

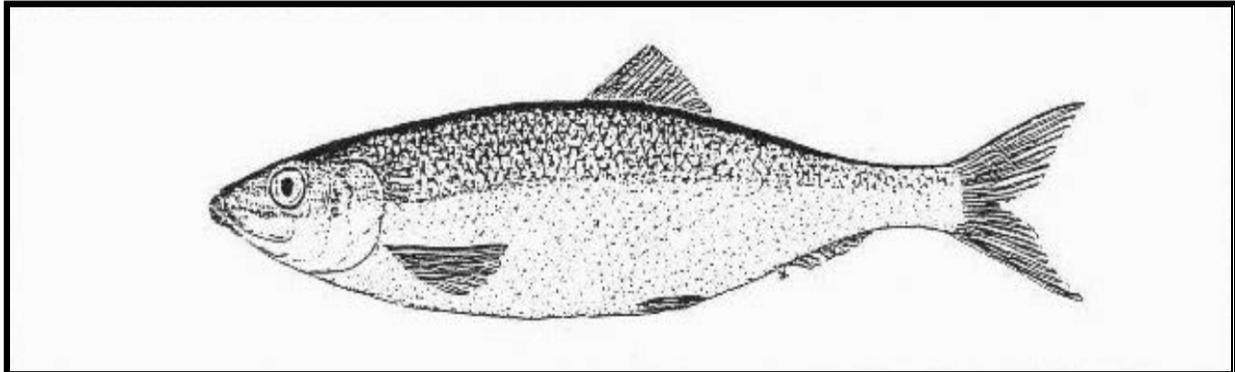
SCH No. 98052052

**FINAL**

**SUPPLEMENTAL ENVIRONMENTAL DOCUMENT**

**PACIFIC HERRING  
COMMERCIAL FISHING REGULATIONS**

(Sections 163, 163.1, 163.5, and 164, Title 14, California Code of Regulations)



**2011  
STATE OF CALIFORNIA  
THE NATURAL RESOURCES AGENCY  
DEPARTMENT OF FISH AND GAME**

**FINAL SUPPLEMENTAL ENVIRONMENTAL DOCUMENT  
PACIFIC HERRING COMMERCIAL FISHING REGULATIONS**

**Table of Contents**

SUMMARY .....	S-1
S.1 Introduction .....	S-2
S.2 Proposed Project.....	S-2
S.3 Project Alternatives .....	S-2
S.4 Existing Environment .....	S-3
S.5 Environmental Impacts.....	S-3
S.5.1 Proposed Project .....	S-3
S.5.2 Alternatives .....	S-4
S.5.3 Cumulative .....	S-5
S.6 Areas of Controversy .....	S-5
S.7 Issues to be Resolved.....	S-5
Chapter 1. INTRODUCTION .....	1-1
1.1 Background .....	1-1
1.2 The Functional Equivalent .....	1-2
1.3 Scoping Process.....	1-3
1.4 Report Availability.....	1-5
1.5 Authorities and Responsibilities.....	1-5
Chapter 2. PROJECT DESCRIPTION .....	2-1
2.1 Project Objectives.....	2-1
2.2 Project Locations .....	2-2
2.2.1 San Francisco Bay .....	2-3
2.2.1.1 Roe Herring Fishery.....	2-3
2.2.1.2 Herring Eggs on Kelp (HEOK) Fishery.....	2-5
2.2.1.3 Fresh Fish Market Fishery (not for roe purposes) San Francisco Bay.....	2-5
2.2.2 Tomales Bay .....	2-6
2.2.2.1 Roe Herring Fishery.....	2-6
2.2.2.2 Fresh Fish Market Fishery (not for roe purposes) Tomales Bay ..	2-6
2.2.3 Open Ocean.....	2-6
2.2.3.1 Open Waters Fishery .....	2-6
2.3 Project Characteristics.....	2-7
2.3.1 Roe Herring Fisheries .....	2-9
2.3.1.1 San Francisco Bay 2011-12 Quota.....	2-9
2.3.1.2 Tomales Bay, Humboldt Bay, and Crescent City Harbor 2011-12 Quota .....	2-11
2.3.1.3 Season Dates .....	2-11
2.3.2 Fresh Fish Market .....	2-11
2.3.2.1 Daily Fresh Fish Market Order Limit .....	2-11
2.3.2.2 Season Dates .....	2-12
2.4 Project Alternatives.....	2-12

2.4.1 Alternative 1 (no project) .....	2-13
2.4.2 Alternative 2 (existing regulations) .....	2-13
2.4.3 Alternative 3 (individual vessel quota).....	2-13
Chapter 3. ENVIRONMENTAL SETTING .....	3-1
3.1 General.....	3-1
3.2 Spawning Population Estimation Methods.....	3-2
3.3 Status of the San Francisco Spawning Population .....	3-3
3.3.1 San Francisco Bay Herring Young of the Year (YOY).....	3-11
3.3.2 <i>Cosco Busan</i> Oil Spill and Potential Impacts to San Francisco Bay Herring .....	3-12
3.3.3 Importance of Herring as a Forage Species.....	3-13
Chapter 4. ENVIRONMENTAL IMPACT ANALYSIS AND CUMULATIVE EFFECTS..	4-1
Chapter 5. ANALYSIS OF ALTERNATIVES .....	5-1
5.1 Alternative 1 (no project) .....	5-1
5.2 Alternative 2 (existing regulations).....	5-2
5.3 Alternative 3 (individual vessel quota).....	5-2
Chapter 6. CONSULTATION .....	6-1
Chapter 7. RESPONSES TO COMMENTS REGARDING THE PROPOSED PROJECT .....	7-1
Literature Cited.....	L-1
Appendix A Summary of Changes .....	A-1

## **SUMMARY**

### **S.1 Introduction**

This Final Supplemental Environmental Document (FSED) to the Final Environmental Document (FED), Pacific Herring Commercial Fishing Regulations, 1998, provides the review and analysis required by California Environmental Quality Act (CEQA) Guidelines (Section 15000 et seq., Title 14, California Code of Regulations [CCR]). The 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 FSED reviews and evaluates proposed regulatory changes for the 2011-12 fishing season, supplementing, and in some cases replacing, aspects of the proposed project described in the 1998 FED and the FSEDs of 1999, 2000, 2001, 2002, 2004, 2005, 2006, 2007, 2008, 2009 and 2010. A Notice of Preparation (NOP) identified and incorporated concerns and recommendations of the public, resource and regulatory agencies, and the fishing industry into the review and analysis of the proposed changes contained in these documents.

The FSED includes seven chapters. Chapter 1 discusses the authorities and responsibilities under which the FSED was developed and describes its intended use. Chapter 2 describes the proposed project and alternatives, and options for regulating the commercial harvest of herring. Chapter 3 describes the existing environment where the California herring 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. Chapter 6 identifies consultations with other agencies, professionals, and the public. Chapter 7 responds to public comments regarding the proposed project.

The proposed project has been selected as the preferred alternative based on the analysis of this FSED. 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, pet food, as fresh fish, and the harvest of herring eggs-on-kelp. The proposed project takes the form of recommendations for continuation, amendment, or change to an existing body of regulations in effect since December 9, 2010 (Sections 163, and 164, Title 14, CCR). 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 regulatory changes will establish fishing quotas for San Francisco Bay for the 2011-12 herring fishing season, based on the most recent assessments of the spawning populations. Previously established quotas for Tomales Bay, Humboldt Bay, and Crescent City Harbor fisheries are not affected by these regulatory changes.

The specific regulatory changes proposed for the 2011-12 season will: (1) provide the Commission the option to consider a quota equal to zero to 10 percent of the most recent San Francisco Bay spawning biomass estimate; (2) set the dates of the gill net roe herring fishery in San Francisco Bay from noon on January 2 until noon on March 9, 2012; (3) allow San Francisco Bay and Tomales Bay fresh fish market permits to be allowed to fish from November 2 through March 31 excluding days during that period when the San Francisco Bay and Tomales Bay limited entry herring gill net permit fisheries are open; and (4) set the dates of the roe herring fishery in Tomales Bay from noon on December 26, 2011, until noon on February 24, 2012. No quota changes were made for the Crescent City Harbor area, Humboldt Bay, or Tomales Bay fisheries.

## **S.3 Project Alternatives**

Three alternatives to the proposed project are considered in this FSED. These alternatives include: (1) a no-fishery alternative; (2) a no change alternative, which uses existing regulations; and (3) establishing individual vessel quotas for gill net vessels in the roe herring fishery. Refer to Section 2.4, Project Alternatives, and Chapter 5 of this

FSED, 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 environments most likely to be affected by the regulatory revisions outlined in this FSED are San Francisco Bay and Tomales 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. Herring fisheries occur in the Crescent City Harbor area and Humboldt Bay. 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 FSED. 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 roe 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 FSED are addressed within this document.

## **S.5.2 Alternatives**

The alternatives proposed in this FSED are the same as those described in the FED. 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.

### **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.

### **Alternative 2 (existing regulations)**

In most regards, the environmental impacts associated with this alternative would be comparable to those of the proposed project. Although this alternative does provide for an adjustment of quotas and season dates, it 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 2010 and would not provide for consistent adaptive management of the State's resources.

### **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 roe 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 FSED 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 ongoing 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 FSED.

## **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, and the

2010 FSED include a review and discussion of the proposed project as well as alternatives.

## Chapter 1. INTRODUCTION

### 1.1 Background

This Final Supplemental Environmental Document (FSED) 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 Game (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 2011-12 herring commercial fishing season.

This FSED was prepared as a supplement to: (1) the 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, and (12) the FSED certified by the Commission in September 2010. 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, and 2010 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, and 2010-11 herring commercial fishing seasons, respectively. Environmental documents (DSED and FSED) were not prepared

for the 2003-04 season. This FSED supplements the existing certified environmental documents and provides revisions to the regulations for the 2011-12 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, Final Environmental Document 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. The lead agency when deciding whether to approve the proposed project, 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 April 18, 2011. Following the release of the NOP, the 30-day public comment period pursuant to CEQA for the DSED ended May 18, 2011. Pursuant to CEQA regulations, a 45-day public comment period for reviewing the DSED is from May 31, 2011, to July 15, 2011.

This is the twelfth FSED 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; and the eleventh was certified by the Commission in September 2010. As provided for by CEQA, the Department will continue to use this method of revising Sections 163, 163.1 (the new section added in December 2005), 163.5, and 164, Title 14, CCR, for a period of approximately five to ten years. After this period, or sooner if deemed necessary, the Department will prepare a new environmental document or a fishery management plan (FMP).

### **1.3 Scoping Process**

Pursuant to CEQA, the Department distributed, for the Commission, an NOP to interested parties on April 18, 2011. The Department received input on the proposed project at a Director's Herring Advisory Committee (DHAC) meeting held on April 6, 2011, 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.

During the scoping process in past years, several issues were raised that are not included in this FSED including; developing a threshold, harvesting only the fishable biomass, a complete history of the fishery, genetic comparisons of the Tomales and San Francisco populations, the cost of management of the fishery, and establishing a limited voluntary individual quota herring fishery. All of these issues would be better addressed in a Fishery Management Plan (FMP). FMPs are required for all marine fisheries pursuant to the Marine Life Management Act. FMPs 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. Fishery management plans 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. The current 1998 FED and subsequent FSEDs serve as an interim FMP for herring until an FMP can be developed.

#### **1.4 Report Availability**

This FSED is available at the California Fish and Game Commission office and California Department of Fish and Game Marine Region offices. It will also be posted on the Department of Fish and Game website at [www.dfg.ca.gov/marine/herring/ceqa.asp](http://www.dfg.ca.gov/marine/herring/ceqa.asp).

#### **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, delegated authority from the Legislature to the Commission, whose members are appointed by the Governor, to regulate the commercial harvest and possession of herring. The remaining FGC sections relative 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 2011-12 season on August 4, 2011, in Sacramento, California, and on September 15, 2011, in Redding, 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 Final Environmental Document (FED) certified by the California Fish and Game Commission (Commission) on August 28, 1998, is the regulation of Pacific herring (herring), *Clupea pallasii*, fisheries under the State's jurisdiction. The regulations are considered for inclusion in the California Code of Regulations (CCR) to implement the State's policies for managing the commercial use of herring (Sections 163, 163.1, 163.5, and 164, Title 14, CCR). The proposed project and alternatives addressed in this Final Supplemental Environmental Document (FSED) 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, commercial fishermen, and from the Director's Herring Advisory Committee (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:

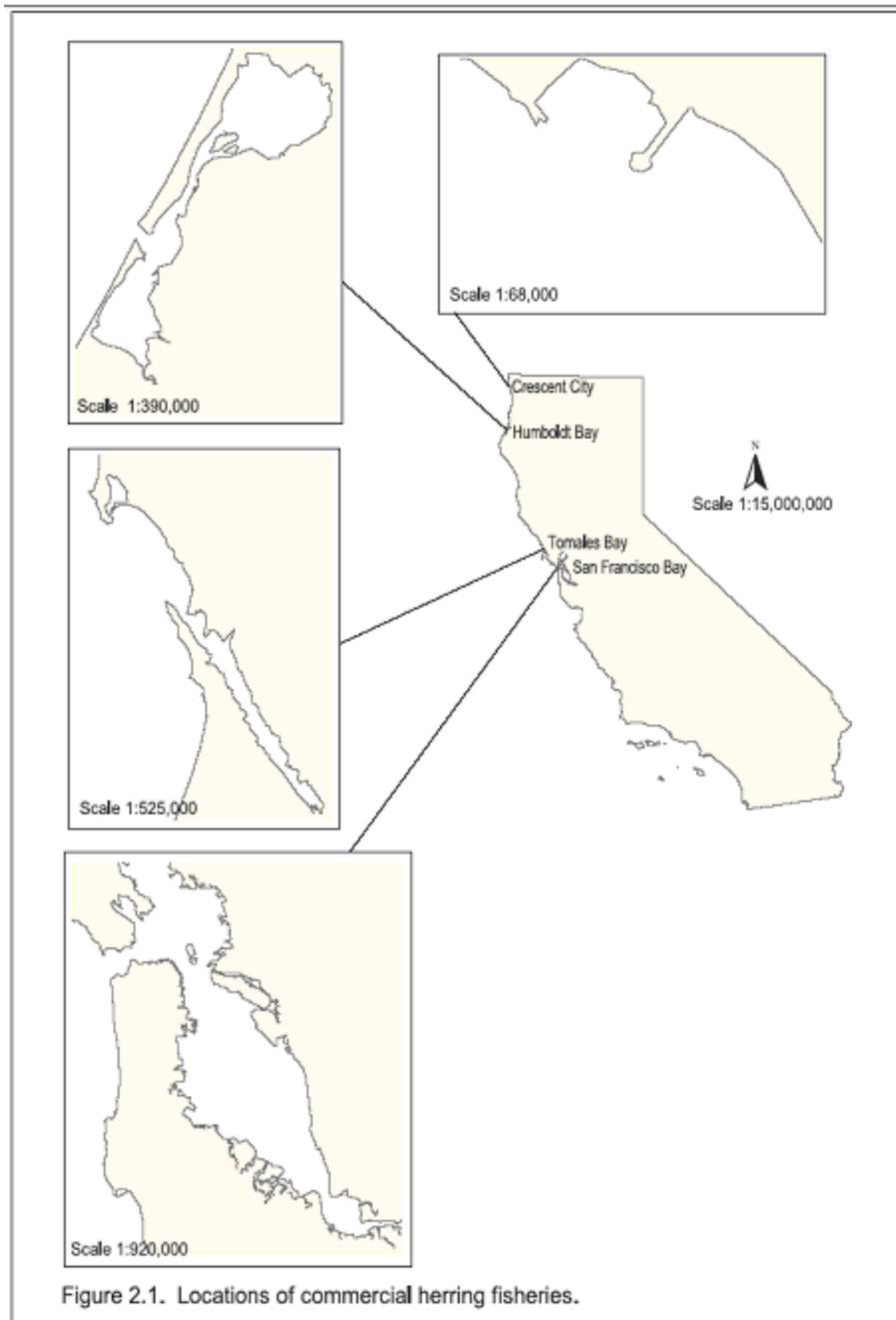
- Restore healthy age structures to stocks in need of rebuilding;
- Avoid and/or minimize the harvest of two and three-year-old herring, many of which are first-time spawners;
- Manage commercial harvest of herring to achieve a sustainable fishery;
- Provide sufficient herring to conserve living resources of the ocean that utilize herring as a food source;
- Provide 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 (Fish and Game Code Section 8550). Current regulations specify permit qualifications, permit validation requirements, permit limitations, permit areas, seasons, fishing quotas, gear restrictions, and landing and monitoring requirements.

The proposed project addressed by this FSED consists of amendments and changes to existing regulations for the 2011-12 commercial herring fishing season. The proposed project adjusts the fishing quota and season dates and times that fishing operations are allowed in San Francisco Bay, and season dates and times for fishing operations in Tomales Bay. Quota recommendations for San Francisco Bay are primarily based on the most recent assessments by the Department of Fish and Game (Department) of the size of the spawning population of herring in San Francisco Bay.

## **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, and proposed seasons, 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.



## 2.2.1 San Francisco Bay

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

### 2.2.1.1 Roe Herring Fishery

**Season:** Noon on Monday, January 2, 2012, until noon on Friday, March 9, 2012.

Note: Herring fishing is not permitted after noon on each Friday until 5:00 p.m. on each Sunday (Section 163 (h)(5), Title 14, CCR).

Gill net permittees (Odd #) January 8-13, January 22-27, February 5-10, February 19-24, and March 4-9.

Gill net permittees (Even #) January 2-6, January 15-20, January 29-31, February 1-3, February 12-17, February 26-29, and March 1-2.

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

**Quota:** The total take of herring in San Francisco Bay for commercial purposes shall be set between zero to 10 percent of the most current biomass estimate for San Francisco Bay. 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. The Department's recommendation for the 2011-12 season is 2,854 tons.

**Note:** The overall quota for the herring roe fishery will be reduced by transfers to the herring eggs-on-kelp fishery, and the fresh fish market quota (See Section 2.2.1.2 and 2.2.1.3).

**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, 2011 to March 31, 2012

**Quota:** The Department recommends that the Commission adopt a five percent harvest for San Francisco Bay for the 2011-12 season. This would allow a 5.0-ton individual quota for transferred "CH" gill net permits and a 3.3-ton quota for individual gill net permits.

**Note:** The combined quota for harvest of herring eggs on kelp depends on the number of "CH" and gill net permits transferred to the herring eggs on kelp fishery.

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

**Note:** The area open to the herring eggs -on -kelp 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).

#### **2.2.1.3 Fresh Fish Market Fishery (not for roe purposes) San Francisco Bay**

**Season:** November 2 through March 31 excluding days during that period when the San Francisco Bay limited entry herring gill net permit fisheries are open.

**Quota:** If the Commission adopts a harvest rate greater than zero, 20 tons of the overall San Francisco Bay quota will be allotted to the fresh fish market fishery.

**Note:** No permittee may take or possess herring except in the amount specified on a current daily market order, not to exceed 1,000 pounds, from a licensed fish dealer.

**Area:** Same as specified in roe herring fishery.

### **2.2.2 Tomales Bay**

The proposed Department commercial herring fishing dates for Tomales Bay are as follows:

#### **2.2.2.1 Roe Herring Fishery**

**Season:** Noon on Sunday, December 26, 2011, until noon Friday, February 24, 2012. Weekend fishing is allowed contingent on funds made available to the Department to cover biological staff time.

**Quota:** The total take of herring for roe purposes shall not exceed 350 tons for the season.

**Area:** Tomales Bay includes the waters of District 10 lying south of a line drawn west 252° magnetic, from the western tip of Tom's Point to the opposite shore.

#### **2.2.2.2 Fresh Fish Market Fishery (not for roe purposes) Tomales Bay**

**Season:** November 2 through March 31 excluding days during that period when the Tomales Bay limited entry herring gill net permit fisheries are open.

**Quota:** The total take of herring for fresh fish market shall not exceed 10 tons for the season.

**Note:** No permittee may take or possess herring except in the amount specified on a current daily market order, not to exceed 1,000 pounds, from a licensed fish dealer.

**Area:** Same as the roe herring fishery.

### **2.2.3 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.

#### **2.2.3.1 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 and Tomales Bay fisheries. No modifications are proposed for Crescent City Harbor area or Humboldt Bay. 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 roe herring and HEOK 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 size of the spawning population of herring in San Francisco Bay (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 2011-12 season included: (1) provide the Commission the option to consider a quota of zero to 10 percent of the most recent San Francisco Bay spawning biomass estimate (the Department and DHAC recommend a five percent harvest for San Francisco Bay); (2) set the dates of the gill net roe herring fishery in San Francisco Bay from noon on Monday, January 2, 2012, until noon on Friday, March 9, 2012; (3) allow San Francisco Bay and Tomales Bay fresh fish market permits to be in force from November 2 through March 31 excluding days during that period when the San Francisco Bay and Tomales Bay limited entry herring gill net permit fisheries are open; and (4) set the dates of the roe herring fishery in Tomales Bay from noon on December 26, 2011, until noon on February 24, 2012. No quota changes were made for the Crescent City Harbor area, Humboldt Bay, and Tomales Bay fisheries.

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 in 2006-07. 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 have been used to estimate spawning biomass in San Francisco, Tomales, and Humboldt bays. 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).

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 conducted spawning deposition surveys as the primary assessment tool to estimate the spawning biomass. This is in conjunction with trawl surveys that are used to determine age and population structure of herring schools entering San Francisco Bay. Spawning biomass estimates for San Francisco Bay are shown in Figure 2.2. Currently, the Department does not conduct spawning biomass surveys in Tomales Bay, Humboldt Bay or the Crescent City Harbor area.

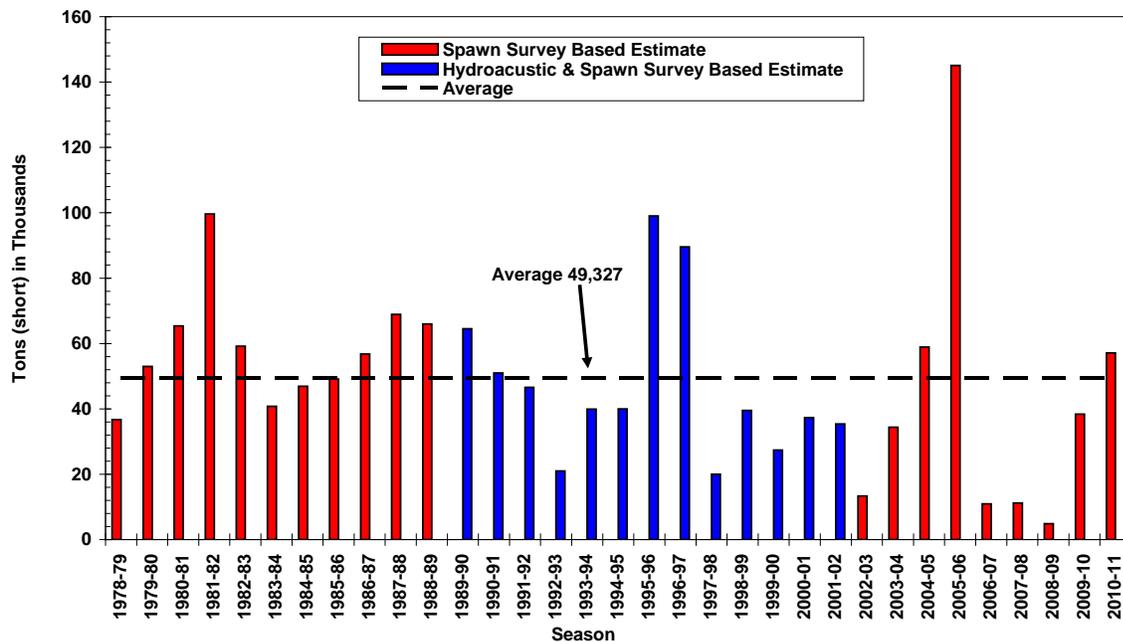


Figure 2.2 San Francisco Bay Pacific Herring Spawning Biomass Estimates for Seasons 1978 to 2011

Annual fishing quotas are intended to provide for a sustainable fishery and have been limited to a total catch, not to exceed 20 percent (harvest percentage) of the spawning biomass. This exploitation level 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 assumes stable environmental and biological conditions.

Quotas are the principal regulatory tool to establish adequate protection of the herring resource and provide for the long-term yield of the fishery. Each year, the Department recommends a harvest percentage that is not determined by a fixed mathematical formula; rather, the recommendation is based upon the modeling results and takes into account additional data collected each season, such as oceanic 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, or indication of population stress, and/or unfavorable oceanographic conditions, harvest percentages in previous years have been set below 15 percent. For example, a near record low spawning biomass was estimated for both the 2006-07 and 2007-08 seasons; therefore, a conservative harvest percentage of 10 percent was recommended for those two seasons. The Department and DHAC recommended a zero ton quota or no fishery option for the 2009-10 season, when the herring spawning biomass in 2008-09 fell to a new historical low of 4,833 tons. The Commission adopted this recommendation and no commercial fishery was held in San Francisco Bay for the 2009-10 season. This was done to help safeguard the remaining population and 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 FSED, reflect both Department and the public recommendations.

### **2.3.1 Roe Herring Fisheries**

#### **2.3.1.1 San Francisco Bay 2011-12 Quota**

The spawning biomass estimate for the 2010-11 season was 57,082 tons, well above the historical average (1978-79 season to present) of 49,327 tons. This was the second consecutive year of increasing 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 of zero to 10 percent of the 2010-11 spawning

biomass estimate of 57,082 tons. Due to the recovering status of the herring population, the Department recommends a conservative five percent harvest option for the 2011-12 season. The Department remains concerned over the age structure of the herring stock that is heavily skewed towards younger fish, specifically the percentage of 3-year old herring in the 2010-11 spawning population. The Department's recommendation of a five percent harvest rate for 2011-12 will help reduce fishing mortality, which will be critical for continued stock recovery. This approach will also help maintain a sustainable fishery while continuing to ensure herring's integral role in both ocean and bay ecosystems.

Based on age data from the 2009-10 research catch, the increase in spawning biomass was due to recruitment of 3-year old herring (2007-08 year class) to the spawning population. This year class is the most robust of recent seasons and while the increase in biomass is encouraging, it will be subjected to increased fishing pressure when it returns as 4-year olds in the 2011-12 season. As a result, the Department remains concerned over the recruitment of age four and older herring to the spawning population and its importance to a healthy age-class structure. However, the Department considers that appropriate harvest controls will allow strong year classes to support a fishery for several seasons. 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.

As the stock recovers, the Department considers that a limited 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 2010-11 season, permit renewals fell to 185 and only 27 vessels elected to participate. Given the decline in the number of participants, a 2,854 ton quota will provide for a fishery while minimizing the threat of overexploitation.

Within the overall quota for San Francisco Bay, separate quotas are established for each gill net platoon (i.e., Odd, and Even fishing groups). The overall quota is divided among the platoons in proportion to the number of permits assigned to each platoon. Adjustments to quota assignments 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. 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 Harbor 2011-12 Quota**

The previously set quota for Tomales Bay, Humboldt Bay and Crescent City Harbor area is 350 tons, 60 tons, and 30 tons, respectively.

#### **2.3.1.3 Season Dates**

Season opening and closing dates for San Francisco and Tomales bays, as well as the dates of various provisions of the regulations, are adjusted each year to account for annual changes in the calendar. The consensus of the DHAC, which met on April 6, 2011, was to recommend that the dates and times of the roe herring fisheries in San Francisco Bay be set from noon on Monday, January 2, 2012, until noon on Friday, March 9, 2012 (all gill net platoons; "DH", Odd and Even). The consensus among Tomales Bay permittees was to recommend opening at noon on Sunday, December 26, 2011, until noon on Friday, February 24, 2012. The Department agrees with the DHAC recommendation for season dates for San Francisco and Tomales bays.

### **2.3.2 Fresh Fish Market (San Francisco and Tomales Bays)**

#### **2.3.2.1 Daily Fresh Fish Market Order Limit**

The Department recommends that no permittee may take or possess herring except in the amount specified on a current daily market order, not to exceed 1,000

pounds, from a licensed fish dealer. Current regulations state that daily market orders are not to exceed 500 pounds; however, a participant in the fresh fish fishery in San Francisco Bay has requested that the Commission raise this limit to 1,000 pounds to meet the demands of an emerging local fresh fish market. The Department does not consider a daily market increase to 1,000 pounds to be detrimental to the herring population if existing regulations pertaining to this fishery are followed and the 20 ton fresh fish quota for San Francisco Bay and 10 ton fresh fish quota for Tomales Bay are not exceeded.

### **2.3.2.2 Season Dates**

The Department recommends that San Francisco Bay and Tomales Bay fresh fish market permittees be allowed to fish from November 2 until March 31, excluding days during that period when the San Francisco Bay and Tomales Bay limited entry roe herring gill net fisheries are open. The changes to the fishing period for San Francisco Bay and Tomales Bay fresh fish market permits will allow fresh fish market permittees access to herring when they are typically present in these bays. It will also prohibit fishing in the months of the year when adult herring are absent, reducing the chance for unwanted by-catch.

## **2.4 Project Alternatives**

Three alternatives to the proposed project are considered. These alternatives were examined and detailed in the FED, 1998, and re-examined as they apply to this FSED. 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 FSED are:

- Alternative 1 (no project, i.e. no fishery). Under this alternative, the commercial harvest of herring would be prohibited.
- Alternative 2. Under this alternative, existing regulations would be modified only by adjusting quotas to reflect current biomass estimates and by adjusting dates

to reflect changes in the calendar.

- Alternative 3 (individual vessel quota for gill net vessels in herring roe 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 only amendment or change suggested relates to adjusting quotas to reflect current biomass estimates and adjusting dates to reflect annual changes in the calendar.

#### **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. An individual permit quota has been suggested each season for the past several years. However, there has never been a clear consensus of support or opposition 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

Pacific herring (herring), *Clupea pallasii*, 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, Outram and Humphreys 1974). 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 (Miller and Schmidtke 1956).

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 during the summer were found in shallow nearshore waters of less than 50 meters, 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 roe herring gill net fisheries catch herring as they move into the shallows to spawn when the eggs are ripest. The primary product from this fishery, *kazunoko*, is the sac roe (eggs) removed from the females, which is processed and exported for sale to Japan. California's roe

herring fisheries occur in the Crescent City Harbor area, Humboldt Bay, Tomales Bay, and San Francisco Bay. Small fisheries for fresh fish markets are also permitted during spawning season in Tomales and San Francisco bays when roe herring fisheries are closed.

The San Francisco Bay herring eggs -on -kelp 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.

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.

The roe herring fishery in California has been intensively regulated since its inception in 1973, at first by the California State Legislature, then by the Fish and Game Commission (Commission). Department of Fish and Game (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 Final Environmental Document (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 Harbor 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 an independent peer review conducted by California Sea Grant. 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 2010-11 season is 57,082 tons, which exceeds the historical average (1978-79 season to present) of 49,327 tons. This is the second year of significant increase since the 2008-09 season record low estimate of 4,833 tons (Figure 2.2). Age composition data indicates that the increase in spawning biomass was due to a strong recruitment of 3-year old herring to the spawning population (Figure 3.1). The strength of this year class was first noted during the 2009-10 season when fish returned to the bay as 2-year herring. The increase in recruitment, as well as improved physical condition, is likely due to more favorable biological and environmental conditions, both in estuarine and oceanic ecosystems.

Improving oceanic conditions as reported in the El Niño Southern Oscillation (ENSO), Pacific Decadal Oscillation (PDO), and Upwelling Indices (UI) may aid in herring stock recovery. These indices can be used as predictors of favorable environmental conditions for herring. Many studies have shown correlations between the amount of coastal upwelling and production of various fisheries including herring. When indices show weak or no El Niño events, cool sea surface temperatures and offshore winds often prevail, resulting in strong coastal upwelling events affecting

plankton production. The cool, nutrient laden waters result in increased availability of plankton, fueling the marine food web of which herring are an integral part.

Hydrographic conditions also improved from previous seasons for San Francisco Bay, with above average rainfall reported for the current water year (July 1, 2010 to June 30, 2011). During average or above average rainfall years, winter storms supply sufficient freshwater to San Francisco Bay to create lowered bay salinity and ideal spawning conditions for herring. California experienced a statewide drought from 2007 through 2009. Two consecutive winters of near or above normal precipitation has resulted in improved bay conditions and can be expected to aid in stock recovery.

There were ten recorded spawning events during the 2010-11 season, primarily within the central and northern areas of San Francisco Bay. Spawning events were recorded from as far north as Point Richmond and south to Coyote Point. The first recorded spawn of the season occurred December 1-4, 2010, and the last recorded spawn occurred on March 5, 2011 (Table 3.1). There were several protracted spawning events in the north bay and intermittent smaller spawning events occurring in the southern areas of the bay. Of particular interest was the return of herring to Point Richmond during two spawning events. Before the 2009-10 season, this area had not been visited by spawning herring since January 1986. The spawning biomass for the season was more temporally distributed than previous seasons. This type of distribution helps prevent over exploitation of a single spawning wave and is an important consideration when making management decisions for the herring fishery.

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. The age of herring is determined from a surface reading of the otoliths (ear bones) of herring. Samples used to estimate the age structure are sorted into age classes or groups of fish the same age. The age class structure helps assess cohorts (year classes) of herring born in a given year or season which compose the spawning population.

The age composition estimate for the 2010-11 season shows a rebuilding of the spawning stock through a strong recruitment of 3-year old herring (2007-08 year class)

(Table 3.2). Based on both length frequencies and age estimates, the 2007-08 year class (3-year old fish) was the dominant year class during the 2010-11 season. During the last several seasons, the herring population structure has experienced a truncation of age classes which continued during the 2010-11 season and is expected for the 2011-12 season. The numbers and proportion of older herring remain well below historical averages and is of concern because these older fish historically supported the commercial fishery. The successive cohorts that would normally support a commercial fishery (herring age four, five, and six), have shown poor survival. Low survival of these older age classes places additional burden on abundant cohorts like the 2007-08 year class to support the San Francisco Bay fishery and to fulfill the ecosystem role of herring. This is the primary reason the Department recommends a five percent quota for the commercial herring fishery.

**Table 3.1 2010-2011 San Francisco Bay Pacific Herring Biomass Estimate (weights in short tons)**

#	Approximate Spawn/Catch Date	Location	Submerged Veg	Shoreline	Spawn Total	Gill		Biomass Total
						net	HEOK	
1	December 1-4, 2010	Richardson Bay	39		39			39
2	December 7-8, 2010	Burlingame WFront		77	77			77
3	December 22-23, 2010	Richardson Bay	2,241		2,241			2,241
4	December 29, 2010	Coyote Point		189	189			189
5	January 10-11, 2011	Richardson Bay	27,485		27,485	246		27,731
6	January 18-20, 2011	San Francisco WFront		9,484	9,484	746		10,230
7	January 24-27, 2011	Paradise to GG Bridge (includes Richardson Bay)	7,806	2,429	10,235	734		10,969
8	February 4-7, 2011	Point Richmond	3,855	198	4,052			4,052
9	February 27-28, 2011	Point Richmond	153	3	156			156
10	March 5, 2011	Richardson Bay	1,397		1,397			1,397
n	spawn events = 10	Total in Tons	42,976	12,379	55,356	1,727	0	57,082

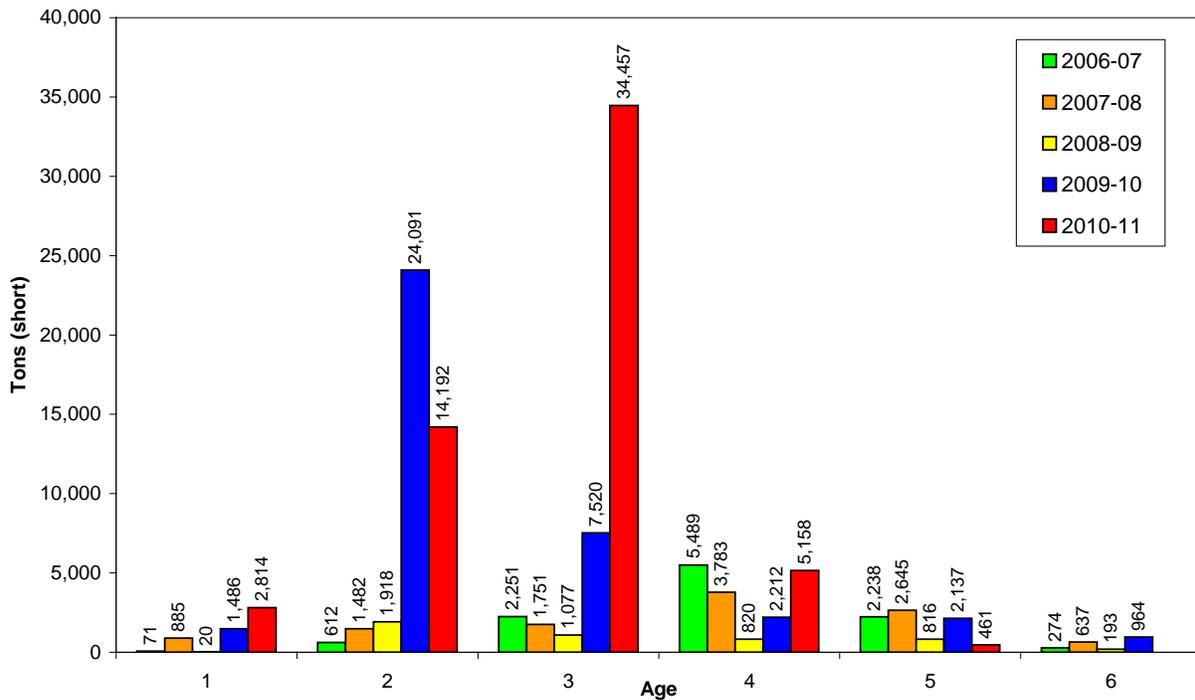


Figure 3.1 San Francisco spawning biomass by age class for the 2006-07 to 2010-11 seasons

The length-weight relationship for herring in spawning condition sampled by Department research nets in the 2010-11 season indicates that herring above 130 millimeters (mm) were heavier in weight for a given body length (BL) compared to the previous season (Figure 3.2). The length-weight relationship of herring can also be used to develop a condition factor index, which is used to describe the health of a population. The San Francisco Bay herring condition factor index improved for mature herring when compared to last season and showed the best indices since the 2002-03 season (Figure 3.3). Both female and male herring returned in a more robust condition which may be an indicator of better growth, and reproductive potential for the 2011-12 season.

In summary, the spawning biomass estimate for the 2010-11 season was 57,082 tons, notably above the historical average (1978-79 season to present) of 49,327 tons. This was the second consecutive year of increased biomass following the record low during the 2008-09 season of 4,833 tons. The 2010-11 spawning biomass estimate was one and a half times higher than the estimate of 38,409 tons for the 2009-10

season and an eleven-fold increase over the 2008-09 season estimate of 4,833 tons. Age composition analysis indicated the increase in spawning biomass was due to strong recruitment of 3-year old herring to the spawning population. The improved physical condition of fish indicates that favorable biological and environmental conditions are helping to rebuild the San Francisco Bay herring stock. Early 2011 reports of the ENSO, PDO, and UI indices indicate neutral to favorable oceanic conditions that will aid in continued herring stock recovery. In addition, hydrographic conditions within San Francisco Bay have improved over previous seasons with above average rainfall reported for the current water year; this may aid in spawning success and survival of young herring in the bay.

Since the 2002-03 season, the Department has expressed concern regarding the health, specifically the age structure, of the San Francisco Bay herring population. Following the 1997-98 El Niño, the estimated number of age four and older herring, which has historically supported the gill net fishery, declined and these older age classes have yet to recover based upon the 2010-11 season age data. Unfavorable oceanic and estuarine conditions from 2006 through 2009 may to have led to high mortality of herring from the 2005-06 and 2006-07 year classes and could account for their low abundance in the 2010-11 catch. In contrast, strong recruitment of 3-year old fish (2007-08 year class) into the spawning population demonstrates the potential for stock recovery. The 2007-08 year class is the strongest in recent seasons and this year class will likely compose the majority of commercial catches in the upcoming season (Figure 3.4). As a result, management should consider conservation of this year-class to prevent overexploitation by the fishery. Continued monitoring of the commercial catch will ensure that the Department's management goals are achieved and younger fish are not harvested at unsustainable levels. 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. Setting an appropriate harvest level for 2011-12 will allow these year classes to support a fishery for the next several seasons.

**Table 3.2 Estimated numbers (x 1,000) of herring-at-age in the San Francisco Bay spawning population, 1982-83 to present**

Age and Percent Composition																			
Season	1	%	2	%	3	%	4	%	5	%	6	%	7	%	8	%	9	%	Total
82-83	a	N/A	87,908	14.8	149,971	25.2	182,936	30.7	118,040	19.8	30,478	5.1	17,177	2.9	8,121	1.4	797	0.1	595,428
83-84	a	N/A	332,699	56.6	69,654	11.9	92,565	15.8	73,840	12.6	17,306	2.9	1,168	0.2	117	0	0	0	587,349
84-85	a	N/A	184,695	38.7	190,998	40	46,613	9.8	22,153	4.6	25,914	5.4	6,652	1.4	688	0.1	0	0	477,713
85-86	a	N/A	162,422	32.4	160,613	32.1	126,535	25.3	26,790	5.3	16,038	3.2	7,752	1.5	717	0.1	182	0	501,049
86-87	a	N/A	168,962	29.2	194,365	33.6	134,528	23.2	64,598	11.2	9,182	1.6	6,175	1.1	1,065	0.2	246	0	579,121
87-88	a	N/A	233,193	30.6	292,508	38.3	136,604	17.9	66,494	8.7	25,337	3.3	5,027	0.7	3,939	0.5	0	0	763,102
88-89	a	N/A	146,525	25.8	222,058	39	139,906	24.6	44,435	7.8	12,310	2.2	3,030	0.5	534	0.1	0	0	568,798
89-90	a	N/A	294,631	37.6	237,377	30.3	136,248	17.4	84,361	10.8	23,970	3.1	6,572	0.8	0	0	0	0	783,159
90-91																			
91-92	1,356	0.3	13,666	3.0	126,016	27.5	206,930	45.2	82,870	18.1	23,764	5.2	3,490	0.8	0	0	0	0	458,092
92-93	0	0	48,925	20.5	50,398	21.1	79,045	33.1	51,713	21.7	8,642	3.6	0	0	0	0	0	0	238,723
93-94	11,485	2.7	22,403	5.3	134,870	31.8	160,335	37.9	63,331	15	25,926	6.1	4,808	1.1	355	0.1	0	0	423,513
94-95	2,276	0.5	39,363	9.0	236,783	54.1	94,833	21.7	42,850	9.8	18,223	4.2	3,196	0.7	0	0	0	0	437,524
95-96	3,142	0.3	483,164	38.9	359,357	29	282,069	22.7	81,768	6.6	28,904	2.3	1,687	0.1	0	0	0	0	1,240,091
96-97	1,184	0.1	290,497	29.1	359,459	36	183,370	18.4	120,029	12	33,098	3.3	8,935	0.9	270	0	0	0	996,842
97-98	42	0	45,092	17.2	129,411	49.3	65,637	25	18,724	7.1	2,259	0.9	1,430	0.5	0	0	0	0	262,595
98-99	1,931	0.4	256,816	52.0	54,306	11	114,835	23.2	56,915	11.5	9,729	2	558	0.1	978	0.2	<sup>b</sup>	0	496,068
99-00	1,440	0.4	103,490	30.4	154,260	45.3	48,150	14.1	29,000	8.5	4,310	1.3	0	0	0	0	<sup>b</sup>	0	340,650
00-01	255,158	36	178,401	25.2	185,748	26.2	65,555	9.2	24,267	3.4	126	0	0	0	0	0	0	0	709,255
01-02	5,788	1.5	157,182	39.6	138,752	35	75,088	18.9	15,383	3.9	4,265	1.1	152	0	0	0	0	0	396,610
02-03																			
03-04 <sup>c</sup>	2,473	0.5	328,257	65.5	122,072	24.3	26,641	5.3	14,848	3	7,225	1.4	0	0	0	0	0	0	501,516
5-Apr	0	0	287,298	33.1	360,741	41.6	166,538	19.2	44,684	5.2	8,367	1	0	0	0	0	0	0	867,628
05-06	59,112	3.2	217,177	11.7	896,819	48.3	438,877	23.6	234,285	12.6	11,202	0.6	0	0	0	0	0	0	1,857,473
06-07	2,176	1.5	11,970	8.1	37,000	25.0	70,734	47.8	23,941	16.2	2,176	1.5	0	0	0	0	0	0	147,997
07-08	24,928	16.1	31,035	20.0	25,714	16.6	42,578	27.5	24,987	16.1	5,602	3.6	0	0	0	0	0	0	154,844
08-09	623	0.8	36,786	49.6	16,211	21.8	10,599	14.3	8,105	10.9	1,870	2.5	0	0	0	0	0	0	74,194
09-10	48,493	7.3	458,179	69.0	103,675	15.6	25,083	3.8	20,066	3.0	8,361	1.3	0	0	0	0	0	0	663,857
10-11	102,213	4.9	227,851	24.9	436,537	60.4	55,366	9.0	4,259	0.8	0	0.0	0	0	0	0	0	0	826,226
<b>Mean</b>	<b>27,569</b>	<b>4.0</b>	<b>179,577</b>	<b>30.3</b>	<b>201,692</b>	<b>32.2</b>	<b>118,822</b>	<b>21.7</b>	<b>54,175</b>	<b>9.9</b>	<b>13,503</b>	<b>2.5</b>	<b>2,993</b>	<b>0.5</b>	<b>646</b>	<b>0.1</b>	<b>51</b>	<b>0.0</b>	<b>590,719</b>

Note: The 1990-91 and 2002-03 seasons were not estimated due to incomplete or unresolved data sets. <sup>a</sup> 1-year-olds were not estimated, <sup>b</sup> 9-year-olds were not estimated, <sup>c</sup> includes corrected estimated number of two-year-olds

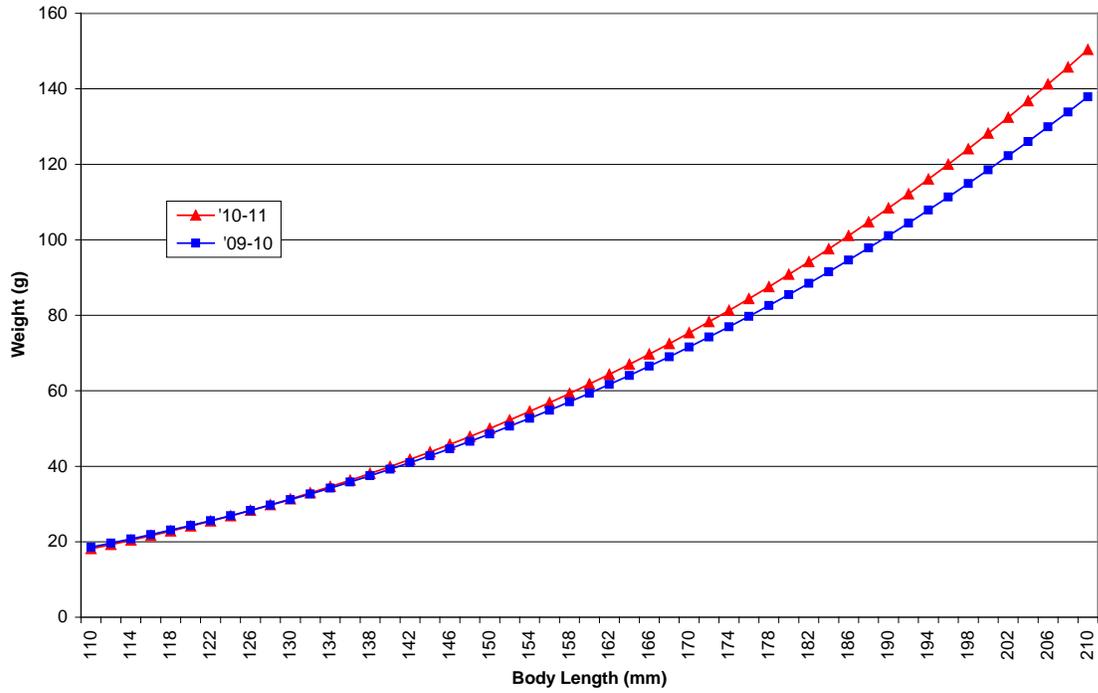


Figure 3.2 Length-weight relationship of ripe San Francisco Bay Herring captured with research during the 2010-11 and 2009-10 seasons

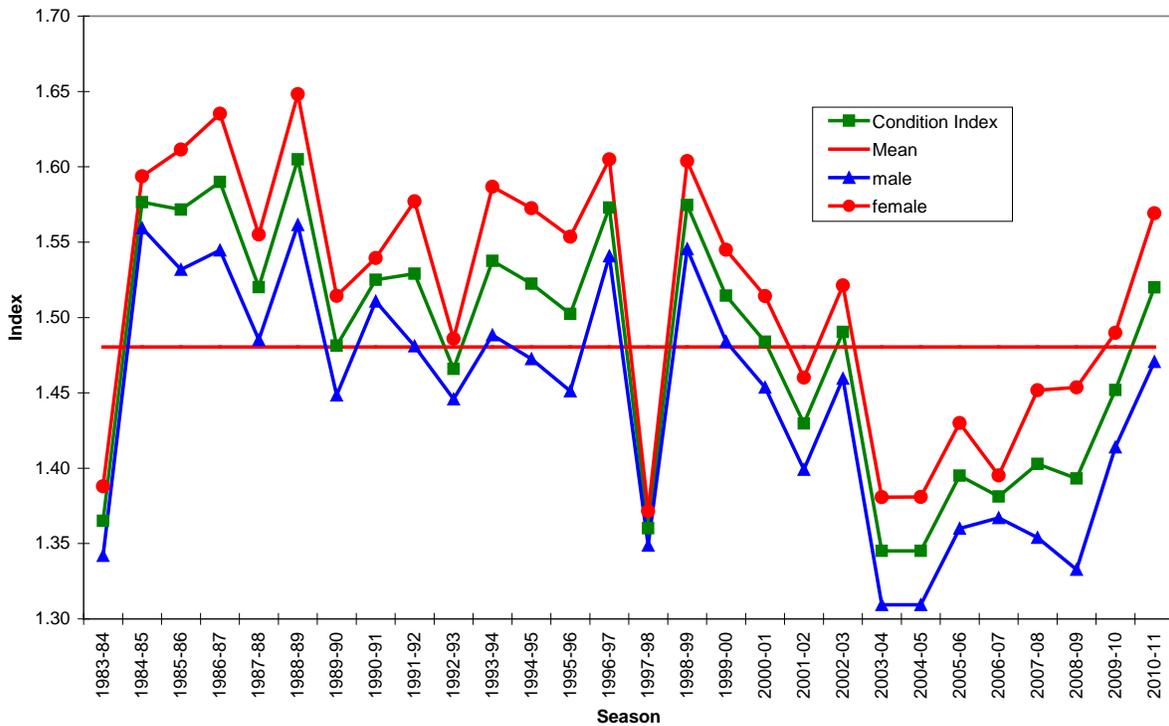


Figure 3.3 Historical Condition Indices for Ripe San Francisco Bay Pacific Herring

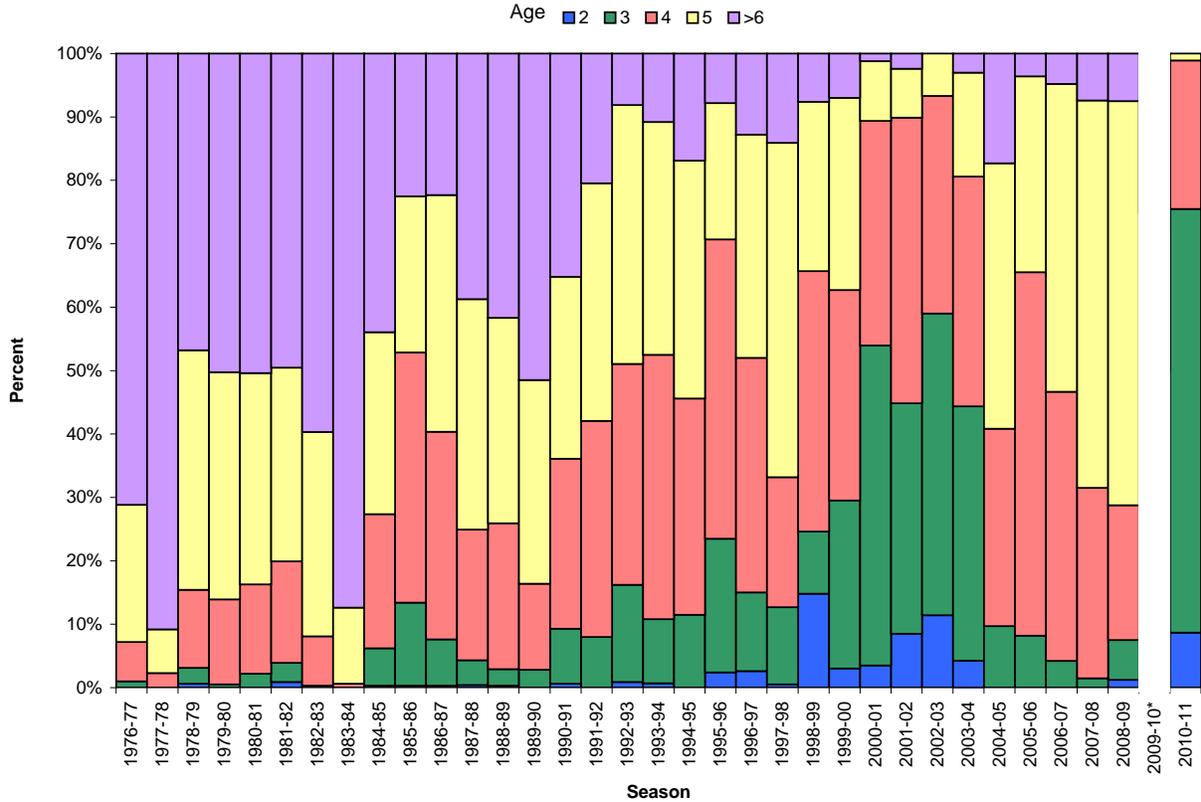


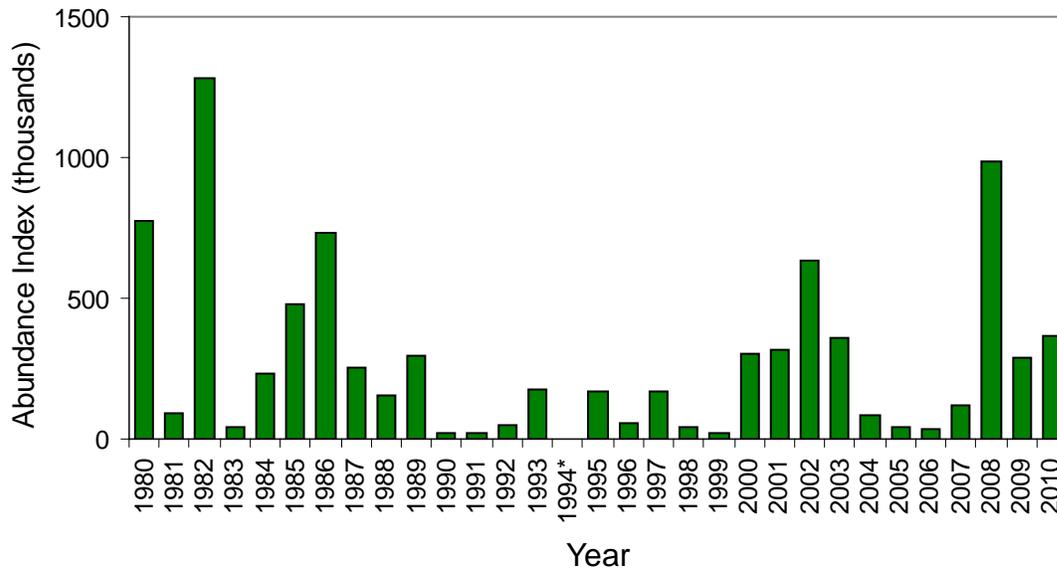
Figure 3.4 Age composition of the Commercial gillnet catch for the San Francisco Bay herring fishery. \*There was a zero ton quota and therefore, no commercial catch during the 2009-10 season.

### 3.3.1 San Francisco Bay Herring Young of the Year (YOY)

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 2010 was near the average for the period of record (Figure 3.4) which was expected, considering the near average herring spawning biomass estimate for the 2009-10 spawning season. The abundance of YOY

indicated favorable environmental conditions for survival within San Francisco Bay (Hieb et al, 2011). 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.



**Figure 3.5 San Francisco Bay herring young-of-the-year abundance indices 1980-2010. \*No index was calculated for 1994.**

### 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; however, the results are still under review. The findings of the NRDA report will assist in determining the immediate and long-term impacts to herring resources and direct management activities for San Francisco Bay herring. Field observations by Department staff indicated that key spawning areas were oiled during the spill. A review of existing literature indicates that 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 referenced in 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. As a key forage species, low biomass levels of herring could impact important recreational and

commercial species as well as threatened and endangered fish, marine mammals, and sea birds that rely upon them as a food source.

Specifically, herring are a crucial part of the San Francisco Bay food web. Herring, at each life history stage from egg to adult, are utilized as forage within San Francisco Bay. Spawning herring are an important food source for marine mammals and birds residing within the bay during the winter, when many other fish leave the bay. Herring eggs are consumed by at least 20 species of birds (including several species of ducks and gulls) in addition to non-avian predators such as sturgeon, surfperch, smelt and crab. Invertebrates, surfperch and young salmonids have all been documented as predators of herring larvae. Juvenile herring support a wide range of San Francisco Bay species, as a food source, from spring through fall. In offshore waters, adult herring are consumed by Pacific whiting, salmon (chinook and coho), sharks, sablefish, striped bass, steelhead, Pacific cod, rockfish, and walleye pollock. Herring are also consumed by marine mammals including harbor seals, northern fur seals, California sea lions, porpoises, dolphins, and whales.

Because herring play an important role as a forage species in ocean and bay ecosystems, it is vital that management concepts take into account these complex interactions. Herring occupy a crucial intermediate trophic level, between plankton and larger predators, which is usually comprised of only a few species (typically small pelagic fish). Changes in abundance of a forage species such as herring may lead to changes in the abundance of other species. Given the rebuilding status of the San Francisco Bay stock, the importance of conserving herring becomes vital to ensure long-term sustainability of the fishery while safeguarding its importance as a forage species in a functioning ecosystem.

## 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 Final Environmental Document (FED). The proposed project and two of the three alternatives will permit a continuation of the regulated commercial harvest of Pacific herring (herring), *Clupea pallasii*, in California. An analysis of the impacts of the proposed project is discussed in this Final Supplemental Environmental Document (FSED).

Existing regulations permit the commercial harvest of herring in four geographical areas: San Francisco Bay, Tomales Bay, Humboldt Bay, and the Crescent City Harbor 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 stock assessments 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 of Fish and Game 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 FSED. 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 Final Environmental Document (FED). Three commercial harvest alternatives were selected for consideration by the California Fish and Game Commission (Commission) based on the Department of Fish and Game's (Department) recommendation, public comment received during the normal review process, or in response to the Notice of Preparation (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 Pacific herring (herring), *Clupea pallasii*, 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 crops 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 2010, were for the 2010-11 herring commercial fishing season. These regulations reflect the amendments as adopted by the Commission in September 2010. Under Alternative 2, changes would be made to revise the herring fishing seasons by location or adjust quotas to reflect the 2010-11 biomass estimate determined by the Department. In most regards, the environmental impacts of Alternative 2 will be similar to those of the proposed project. Alternative 2, however, does not address problems or conditions that are addressed by the proposed project.

## **5.3 Alternative 3 (individual vessel quota)**

This alternative modifies Alternative 2 by establishing individual boat quotas for the roe 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, overall quotas have typically been met 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 Final Environmental Document (FED) explains the role that consultation with other agencies, professionals, and the public plays in the Department of Fish and Game (Department) marine resource management programs. Department staff, involved in Pacific herring (herring), *Clupea pallasii*, resource management, is 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 received all environmental documents that have been prepared regarding herring. To date, we have not received any comments from these agencies.

Consultations also occur 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 2011-12 season with the Director's Herring Advisory Committee (DHAC) on April 6, 2011.

Proposed changes to the regulations for the 2011-12 season were modified, as necessary, based on comments from the DHAC. These recommendations will be presented to the California Fish and Game Commission (Commission) at their June 30, 2011, meeting.

Prior to preparation of the Draft Supplemental Environmental Document, the Department initiated a broader consultation by distributing a Notice of Preparation (NOP) that announced the intent to prepare the document dated April 18, 2011. 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 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.

## **Chapter 7. RESPONSES TO COMMENTS REGARDING THE PROPOSED PROJECT**

Pursuant to Sections 2180.5 (d)(2)(vi) and 2180.5 (d)(3)(ii) of the Public Resources Code, a copy of the Draft Supplemental Environmental Document (DSED) was placed on file and made available for public review for a 45-day period. Notice was given at the time of filing that any person interested in commenting on the DSED should do so, in writing, by 5:00 p.m. on August 4, 2011, to the Fish and Game Commission office in Sacramento. Notice was also given that any person interested may present oral or written testimony relevant to the DSED at the Commission's public hearing for discussion of proposed herring fishing regulations on Wednesday, August 3, 2011, in Sacramento, California. No comments were received by either the Commission, or the Department, on the DSED.

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# **Appendix A**

## **Summary of Changes**

## **Summary of Changes to the 2011 Draft Supplemental Environmental Document for Pacific Herring Commercial Fishing Regulations**

This appendix provides a summary of the changes made to the Draft Supplemental Environmental Document (DSED) based updated information on age data for San Francisco Bay, and minor grammatical changes for clarity.

### General changes throughout the Document

- References to the DSED were changed to FSED (Final Supplemental Environmental Document) where applicable.
- Misspellings, grammatical errors, and errors in graph or table identification, were corrected.

### Summary

- The following text was changed in S.1 Introduction, paragraph 2 to show the number of chapters in the FSED: The FSED includes seven chapters.
- The following text was added to S.1 Introduction, paragraph 2: Chapter 7 responds to public comments regarding the proposed project.

### Table of Contents

- The table of contents was revised to match any page numbers that changed during the process of finalizing the FSED document.
- Chapter 7, Responses to Comments Regarding the Proposed Project was added.
- Appendix A, Summary of Changes was added.

### Chapter 1. Introduction

- Minor editorial changes were made to improve clarity.

### Chapter 2. Project Description

- Minor editorial changes were made to improve clarity.
- The following sentence was revised for clarity in Section 2.3.1.1 San Francisco Bay 2011-12 Quota, paragraph 1: The Department's recommendation of a five percent harvest rate for 2011-12 will help reduce fishing mortality, which will be critical for continued stock recovery.
- The following sentences were revised in Section 2.3.1.1 San Francisco Bay 2011-12 Quota, paragraph 2 for clarity and to include completed age data analysis: Based on age data from the 2009-10 research catch, the increase in spawning biomass was due to recruitment of 3-year old herring (2007-08 year class) to the spawning population. This year class is the most robust of recent seasons and while the increase in biomass is encouraging, it will be subjected to increased fishing pressure when it returns as 4-year olds in the 2011-12 season. As a result, the Department remains concerned over the recruitment of age four and older herring to the spawning population and its importance to a healthy age-class structure. However, the Department considers that appropriate harvest controls will allow strong year classes to support a fishery for several seasons.

- The following sentence was revised for clarity in Section 2.3.1.1 San Francisco Bay 2011-12 Quota, paragraph 3: As the stock recovers, the Department considers that a limited quota maintains sustainability while safeguarding sufficient numbers of herring for stock rebuilding.

### Chapter 3. Environmental Setting

- The following sentences were revised in Section 3.3 Status of the San Francisco Spawning Population, paragraph 1 for clarity and to include completed age data analysis: Age composition data indicates that the increase in spawning biomass was due to a strong recruitment of 3-year old herring to the spawning population (Figure 3.1). The strength of this year class was first noted during the 2009-10 season when fish returned to the bay as 2-year herring. The increase in recruitment, as well as improved physical condition, is likely due to more favorable biological and environmental conditions, both in estuarine and oceanic ecosystems.  
The following sentences were revised in Section 3.3 Status of the San Francisco Spawning Population, paragraph 6 for clarity and to include completed age data analysis: The age composition estimate for the 2010-11 season shows a rebuilding of the spawning stock through a strong recruitment of 3-year old herring (2007-08 year class) (Table 3.2). Based on both length frequencies and age estimates, the 2007-08 year class (3-year old fish) was the dominant year class during the 2010-11 season. During the last several seasons, the herring population structure has experienced a truncation of age classes which continued during the 2010-11 season and is expected for the 2011-12 season. The numbers and proportion of older herring remain well below historical averages and is of concern because these older fish historically supported the commercial fishery.
- The following sentence was added to Section 3.3 Status of the San Francisco Spawning Population, paragraph 6: This is the primary reason the Department recommends a five percent quota for the commercial herring fishery.
- The preliminary age data found in Figure 3.1 of the DSED was updated using final age data based on a comprehensive analysis of herring otoliths.
- The following sentences were revised in Section 3.8, paragraph 1 for clarity and to include completed age data analysis: Age composition analysis indicated the increase in spawning biomass was due to strong recruitment of 3-year old herring to the spawning population.
- Minor editorial changes were made in Section 3.3 Status of the San Francisco Spawning Population, paragraph 9, additionally the following sentences were changed to improve clarity. The 2007-08 year class is the strongest in recent seasons and this year class will likely compose the majority of commercial catches in the upcoming season (Figure 3.4). As a result, management should consider conservation of this year-class to prevent overexploitation by the fishery.
- The preliminary age data found in Table 3.2 of the DSED was updated using final age data.

- Figure 3.4 was updated using completed age composition analysis. The DSED does not include 2010-11 commercial age data.
- The following sentence was revised in Section 3.3.1 San Francisco Bay Herring Young of the Year (YOY), paragraph 2 to include completed young-of-the-year analysis: The herring YOY abundance index for 2010 was near the average for the period of record (Figure 3.4) which was expected, considering the near average herring spawning biomass estimate of 2009-10.
- Figure 3.5 was updated using final young-of-the-year abundance data. The DSED does not contain 2010 young-of-the-year abundance data.

#### Chapter 4. Environmental Impact Analysis and Cumulative Effects

- No changes

#### Chapter 5. Analysis of Alternatives

- No changes

#### Chapter 6. Consultation

- No changes

#### Chapter 7. Response to Comments

- This chapter is added to all FSEDs.
- No comments were received.

#### Appendix A Summary of Changes

- Added