bay through summer, and then migrate out to sea. Research conducted on herring in Straits of Georgia, British Columbia (BC) suggests that 1- and 2-year old herring occupy inshore waters and older herring occupy shelf waters (Haegele 1997). In BC waters, juvenile herring were found in shallow nearshore waters of less than 50 meters during the summer, in shoals of similar-sized individuals. Based on the life history data of herring in BC waters, there may be very little direct competition for food between age classes, and the first opportunity for direct interaction may be when herring sexually mature and join the spawning stock (Hay 2002).

Most herring fisheries occur during the spawning season. The herring gill net fisheries catch herring as they move into the shallows to spawn. The traditional product from this fishery, *kazunoko*, is the sac roe (eggs) removed from the females, which is processed and exported for sale in Japan. California's roe herring fisheries have historically occurred in the Crescent City area, Humboldt Bay, Tomales Bay, and San Francisco Bay.

The San Francisco Bay HEOK fishery suspends giant kelp, *Macrocystis pyrifera*, from rafts for herring to spawn on in shallow water areas. The kelp is harvested near the Channel Islands and/or in Monterey Bay and then transported to San Francisco Bay. The product of this fishery is the egg-coated kelp blades that are processed and exported to Japan. This product, *komochi* or *kazunoko kombu*, is typically served as an appetizer during New Year's celebrations.

The herring fishery in California has been intensively regulated since its inception in 1973, at first by the California State Legislature, then by the Commission. Department estimates of the spawning population biomass have provided a critical source of information used for establishing fishery quotas to control the harvest of herring and provide for the long-term health of the herring resource. A thorough description of the environmental setting is provided in Chapter 3 of the 1998 FED, which includes herring life history, ecology, status of stocks and fisheries at that time, and biological and environmental descriptions of herring fishery locations (Crescent City area, Humboldt Bay, Tomales Bay, San Francisco Bay, and Monterey Bay).

3.2. Spawning Population Estimation Methods

During the 1973-74 through 1988-89 seasons, Department estimates of San Francisco Bay herring spawning biomass were made using spawn deposition surveys (refer to Sections 3.4 and 3.5 below). From the 1990-91 through 2001-02 seasons, the Department estimated San Francisco Bay spawning biomass using a combination of spawn deposition and hydroacoustic surveys. In 2002-03, the Department was unable to generate a spawning biomass due to a wide discrepancy between the two survey methods.

The Department assessed the two methods using the Coleraine Model and through an independent peer review conducted by California Sea Grant (California Sea

Grant Extension Program 2003). The results indicated that the spawn deposition survey provided a better estimate of spawning biomass. Beginning with the 2003-04 season, the Department reverted to using the spawn deposition surveys alone for biomass estimation. In addition to the spawning biomass estimates, the Department collects fishery independent age composition data from the population and fishery dependent age composition data from the commercial catch. All of the information collected by the Department, including ocean conditions, is used in annual population assessments.

3.3. Status of the San Francisco Spawning Population

The spawning biomass estimate for the 2014-15 season is 16,674 tons. This estimate represents a decrease of 43,926 tons from the 2013-14 season estimate of 60,600 tons (Figure 2.2). The reduction in the spawning biomass is likely due to unfavorable environmental and biological conditions in the California Current Ecosystem during the summer and fall of 2014.

Variability in several oceanographic processes can affect coastal and nearshore productivity, and in turn the spawning population of herring in the San Francisco Bay. Coastal upwelling has been shown to affect recruitment in estuarine populations of forage fish including herring (Reum et al. 2011). During coastal upwelling deep, cold, nutrient-rich water is brought to the surface nearshore by Ekman transport resulting from predominantly north winds during spring and summer along the coast of California. The presence of this nutrient-laden water results in increased plankton which fuels production in coastal pelagic ecosystems (Rykaczewski and Checkley 2008). However, large-scale oceanographic processes in the Pacific Ocean such as the El Nino Southern Oscillation (ENSO) cycle and the Pacific Decadal Oscillation (PDO) can affect the nutrient content of upwelled water, in turn affecting nearshore marine ecosystems (Chavez et al. 2002, Checkley and Barth 2009). The ENSO cycle, which is measured using various indices including the Multivariate ENSO Index (MEI), is the major mode of climate variability in the equatorial Pacific and can have strong impacts throughout the Pacific Basin and the California Current Ecosystem (CCE). Positive MEI values are associated with El Nino conditions. Strong El Nino conditions result in upwelled water that tends to be warmer and more nutrient-poor than water that is upwelled during

ENSO-neutral and La Nina conditions. The PDO reflects periodic changes in North Pacific sea surface temperature that occur at a longer temporal scale than the ENSO cycle. PDO values fluctuate between positive values, which indicate warmer, less productive conditions, and negative values, which indicate cooler, more productive conditions in the North Pacific.

Climate data reported in early 2015 indicate that multiple oceanographic processes in combination have resulted in unfavorable biological conditions in the CCE during the period of time herring spend feeding in the Pacific ocean (National Marine Fisheries Service 2015). Following a year of strong coastal upwelling in 2013, upwelling indices showed a return to average and below-average upwelling in 2014. Although MEI shows ENSO-neutral conditions as of December 2014, the PDO switched to a strongly positive (warm) phase, a reversal from the relatively high-productivity, cool regime that had dominated the region from mid-2010 through the end of 2013. Record-high sea surface temperatures that dominated the Gulf of Alaska spread south into the northern and central CCE during the fall of 2014. These conditions contributed to an overall reduction in productivity in the NE Pacific in the fall of 2014, which was reflected in a sharp decline of the lipid-rich, northern copepod species that are of high nutritional value to pelagic fish species. This overall reduced productivity in the NE Pacific, and CCE specifically, was likely a major contributing factor to the reduction in spawning herring biomass observed by the Department during the 2014-15 spawning season in San Francisco Bay.

Twelve spawning events were recorded during the 2014-15 season, primarily in the northern areas of San Francisco Bay and along the San Francisco waterfront (Table 3.1). Spawning events were spatially and temporally well distributed, occurring as far north as Point San Pablo and south to Coyote Point (Figure 3.1). The first recorded spawn of the season occurred October 19-20, 2014, and the last recorded spawn occurred from February 25-March 1, 2015. There were several spawning events in Richardson Bay and smaller events to the east along the Marin county shore. The largest spawn event of the season was at Point Richmond with 6,716 tons of herring recorded. The second largest was the Richardson Bay to Point Diablo spawn with 3,947 tons, followed by the San Francisco waterfront spawn, estimated at 3,458 tons.

The heavy spawn deposition observed in intertidal (shore) areas this season may have been related to reduced submerged vegetation densities, and thus available spawning substrate, observed in major submerged spawn areas such as Richardson Bay.

Table 3.1 2014-15 San Francisco Bay Pacific herring spawning biomass estimate by event with commercial catch totals.

#	Approximate Spawn/Catch Date	Location	Submerged Areas	Shore Areas	Spawn Total	Gill-Net	HEOK	Biomass Total
1	October 19-20, 2014	Richardson Bay	Trace					Trace
2	November 25-26, 2014	Richardson Bay	375		375			375
3	December 12-14, 2014	Richardson Bay	18		18			18
4	December 20-23, 2014	Richardson Bay	499	11	509			509
5	December 27-30, 2014	San Francisco Waterfront		3,458	3,458			3,458
6	January 3-4, 2015	Coyote Point		166	166			166
7	January 5-8, 2015	Richardson Bay	1,016		1,016			1,016
8	January 10-13, 2015	Paradise Cove-Belvedere Cove	163	197	360			360
9	January 19-21, 2015	Richardson Bay-Point Diablo	1,596	2,312	3,909	38.0		3,947
10	January 29-February 1, 2015	Point Richmond-Point San Pablo	4,206	2,502	6,708	7.6		6,716
11	February 1-2, 2015	Tiburon (Keil Cove-Belvedere Cove)	23	58	81			81
12	February 25-March 1, 2015	Richardson Bay	30		30			30
Spawn Events (n) = 12		Totals in short tons	7,925	8,703	16,628	46	0	16,674

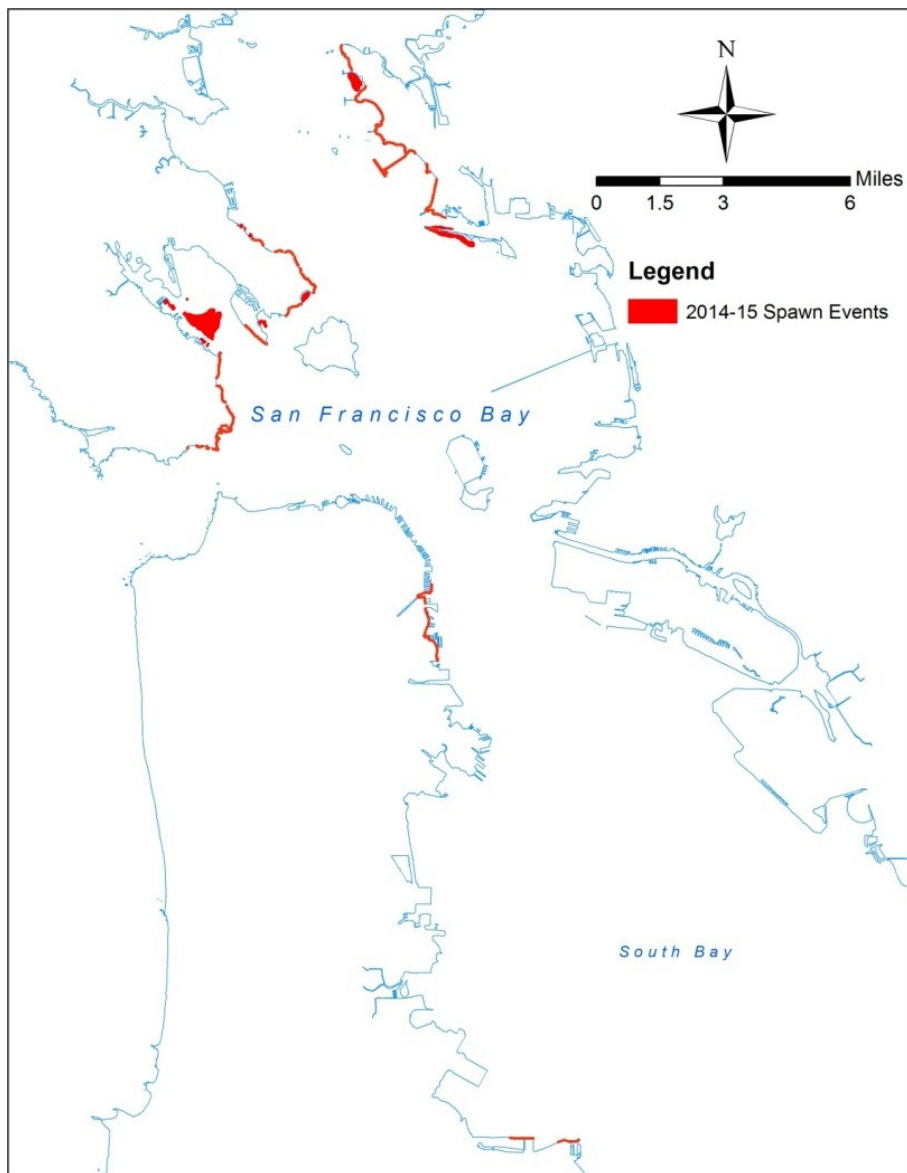


Figure 3.1 San Francisco Bay Pacific herring 2014-15 season spawn event map.

The Department uses the spawning stock biomass and age class structure to assess the spawning population and determine an appropriate harvest level from the available stock. Herring were captured with research nets to estimate the age class structure of the San Francisco Bay spawning population this season. Preliminary ages are assigned using a length-age key. Final age is determined from a surface reading of the otoliths (ear bones) of herring. Data are compiled into age classes (groups of fish the same age) for analysis. The age class composition is used to assess the cohorts

(year classes) of herring born in a given season which compose the spawning population.

Age composition for the 2014-15 season, based on length frequency age estimates, shows a balanced age class distribution, with age 3 and 4 herring most abundant in the spawning population (Figures 3.2 and 3.3). However, the proportion of age six and older herring was below average, and there was reduced presence of all age classes in the spawning biomass. This remains a concern for fishery management because these older fish formerly supported the commercial fishery. Reduced numbers of these older age classes places additional burden on younger cohorts to support the San Francisco Bay fishery and to fulfill herring's role as forage. It is the Department's longstanding management objective to reduce the harvest of 2- and 3-year old herring, many of which are first-time spawners. Commercial fishing effort was severely reduced this season but based on preliminary age composition analysis; this objective was achieved during the 2014-15 commercial season (Figure 3.4).

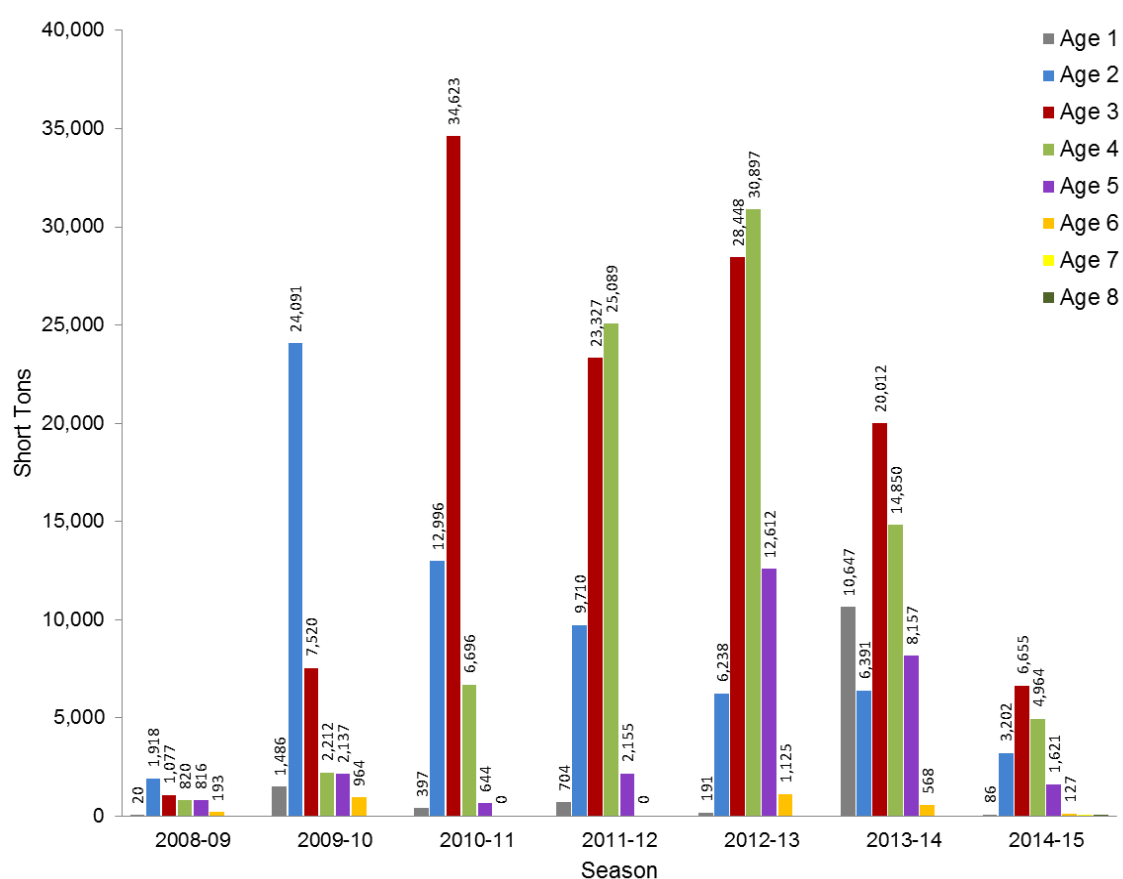


Figure 3.2 San Francisco Bay spawning biomass by age class for the 2008-09 to 2014-15 seasons. 2014-15 age data are preliminary.

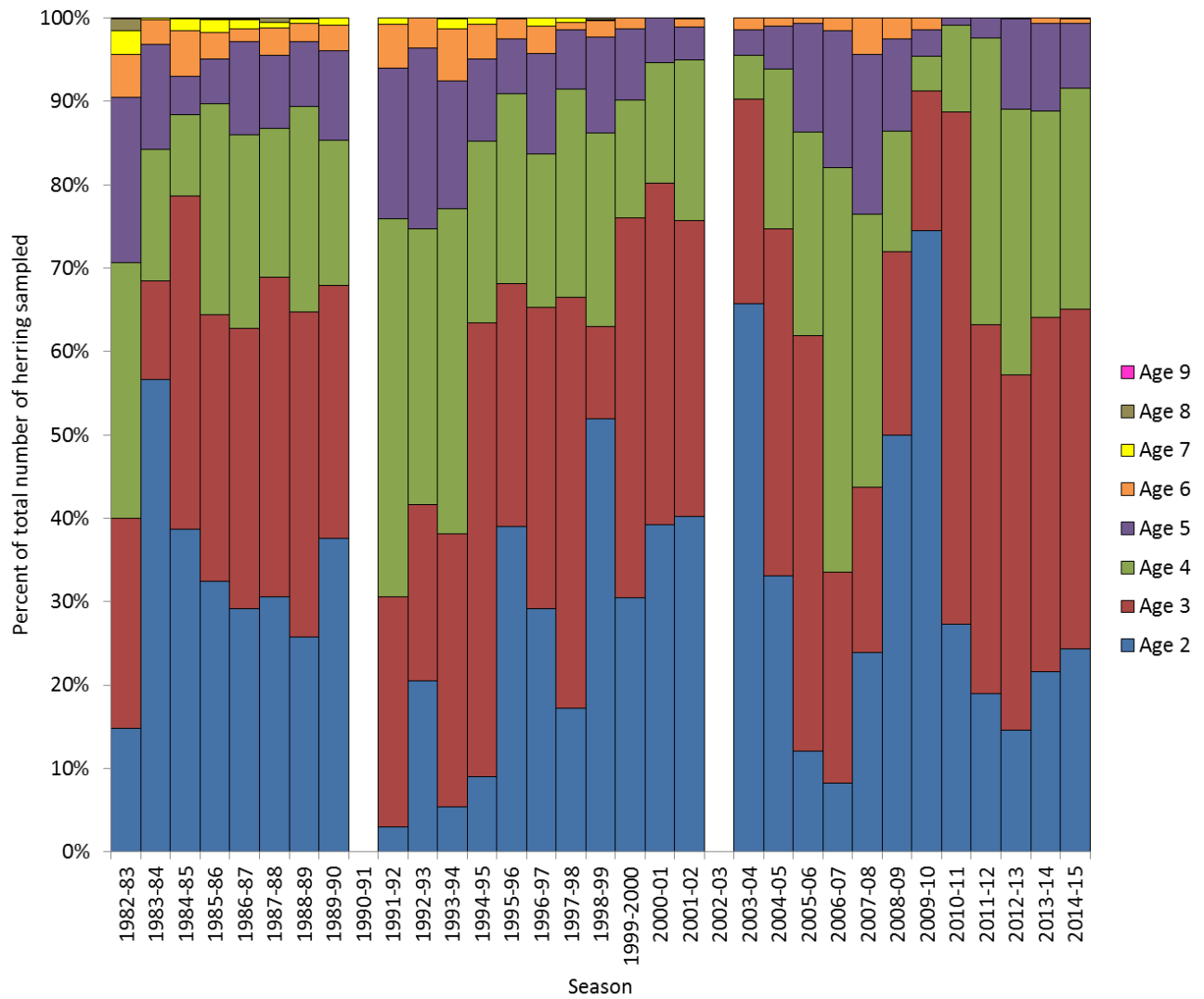


Figure 3.3 Age composition of the research catch (excluding age-1 fish) by number of ripe fish for the San Francisco Bay Pacific herring spawning biomass. 2014-15 age data are preliminary.

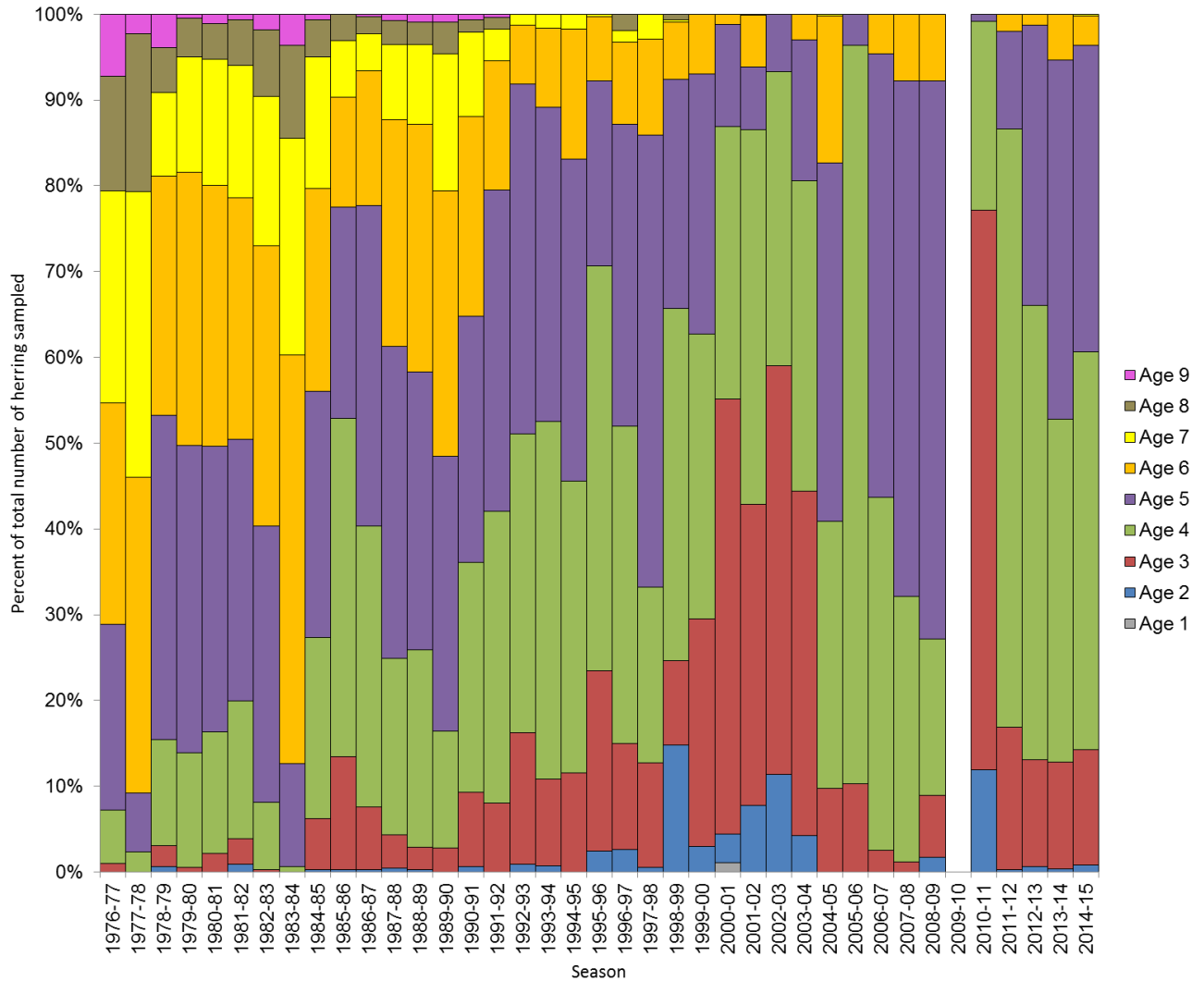


Figure 3.4 Age composition of the commercial gill net catch. Percent by number of fish for the San Francisco Bay Pacific herring fishery. The fishery was closed during the 2009-10 season. 2014-15 age data are preliminary.

The length-weight relationships for herring in spawning condition are used to develop a condition factor index (CI), which is derived from a fish's weight divided by the cube of its length, and used to describe the general health of a population. The mean CI for mature 2014-15 San Francisco Bay herring was above average, showing a slightly improved condition relative to the 2013-14 season (Figure 3.5).



Figure 3.5 Average Condition Index (CI) and historical mean CI for ripe male and female fish from the Department's San Francisco Bay Pacific herring research catch.

In summary, the spawning biomass estimate for the 2014-15 season was 16,674 tons, well below the historical average (1979-80 season to present) of 51,300 tons. Following the record low spawning estimate of the 2008-09 season, the San Francisco Bay spawning population had shown strong signs of recovery over the last five years. However, early 2015 reports of oceanographic and climate indices suggest unfavorable to poor oceanic conditions likely contributed to the low biomass estimate for the 2014-15 spawning season. Despite the observed reduction in biomass of all age classes, preliminary age composition analysis indicates a balanced age class distribution of the spawning biomass. The Department considers precautionary harvest percentages as the primary means of assuring a sustainable fishery even in years of unfavorable ecological conditions. Continued monitoring of both the herring spawning population and commercial catch will ensure that the Department's management goals are achieved and younger fish are not harvested at unsustainable levels. The population is further safeguarded by the low exploitation rates in recent seasons that have resulted

from the Department's recommended harvest percentages of five percent or less. These management measures help to maintain herring's importance as a key forage species in the California Current Ecosystem.

3.3.1. San Francisco Bay Herring Young of the Year

Herring young-of-the-year (YOY) are collected by the Interagency Ecological Program for the San Francisco Estuary by the Department's San Francisco Bay Study (SFBS) during the spring and summer of each year. The SFBS conducts surveys to determine the abundance and distribution of invertebrates and fishes in the San Francisco Estuary from the western Sacramento-San Joaquin Delta to San Francisco Bay. Stations are sampled each month using a midwater trawl that is towed obliquely through the water column to capture species inhabiting varying depths. The catch from this net is used to calculate an index of abundance for YOY herring (Fleming 1999).

The herring YOY abundance index for 2013 was slightly above average for the period of record (Figure 3.6). The abundance of YOY indicated more favorable environmental conditions for survival than the prior year within the San Francisco Estuary (Hieb and Messineo in preparation). However, recruitment to the spawning stock is affected by a number of factors during the first two to three years of life, including predation, food availability, competition, and environmental conditions. Drought conditions and related increases in salinity in the San Francisco Estuary result in a variety of potential impacts on YOY herring, some negative (Jassby et al. 2003, Kimmerer 2002, Orsi 1999) and others positive (Gilbert et al. 2014).

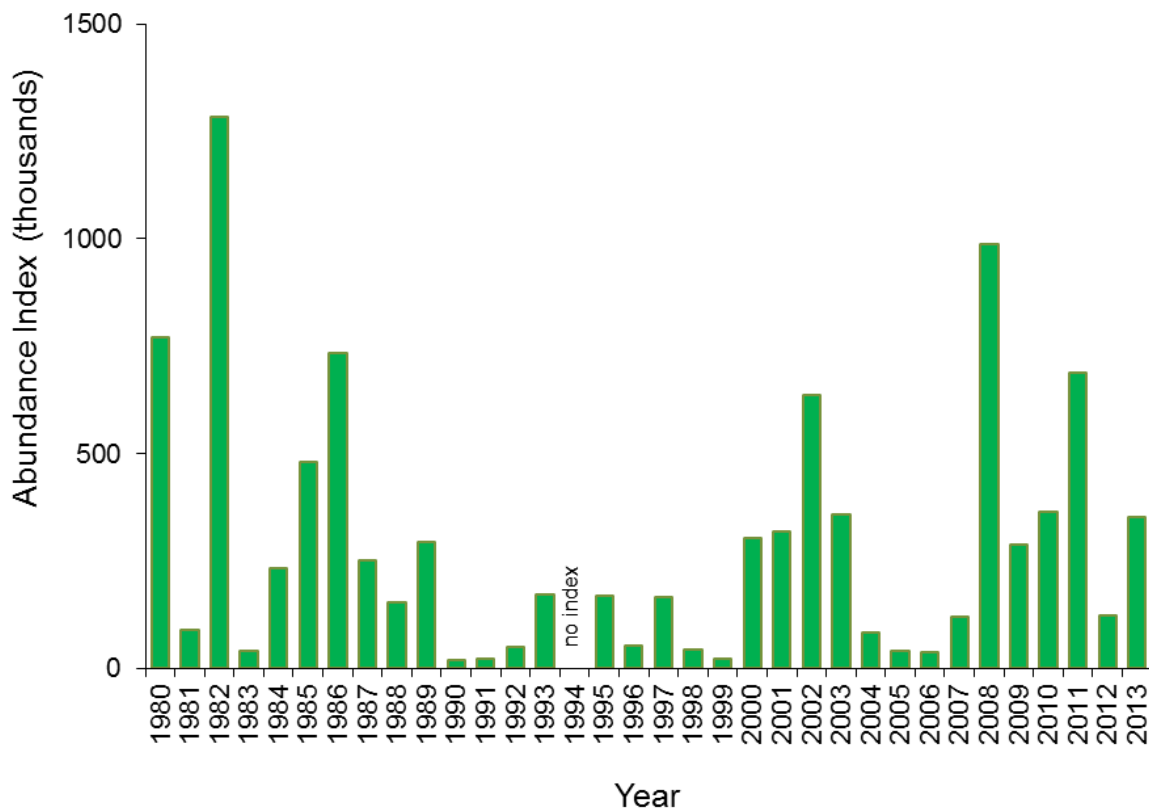


Figure 3.6 San Francisco Bay Pacific herring young-of-the-year abundance indices 1980-2012. *No index was calculated for 1994. Data for 2014 are not yet available.

3.3.2. *Cosco Busan* Oil Spill and Potential Impacts to San Francisco Bay Herring

On November 7, 2007, the container ship, *Cosco Busan* spilled an estimated 58,000 gallons of bunker fuel (IFO 380) into San Francisco Bay. Due to the timing of the oil spill, herring resources were potentially impacted. Since the spill occurred prior to the majority of spawning schools entering the bay, the most likely impact would be to spawning habitat and egg and larval development in contaminated areas. Previous studies, conducted after the *Exxon Valdez* oil spill, on herring egg and larval development exposed to weathered oil and polycyclic aromatic hydrocarbons (PAH) indicate impacts range from increased egg mortality to larval developmental abnormalities resulting in poor survival. Significantly higher herring egg and larval mortality was found in oiled versus non-oiled areas, which supports the hypothesis that

oil exposure decreases survival and hatching success in late stage embryos (McGurk and Brown 1996). Norcross et al (1996) found herring larvae from oiled areas had low growth rate and high proportions of deformities such as craniofacial defects. Larvae from un-oiled areas in Prince William Sound had less severe abnormalities due to oil exposure through the water column or contaminated prey. PAH compounds found in oil selectively disrupt embryonic cardiac function and indirectly affect other tissues that are secondary to cardiovascular dysfunction (Incardona et al. 2004). Sublethal effects resulting from oil exposure, such as developmental abnormalities can become lethal at later stages and environmental variables can alter the baseline of sublethal indicators (Hose et al. 1996). Carls et al (2002) reviewed the toxicological impacts on herring from the *Exxon Valdez* oil spill found four to six percent of the spawn occurred within visibly oiled areas. However, elevated concentrations of biologically available oil were found in the water, providing evidence that the primary source of herring egg oil contamination was through the water. While crude oil and bunker fuel oil may have differing chemical properties, potential oil related impacts on herring are probably similar.

A Natural Resources Damage Assessment (NRDA) team conducted a study of egg and larval development in oiled and non-oiled areas in San Francisco Bay. The findings of the NRDA report assist in determining the immediate and long-term impacts to herring resources and direct management activities for San Francisco Bay herring (Cosco Busan Oil Spill Trustees 2012). Field observations by Department staff indicated that key spawning areas were oiled during the spill and impacts of oil exposure on herring may negatively affect year class strength. Herring have evolved reproductive strategies to withstand predation, environmental uncertainties, and stochastic events. The population appears to be recovering and the Department will continue to monitor the population and adapt its management strategies as appropriate.

3.3.3. Importance of Herring as a Forage Species

As described in Chapter 3, Section 3.2.1.8.1 of the FED, herring are an integral component to a healthy functioning marine ecosystem, making up a large portion of the diet of marine organisms from California to Alaska. Herring are a mid-trophic level species that play an important role linking the lower and higher trophic levels in the food web. Changes in abundance and age structure of a forage species such as herring, as

well as variability in the size and timing of herring spawn events, can lead to changes in the abundances and behaviors of the variety of organisms that depend on herring and their eggs for food, including important recreational and commercial species as well as threatened and endangered fish, marine mammals, and sea birds. The Commission has adopted a policy that recognizes the importance of forage species to the marine ecosystem off California's coast and intends to provide adequate protection for forage species through precautionary and informed management. It is the goal of the Department to provide the Commission with management recommendations for herring that take into account their role as an important forage species and are based on the best available science.

3.4. Status of the Humboldt Bay Population

No spawning biomass estimates have been conducted in Humboldt Bay since 2007. However, the herring population was surveyed in the 2014-15 season to achieve the following objectives: 1) identify spawn timing, 2) map spawning areas, and 3) update length, age, and fecundity information. These data were collected as part of a collaborative effort between the Department and the commercial fishing industry to explore the potential for collecting essential fisheries information. Collaboration with key partners is a potentially useful tool to provide information in areas where the Department lacks the resources to assess herring populations. Information from this study will form the basis for future biomass estimates and will also serve to inform the future development of a Fishery Management Plan that will include San Francisco Bay, Tomales Bay, Humboldt Bay, and the Crescent City area.

Chapter 4. ENVIRONMENTAL IMPACT ANALYSIS AND CUMULATIVE EFFECTS

This chapter addresses the impacts and cumulative effects of the proposed project (changes to the commercial herring fishing regulations) on the existing environment described in Chapter 3 of this document and Chapter 3 of the FED. The proposed project and two of the three alternatives will permit a continuation of the regulated commercial harvest of herring in California. An analysis of the impacts of the proposed project is discussed in this DSED.

Existing regulations permit the commercial harvest of herring in four geographical areas: San Francisco Bay, Tomales Bay, Humboldt Bay, and the Crescent City area. Chapter 4 of the FED examined the environmental sensitivity of each of these areas at existing harvest levels. Thirteen environmental categories were considered, including; land use, traffic circulation, water quality, air quality, housing, public utilities, geological, biological, archaeological, scenic, recreation, noise, and growth inducement. Three categories (land use, archaeology, and growth inducement) were considered to have no environmental sensitivity to commercial herring fishery activity in any of the four geographical areas and were not considered in the impact analysis. Potential impacts relative to the above categories were re-examined annually and addressed in the Supplemental Environmental Document (SED). The basis for this assessment is provided in detail in Section 4.1 of the FED.

Section 4.2 of the FED provided a detailed impact analysis for the ten categories found to have environmental sensitivity to commercial herring fishery activity. Potential impacts to traffic circulation, water quality, air quality, housing and utilities, geology, scenic quality, recreational opportunities, and noise levels that were identified as an aspect of herring fisheries varied in degree with geographic area, but all were considered to be localized, short-term, and less than significant. Some of these potential impacts are mitigated by various existing regulations.

Section 4.2.6 of the FED provided a detailed analysis of the potential environmental impacts to biological resources that exist from commercial herring fisheries. The proposed project adds no new impacts to be analyzed.

The FED divided potential impacts into two categories: (1) direct harvest impacts, and (2) trophic level impacts. Short and long-term potential adverse impacts

exist within each of these categories. Many of these potential impacts are mitigated by current management practices including annual spawning population estimates and regulations that control harvest and fishery impacts. Others are considered localized, short-term, and less than significant.

Chapter 5 of the FED provided a detailed analysis of the factors that have the capacity to influence future herring population status in California in addition to the existing herring fisheries or alternatives (cumulative effects). The proposed project introduces no new cumulative effects to those addressed by the FED. The FED discussed in detail the factors with greatest potential for cumulative effects, including continued commercial harvest of herring, unusual biological events, competitive interactions with other pelagic fish, unusual weather events, habitat loss, and water quality. Mitigation for these potential cumulative effects will be provided by annual stock assessments, annual changes in the level of harvest, or the selection of a no fishery alternative.

The Department identified and addressed impacts and cumulative effects of the proposed project on the existing environment described in Chapter 3 of the FED, subsequent FSEDs, and this DSED. No impacts were identified that were not already addressed in the FED or prior FSEDs. Other impacts identified were determined to be localized, short-term, and less than significant.

Chapter 5. ANALYSIS OF ALTERNATIVES

An analysis of the potential environmental impacts of the three alternatives described in Section 2.4 is provided in Chapter 6 of the FED. Three commercial harvest alternatives were selected for consideration by the Commission based on the Department's recommendation, public comment received during the normal review process, or in response to the NOP. These alternatives were selected to provide the Commission with a range of commercial harvest alternatives. The two commercial harvest alternatives contain common elements with only selected elements of the management framework considered as alternatives. A "no project" (no commercial harvest of herring within California state waters) alternative is also provided.

5.1. Alternative 1 (no project)

The "no project" alternative would eliminate the commercial harvest of herring resources within California waters. Selection of this alternative would be expected to: (1) reduce total mortality and allow herring stocks to increase to carrying capacity; (2) increase competition between species (e.g., sardines and anchovies) occupying the same ecological niche as herring and potentially reduce standing stocks of these species; (3) increase the availability of herring to predators by reducing search effort and increasing capture success; (4) eliminate the ethical concern of those opposed to the commercial harvest of herring and the scientific information on herring derived from sampling the commercial harvest; and (5) eliminate revenues to local and regional economies, and state and federal agencies derived from the commercial harvest of herring.

Localized, short-term, and less than significant impacts to traffic circulation, water quality, air quality, housing, utilities, scenic quality, recreational opportunities, and noise levels would also be eliminated under the no project alternative. Section 6.1 of the FED provides a full analysis of the potential impacts associated with this alternative.

5.2. Alternative 2 (existing regulations)

Existing regulations, adopted in 2014, were for the 2014-15 herring commercial fishing season. These regulations reflect the amendments as adopted by the Commission in August 2014. Under Alternative 2, the herring fishery regulations as

amended through 2014 would remain in place for the 2015-16 season. Under this alternative, existing regulations would be modified only by updating the season year. The environmental impacts of Alternative 2 would be similar to those of the proposed project, though there is potential to harvest herring above the recommended 2015-16 season quota. As a result Alternative 2 would not provide for consistent adaptive management of the State's resources.

5.3. Alternative 3 (individual vessel quota)

This alternative modifies proposed regulations by establishing individual boat quotas for the herring gill net fishery in San Francisco Bay. Localized, short-term, and less than significant impacts of this alternative to circulation of traffic, water quality, air quality, housing, utilities, scenic quality, recreational opportunities, and noise levels are expected to be comparable to the proposed project. However, fishing effort could extend further into the season since the economic incentive would direct effort toward higher roe counts rather than quantity resulting in high-grading or throwing back males. Without individual boat quotas, typically, overall quotas have been met or fishing effort ceases long before season closure. Having the latitude to strive for higher roe counts could add incrementally to the potential impacts associated with the fishery. Section 6.3 of the FED provides further analysis of the potential environmental impacts of this alternative.

Chapter 6. CONSULTATION

Chapter 6 of the FED explains the role that consultation with other agencies, professionals, and the public plays in the Department marine resource management programs. Department staff involved in herring resource management are in contact with other agencies, biologists, and researchers involved in herring management on an ongoing basis. The U.S. Fish and Wildlife Service, NOAA-Fisheries Service, U.S. Environmental Protection Agency, and other state and federal agencies have received all environmental documents that have been prepared regarding herring. To date, the Department has not received comments from these agencies.

Prior to preparation of this DSED, the Department initiated a broader consultation by distributing a NOP that announced the intent to prepare the DSED dated March 27, 2015. In the NOP, the Department requested submission of views on the scope and content of the environmental information to be contained therein. The notice was distributed to members of the public, herring permittees, and interested organizations that had expressed prior interest in herring management. The NOP was also provided to the State Clearinghouse for distribution to appropriate responsible and trustee agencies.

Consultations occurred during the annual review of regulations guiding the commercial harvest of herring. The process began this year when the Department presented the results of its annual population assessment and discussed possible regulatory changes for the 2015-16 season to the DHAC, as well as interested organizations and individuals on April 1, 2015, in Sausalito, County of Marin.

Proposed changes to the regulations for the 2015-16 season will be modified, as necessary, based on comments from the public, other interested parties and DHAC. These recommendations will be presented to the Commission at their August 4-5, 2015, meeting.

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