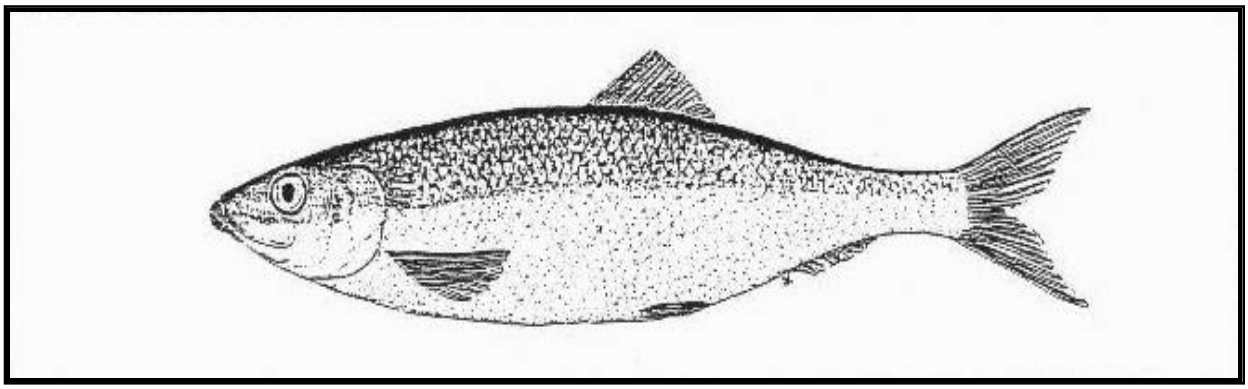
SCH No. 98052052

FINAL

SUPPLEMENTAL ENVIRONMENTAL DOCUMENT

PACIFIC HERRING
COMMERCIAL FISHING REGULATIONS

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



2007
STATE OF CALIFORNIA
THE RESOURCES AGENCY
DEPARTMENT OF FISH AND GAME

DRAFT SUPPLEMENTAL ENVIROMENTAL DOCUMENT
PACIFIC HERRING COMMERCIAL FISHING REGULATIONS

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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 was done to assist the California Fish and Game Commission (Commission) in regulating the commercial harvest of Pacific herring throughout the State's ocean and estuarine waters. Specifically, the FSED reviews and evaluates proposed regulatory changes for the 2007-08 fishing season, supplementing, and in some cases replacing, aspects of the proposed project described in the 1998 FED and the Final Supplemental Environmental Documents (FSED) of 1999, 2000, 2001, 2002, 2004, 2005, and 2006. A Notice of Preparation (NOP) was used to identify and incorporate 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 7 chapters. Chapter 1 discusses the authorities and responsibilities under which the Draft Supplemental Environmental Document (DSED) 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 State's CEQA policy

with respect to the conservation, sustainability, maintenance, and utilization of the Pacific herring resource.

S.2 Proposed Project

The proposed project is a body of proposed regulations governing the commercial harvest of herring-for-roe products, the harvest of herring eggs-on-kelp, and the harvest of herring as fresh fish, for bait, and pet food. The proposed project takes the form of recommendations for continuation, amendment, or change to an existing body of regulations in effect since December 2006 (Sections 163,163.5, and 164, Title 14, CCR). It also includes regulations from Section 163.1, Title 14, CCR, that were adopted by the Commission on December 10, 2005.

The proposed regulatory changes will establish fishing quotas for San Francisco Bay for the 2007-08 herring fishing season and beyond, 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 2007-08 season will: (1) provide the Commission the option to consider a quota equal to 0-10% of the most recent spawning biomass estimate, the Department's recommendation for the 2007-08 season is 1,094 tons, (which is 10% of the 2006-07 spawning biomass); (2) set the dates of the roe herring fisheries in San Francisco Bay from 5:00 p.m. on December 2, 2007 until noon on December 21, 2007. ("DH" gill net platoon only), and 5:00 p.m. on January 2, 2008 until noon on March 21, 2008; (3) set the dates of the roe herring fishery in Tomales Bay from noon on December 26, 2007 until noon on February 29, 2008; (4) grant authority to the Director of Fish and Game, for the 2008-09 season and beyond, to choose a quota within the range of 0-15% of the most current biomass estimate for San Francisco Bay; (5) grant authority to the Director of Fish and Game, for the 2008-09 season and beyond, to choose season dates; (6) extend the distance that herring gill net permittees are allowed to be from fished nets, from 1 nautical mile to 3 nautical miles.

S.3 Project Alternatives

Three alternatives 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 and Tomales 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 also occur in the Crescent City Harbor area, Humboldt Bay, and the open ocean, primarily within Monterey 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 Department conducted 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 fishery)

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 (no change)

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 2007 and would not provide for the 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.

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

S.6 Areas of Controversy

The following area of controversy has been identified regarding commercial herring fishing in prior years and is addressed in Chapter 3 of this FSED:

- Status of the herring population in San Francisco Bay

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 are needed to specify the areas, seasons, fishing quotas and other appropriate special conditions under which fishing operations may be conducted. 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, and the 2006 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 (*Clupea pallasi)* 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 is the proposed changes to the regulations for the 2007-08 California Pacific 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; the (6) the FSED, certified by the Commission in August 2004; (7) the FSED, certified by the Commission in September 2005; and (8) the FSED certified by the Commission in October 2006. The FED outlines the full proposed project consisting of the operation and management of California's Pacific herring commercial fisheries and can be found on the Department's website at: http://www.dfg.ca.gov/marine/herring/ceqa.asp.

The FSED of 1999, 2000, 2001, 2002, 2004, 2005, and 2006 provided for revisions of the proposed project contained in the FED and regulatory revisions necessary for the 1999-2000, 2000-2001, 2001-02, 2002-03, 2004-05, 2005-06, and 2006-07 Pacific herring commercial fishing seasons, respectively. Environmental documents (DSED and FSED) were not prepared for the 2003-04 season. At the close of the 2002-03 fishing season, the Department proposed to implement a two-year

regulatory cycle so that regulatory changes, other than proposed quotas and season dates, would be considered every two years instead of annually. A two-year cycle was designed to relieve the annual burden of detailed review of the herring regulations. This FSED supplements the existing certified environmental documents and provides revisions to the regulations for the 2007-08 Pacific herring commercial fishing season.

The Department and Commission hold the public trust for managing the State's 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 Resources. With certification, an agency may prepare functional equivalent environmental documents in lieu of EIRs or NDs.

The regulatory program of the Fish and Game Commission has been certified by the Secretary for 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 3, 2007. Following the release of the NOP, the 30-day public comment period pursuant to CEQA for the DSED ended May 4, 2007. Pursuant to CEQA regulations, a 45-day public comment period for reviewing the DSED was from July 19, 2007 to September 1, 2007.

This FSED is the eighth Final Supplemental Environmental Document (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 certified by the Commission in August 2002, the fifth certified by the Commission in August 2004, the sixth certified by the Commission in September 2005, and the seventh certified by the Commission in October 2006. 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 fisheries management plan (FMP).

1.3 Scoping Process

The Department invited industry members and interested parties to a town hall meeting held on January 19, 2007 in Sausalito, Marin County. In addition, a Director's Herring Advisory Committee (DHAC) meeting was held on March 16, 2007 in Sacramento. 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. Pursuant to CEQA, the Department distributed, for the Commission, an NOP to interested parties on April 3, 2007. This provided a 30-day opportunity for the Lead Agency to obtain information about the scope and content of the DSED from interested federal, state and local agencies as well as the general public.

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 (MLMA). 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 increased 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 and 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 Pacific herring until an FMP can be developed.

1.4 Report Availability

This FSED Document is available at depository libraries for each of the counties in the affected areas, 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.

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 fisheries 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 Pacific 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 Pacific herring commercial fishing season. These meetings will be held for the 2007-08 season on August 10, 2007 in Santa Barbara, and October 12, 2007 in Concord. 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 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 Pacific 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 Pacific herring stocks in California. Project objectives to achieve 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 Pacific herring to achieve a sustainable fishery;
- Provide sufficient Pacific herring to conserve living resources of the ocean that utilize herring as a food source;
- Provide sufficient Pacific 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 (FGC) 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 2007-08 commercial herring fishing season. The proposed project adjusts fishing quotas by area and gear type. Quota recommendations for San Francisco Bay and Tomales Bay are primarily based on the most recent assessments by the Department of Fish and Game (Department) of the size of the spawning populations of herring in those areas. Other proposed amendments and changes are intended to improve the efficient and orderly conduct of herring fisheries and the management of herring stocks.

2.2 Project Locations

Permits have been issued for commercial herring fishing in 5 geographically distinct areas of the ocean and 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.

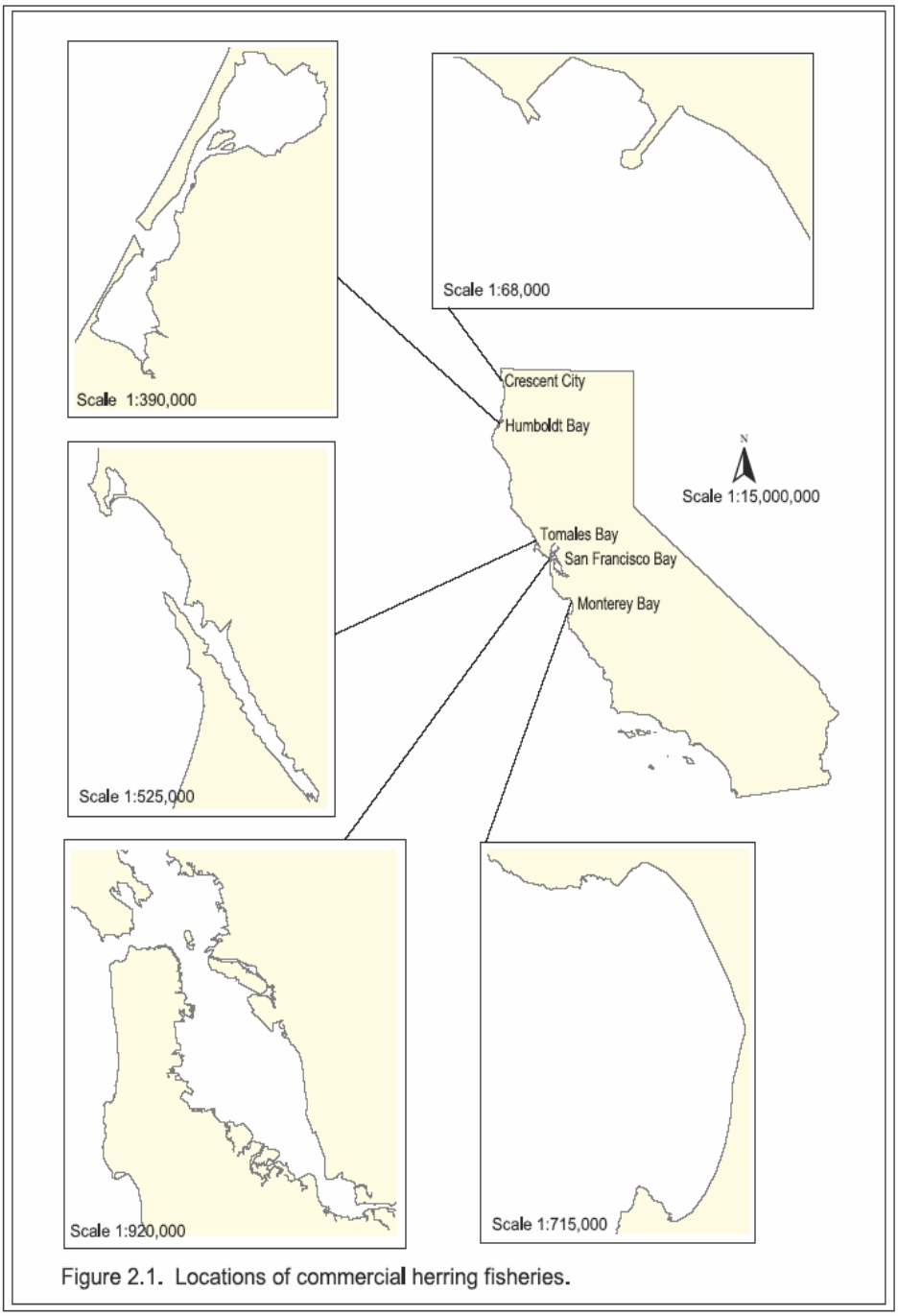

Figure 2.1. Locations of commercial herring fisheries.

2.2.1 San Francisco Bay

The proposed commercial herring fishing dates and quotas by location are as follows:

2.2.1.1 Roe Herring Fishery

Season: 5:00 p.m. on Sunday, December 2, 2007 until noon on Friday, December 21, 2007; and 5:00 p.m. on Wednesday, January 2, 2008 until noon on Friday March 21, 2008.

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

Gill net permittees (DH) December 2-7, December 9-14 and December 16-21, and, if necessary, after other platoons have reached their quotas, until the DH quota is reached or the last day of the season.

Gill net permittees (Odd #) January 2-4, January 13-18, January 27-February 1, February 10-15, February 24-29, and March 9-14.

Gill net permittees (Even #) January 6-11, January 20-25, February 3-8, February 17-22, March 2-7, and March 16-21.

Quota: The total take of herring in San Francisco Bay for commercial purposes shall not exceed 0-10% of the most current biomass estimate for San Francisco Bay based on the determination of the Department as to the status of the stock and utilizing the best science available, including but not limited to information from recent fishery-independent field surveys, commercial catches, age composition, and environmental data. The Department's recommendation for the 2007-08 season is 1,094 tons, which is 10% of the 2006-07 spawning biomass.

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, 2007 to March 31, 2008

Quota: A 1,094-ton quota for San Francisco Bay would result in a 1.9-ton individual quota for transferred "CH" gill net permits and a 0.9-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 November 15, 2007 and April 1 through October 31, 2008.

Quota: 20 tons, except that 10 tons total may be transferred to gill net permittees participating in research sponsored by the Department.

Note: No permittee may take or possess herring except in the amount specified on a current daily market order, not to exceed 500 pounds, from a licensed fish dealer.

Area: Same as the roe herring fishery.

2.2.2 Tomales Bay

The proposed Department commercial herring fishing dates and quotas by location are as follows:

2.2.2.1 Roe Herring Fishery

Season: Noon on Wednesday, December 26, 2007 until noon on Friday, February 29, 2008. 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 November 15, 2007 and April 1 through October 31, 2008.

Quota: 10 tons

Note: No permittee may take or possess herring except in the amount specified on a current daily market order, not to exceed 500 pounds, from a licensed fish dealer.

Area: Same as roe fishery.

2.3 Project Characteristics

The proposed project recommends continuation of the existing regulations as modified by changes discussed below for San Francisco and Tomales bays. No modifications are proposed for Crescent City Harbor area, Humboldt Bay, and open ocean herring fisheries. 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 eggs-on-kelp 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 and Tomales bays (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 2007-08 season included: (1) providing the Commission the option to consider a quota equal to 0-10% of the most recent spawning biomass estimate. The Department's recommendation for the 2007-08 season is 1,094 tons, which is 10% of the 2006-07 spawning biomass; (2) set the dates of the roe herring fisheries in San Francisco Bay from 5:00 p.m. on December 2, 2007 until noon on December 21, 2007.

("DH" gill net platoon only), and 5:00 p.m. on January 2, 2008 until noon on March 21, 2008; (3) set the dates of the roe herring fishery in Tomales Bay from noon on December 26, 2006 until noon on February 29, 2008; (4) grant authority to the Director of Fish and Game, for the 2008-09 season and beyond, to choose a quota within the range of 0-15% of the most current biomass estimate for San Francisco Bay; (5) grant authority to the Director of Fish and Game, for the 2008-09 season and beyond, to choose season dates; (6) extend the distance that herring gill net permittees are allowed from fished nets, from 1 nautical mile to 3 nautical miles. No quota changes were made for the Crescent City Harbor area and 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, and 1990-91, and discontinued following the 1991-92 season; surveys were resumed beginning with the 2000-01 season. Spawning ground surveys are used to estimate spawning biomass in San Francisco, Tomales, and Humboldt bays. Spawning ground surveys assess the total number of eggs spawned and this data is 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 by meshing the results 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. Trawl surveys were used to support the location and timing of the spawn deposition survey. Spawning biomass estimates for San Francisco, Tomales, and Humboldt bays are shown in Figures 2.2, 2.3 and 2.4 respectively. The Department does not conduct spawning biomass surveys in the Crescent City Harbor area.

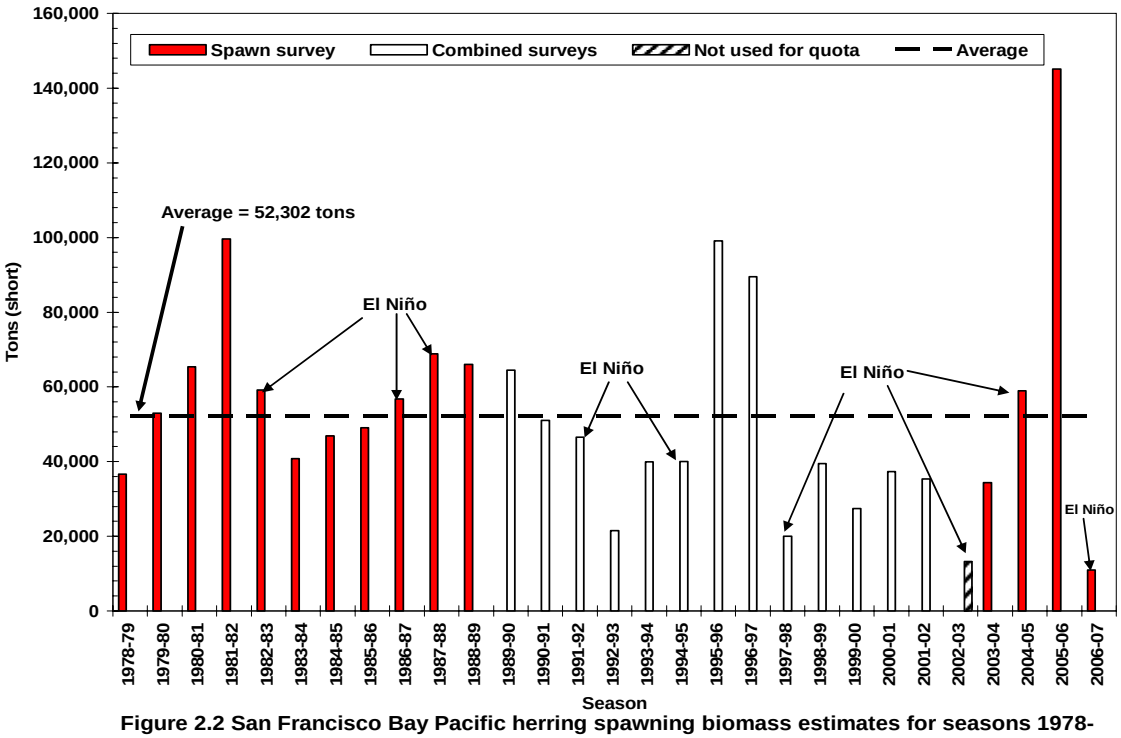

Figure 2.2 San Francisco Bay Pacific herring spawning biomass estimates for seasons 1978-79 to 2006-07

Note: Source for El Niño events

<http://www.cpc.ncep.noaa.gov/products/monitoring_and_data/ENSO_connections.shtml>

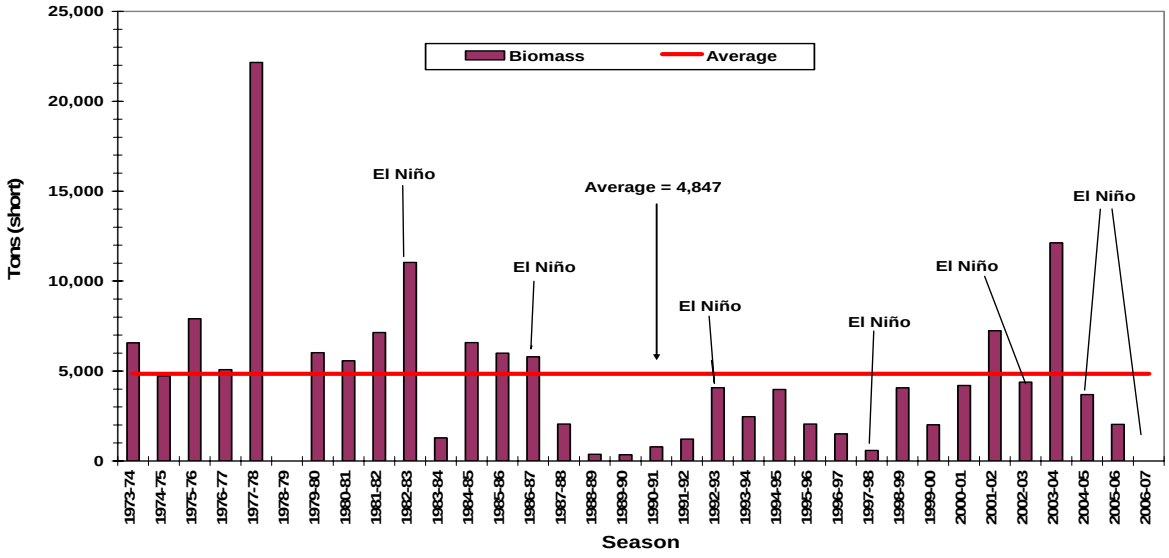

Figure 2.3. Pacific herring spawning biomass estimates for Tomales Bay

Note: No spawning biomass surveys were conducted in the 1978-79 season or the 2006-07season.

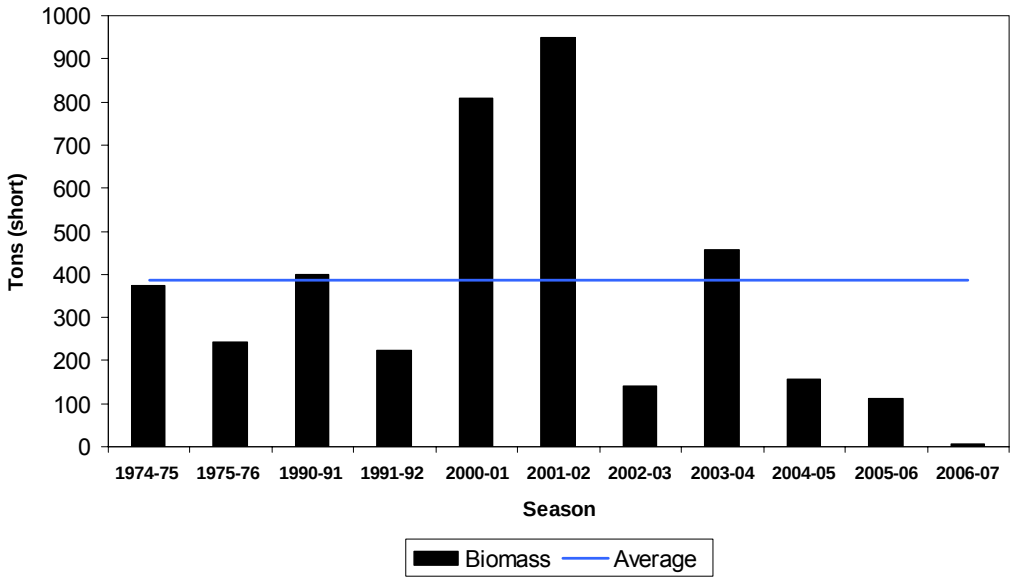

Figure 2.4 Pacific herring biomass estimates for Humboldt Bay for seasons surveyed
Note: Biomass estimates for 2000-01, 2001-02, and 2002-03 were revised in March 2006 using Humboldt Bay eelgrass coverage data previously not available for those seasons.

Annual roe herring fishery quotas are conservative and historically were set to insure that the total catch did not exceed 20 percent of the previous season's spawning biomass estimate, taking into account possible accidental overages and other management uncertainties. The previous season's biomass is considered the best available estimate to quantify herring returning the following season. This exploitation level was selected, based upon computer model simulations developed by the Pacific Fisheries Management Council (Section 3.2.4 of the FED), to help ensure adequate protection of the herring resource while providing long-term sustainability of the fishery. Typically, exploitation rates of no more than 15 percent have been recommended to prevent the 20 percent maximum harvest rate from being exceeded. Quotas are not determined by a fixed percentage; they are modified based on additional biological and fishery data collected each season, such as growth rates, strength and importance of

individual year-classes, recruitment of incoming year-classes, and oceanographic conditions.

The 2006-07 spawning biomass estimate for San Francisco Bay is 10,935 tons, which is far below the 28-year average of 52,302 tons (2002-03 spawn deposition and hydroacoustic surveys were not used for quota calculation and omitted in this average). Landings from the San Francisco Bay roe herring fishery totaled 292 tons, 4,210 tons less than the 4,502-ton quota. This harvest level is 2.7 percent of the season's spawning biomass estimate. In Tomales Bay, due to low staffing levels there was no spawning biomass estimate calculated. Tomales Bay roe herring landings totaled 1.2 tons; 348.8 tons less than the 350-ton season quota.

The spawning biomass estimate in Humboldt Bay for the 2006-07 season is only 7 tons, which results in an average spawning biomass of 386 tons for the 11 seasons of spawn assessment surveys conducted in the bay. The 2004-05 and 2005-06 seasons were also below the 11 season average with 157 and 111 tons estimated, respectively. There has been no fishing effort by Humboldt Bay permittees for the last 2 seasons.

Spawning ground surveys and commercial fishery assessments were not conducted in the Crescent City Harbor area for the 2006-07 season. Although 2 permits are active in Crescent City, no fishing effort has taken place in the Crescent City Harbor area for the past 5 seasons. The Department does not plan to conduct spawning ground surveys and commercial fishery assessments in the Crescent City Harbor area for the 2007-08 season.

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 brought forward by the Department.

2.3.1 Roe Herring Fisheries

2.3.1.1 San Francisco Bay 2007-08 Quota

The 2006-07 spawning biomass estimate for San Francisco Bay is 10,935 tons (including catch), which is far below the 28-year average of 52,302 tons and a 92 percent decrease from last season's estimate of 145,054 tons. Since the 2002-03 season, the Department has expressed concern regarding the health, specifically the age structure, of the San Francisco Bay herring population. One of the Department's herring fishery management goals is to target the harvest of age 4 and older herring and to minimize the harvest of 2- and 3-year old fish, many of which are first-time spawners. The use of 2 inch mesh gillnets in the San Francisco Bay fishery has the potential to increase the take of 2- and 3-year old fish in the commercial catch; however, the percentage of 2- and 3-year old fish in the catch decreased during the 2006-07 season (Figure 2.5). Since the 2002-03 season, the percentage of 2- and 3-year old herring has declined in the commercial catch due to poor growth resulting in smaller-at-age herring that are less susceptible to the selectivity of 2 inch mesh gill nets. A coast-wide trend in deceasing mean length at age, and a truncation in age-classes have been reported for herring fisheries along the eastern Pacific coast in British Columbia and Alaska.

The spawning biomass estimate for this season is the lowest recorded estimate in the history of the roe herring fishery (1978-79 season to present). The precipitous drop in spawning biomass from a record high in 2005-06 to a record low in 2006-07 may have been caused by unfavorable environmental ocean conditions associated with an El Niño event, and an unusually dry winter for San Francisco Bay.

The Department is providing the Commission the option to consider a quota 0-10 percent of the most recent spawning biomass estimate. The Department's recommendation for the 2007-08 season is 1,094 tons, which is 10 percent of the 2006-07 spawning biomass. The Department continues to be concerned about the status of the herring population in San Francisco Bay; however, we believe that our

recommendation represents a conservative approach. The number of boats fishing the San Francisco herring fishery has decreased substantially in the last several years. Since the 2004-05 season, the number of boats actively fishing has gone from over 40 to 25 and both herring permittees and herring buyers anticipate that the number of boats actively fishing during the 2007-08 season to decrease further. Given the decline in the number of active participants in the fishery and the possibility for improved environmental conditions the Department believes that a 1,094 ton quota will provide for a small fishery for the permittees while maintaining conservation safeguards against overexploitation.

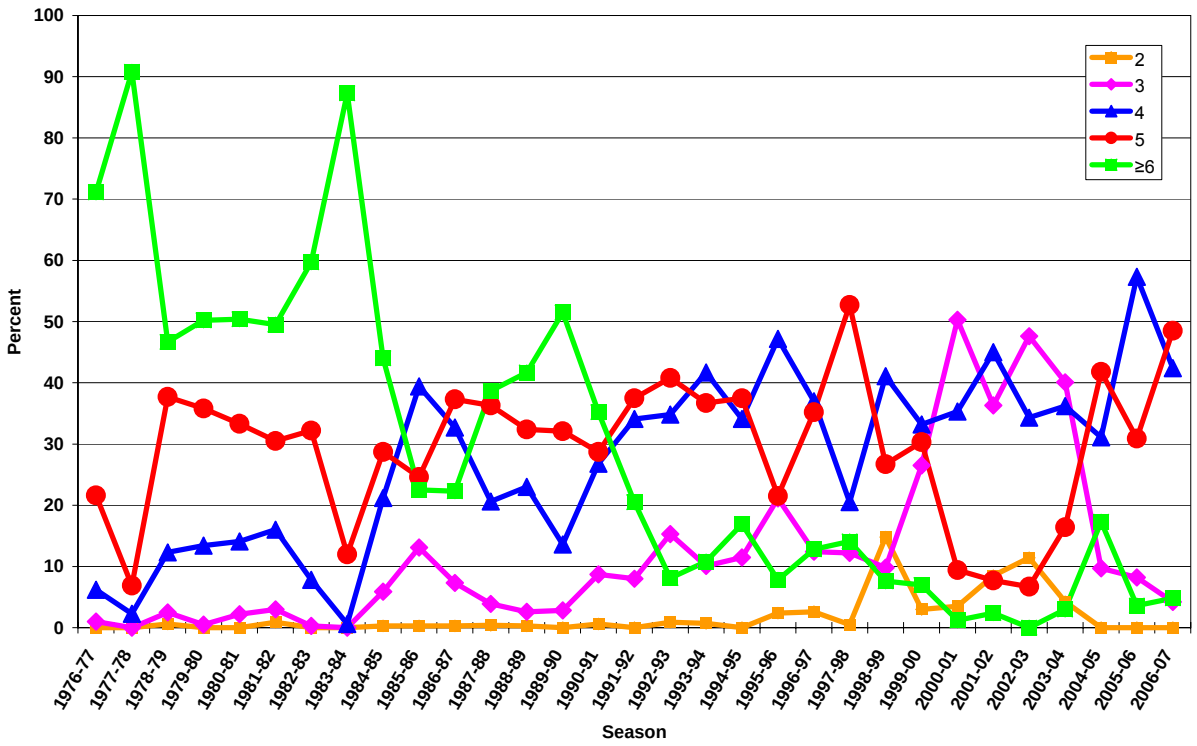

Figure 2.5 Age composition of the commercial gill net catch for the San Francisco Bay herring fishery

Note: The percentages for 6-year olds are fish age 6 and above combined.

Within the overall quota in San Francisco Bay, separate quotas are established for each gill net platoon (i.e., December ("DH"), Odd, and Even platoons). The overall quota is divided among the three platoons in proportion to the number of permits assigned to them. Slight annual adjustments in the quota portions assigned for each platoon are needed to account for attrition of permittees and the use of sac roe herring permits in the herring eggs-on-kelp fishery.

2.3.1.2 Tomales Bay 2007-08 Quota

No spawning biomass estimate was calculated for the 2007-2008 season in Tomales Bay. This was due in part to a lack of available staff resources within the Department. However, limited monitoring was undertaken when time and weather permitted. The spawn survey will resume for the 2007-2008 season and a spawning biomass estimate will be available in 2008. During the 2006-07 season, the commercial gill net quota was set at 350 tons. The 1.2 tons landed during the 2006-07 season was the lowest landing since the fishery re-opened in 1992-93 season.

For the 2007-08 season, the Department proposes to keep the Tomales Bay catch quota at 350 tons. There is no allowance for an in-season quota increase based on the spawning escapement level. The Department's management strategy is to set the catch quota at 350 tons for the 2007-08 season and subsequent seasons. This conservative fixed catch quota is based upon data collected over 34 seasons of managing the Tomales Bay herring fishery. A low set quota based on the overall average season biomass will keep the exploitation rate well below the Department's recommended maximum harvest rate of 20 percent. The proposed quota represents an exploitation rate of 8.7 percent of the average spawning biomass since the Tomales Bay fishery was re-opened in the 1992-93 season. The actual exploitation rate for this fishery over the same period averaged 5.3 percent. Coupled with the decline in fishing effort for Tomales Bay, the Department is confident that a conservative quota will

sufficiently protect the spawning biomass and help sustain the Tomales Bay herring population.

2.3.1.3 Humboldt Bay and Crescent City Harbor 2006-07 Quota

The 2006-07 herring season marked the seventh consecutive year that spawning ground surveys and commercial fishery monitoring and assessment were carried out in Humboldt Bay since these surveys were discontinued following the 1991-1992 herring season. The 2006-07 spawning biomass estimate in Humboldt Bay is 7 tons. This is the lowest biomass estimate recorded in the 11 seasons of spawn assessment surveys conducted in Humboldt Bay, and is just a fraction of the 11-season average of 386 tons. The 2004-05 and 2005-06 seasons were also below the 11-season average with 157 and 111 tons estimated, respectively.

There has been no fishing effort for the last two seasons by Humboldt Bay permittees. After three seasons of far below average catches, concern grew among permittees about the overall health of the Humboldt Bay herring population. A long-time Humboldt Bay herring permittee attributed low landings during the 2002-03, 2003-04, and 2004-05 seasons to a disproportionate amount of small herring entering the bay which were unavailable to commercial 2¼ inch mesh nets. The quota of 60 tons for Humboldt Bay has only been reached once since the 1997-98 El Niño with the herring landings since that event averaging only 15 tons per year.

The average yearly catch for Humboldt Bay permittees since 1983, when the quota was set at 60 tons, is 37 tons. For the last 5 seasons that had fishing effort, the average total landings per year was close to 20 tons with a range of just below 0.6 tons in 2003-04 to 61.2 tons in 2000-01 season. While biomass estimates for the last 4 seasons were far below average, the exploitation rate during 2002-03 and 2003-04 seasons remained below 1 percent with no exploitation occurring 2005-06 and 2006-07. The average yearly biomass estimate from the last 7 spawn assessment surveys conducted since the 2000-01 season is 375 tons. A 60-ton quota based on this average would result in a 16 percent exploitation rate, which is considered an acceptable rate of harvest. Spawn assessment data from recent and historic surveys suggests that the

Humboldt Bay spawning population can continue to support the 60-ton seasonal quota established in 1983. The Department proposes no changes to quotas for the Humboldt Bay or Crescent City Harbor area herring fisheries for the 2007-08 season. The previously set quota for Humboldt Bay and Crescent City Harbor area is 60 tons and 30 tons, respectively.

2.3.1.4 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. 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 March 16, 2007, was to recommend that the dates and times of the roe herring fisheries in San Francisco Bay be set from 5:00 p.m. on Sunday, December 2, 2007 until noon on Friday, December 21, 2007 ("DH" gill net platoon only). Recommended dates for the odd and even platoons are from 5:00 p.m. on Wednesday, January 2, 2008, until noon on Friday, March 21, 2008. The consensus among Tomales Bay permittees was to recommend opening at noon on Wednesday, December 26, 2007, until noon on Friday, February 29, 2008. The Department concurs with the season dates for Tomales Bay.

2.3.1.5 Authority for Director of Fish and Game to Choose Quota

In an effort to streamline the regulatory process for the Pacific herring regulations, the Department proposes that the Commission grant the authority to Director of Fish and Game (Director) to choose the quota within a range of 0-15 percent of the most current biomass estimate for San Francisco Bay. The Director would establish the annual quota based on the determination of the Department as to the status of the stock utilizing the best science available, including but not limited to information from recent fishery-independent field surveys, commercial catches, age

composition and environmental data. The Director shall provide the Executive Director of the Fish and Game Commission and permitted herring fishermen with a memo stating the annual quota by May 15 of each year for the upcoming herring season.

The Department will continue to use a harvest strategy for the commercial herring fishery based on a mathematical model developed by the Pacific Fishery Management Council (PFMC). This model demonstrated that a 20 percent harvest rate of the estimated biomass would be sustainable for several years into the future under stable environmental and biological conditions. Since the 1997-98 El Nino event, the Department has taken a more conservative approach when setting harvest rates, with quotas averaging 10 percent (range 3-15 percent) of the previous season's biomass estimate for that 10-year period. This proposal would potentially reduce the number of regulatory packets that would have to be opened during the next few years, thus reducing the workload for Department and Commission personnel while maintaining the management strategy.

2.3.1.6 Authority for Director of Fish and Game to Choose Season Dates

Season opening and closing dates for San Francisco and Tomales bays, as well as the dates of various provisions of the regulations, have historically been adjusted each year to account for annual changes in the calendar. The Department proposes that the Commission grant the authority to the Director of the Department of Fish and Game to choose season dates for the 2008-09 season and beyond, with input from the DHAC, for the San Francisco and Tomales Bay fisheries. The Director shall provide the Executive Director of the Fish and Game Commission and permitted herring fishermen with a memo stating the season dates by May 15 of each year for the upcoming herring season. This would eliminate the need to open a regulatory packet to change season dates, which would help streamline the regulatory process for the Department and the Commission.

2.3.1.7 Extend the Distance Allowed from the Net from 1 Mile to 3 Miles

Subsection (f)(2)(A) of the roe fishery regulations specifies that herring gillnet permittees shall be within 1 nautical mile of any gill net being fished. The DHAC has recommended that herring permittees be allowed to extend that distance to 3 nautical miles. This would allow them to search for schools of herring while still legally fishing their gillnet gear.

The issue of restricting travel to no more than 1 mile from their fishing net was originally imposed to cut down on nets being left unattended for long periods of time. When the regulation was put in place, there was one permit on each boat and each herring permittee was allowed to fish 2 gillnets. Problems with unattended nets occurred even though they were properly marked with buoys at both ends and lighted at night. Other boaters utilizing San Francisco Bay were impacted, resulting in disabled boaters calling for help from the United States Coast Guard.

Since the regulation was put in place more than 10 years ago, the number of boats actively fishing in the fishery has declined. The sharpest decline has occurred in the last 3 years. Despite the decline, the Department is concerned that by allowing a permittee to be 3 miles from their nets it will increase the travel time for a permittee should a conflict with other boaters occur. The Department is also concerned that monitoring the location of the nets by enforcement personnel will prove more difficult. To alleviate this concern, each actively fishing herring permittee shall provide the means for enforcement personnel to contact the herring permittee should problems occur.

2.3.1.8 Seasonal Permit Transfer/Substitution Fee

Current language in the first paragraph of Section 163 states that, “the $50 transfer fee must be received in the Department’s License and Revenue Branch, Sacramento office no later than 5 working days after written approval of any boat transfer of permittee substitution”. The Department proposes to amend this paragraph to require that the fee of $50 for boat transfers and permittee substitution requests be submitted along with the written request for transfer or substitution. Fish and Game Code Section 1050.1 states that any license, permit, tag stamp, or entitlement authorized pursuant to this code is not valid until the fee authorized or identified in statue or regulation for that entitlement is received and paid to the Department or its agent.

2.3.1.9 Permit Issuance Date

Current language in the first paragraph of Section 163 specifies an “issuance date” of November 15. The Department proposes to remove the term “issuance date”. License and Revenue Branch issues licenses and permits as the applications and payment are received. It would not be practical to hold and issue all herring applications until November 15.

2.3.1.10 Changes for Clarity and Consistency

Existing language in Section 163(b)(1) outlines the requirements for submitting an application for a herring permit. Along with other requirements, it states that a “certificate of the boat registration” is needed. A certificate of boat registration does not exist. Therefore, for clarity, the Department proposes to remove “certificate of”.

In Section 163(b)(3), existing language specifies the due date for herring permit applications. It also states that if an application is not received or postmarked by the deadline date, it will not be eligible for consideration for the current herring season. Currently, the Commission applies penalties to late applications pursuant to Section 163.5(f)(2)(A)(3). Therefore, for consistency and clarity the Department proposes to remove the language “not be eligible for consideration for the current California herring

season", and add that applications and permit fees received after the above deadline "will be subject to Section 163.5(f)(2)(A)(3) of Title, 14, of the CCR."

Corrections to the Herring Eggs on Kelp Permit Application number in subsection 164(h)(1) are proposed to coincide with the 2007-08 season application.

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, alternative). Under this alternative, the commercial harvest of herring would be prohibited.

- Alternative 2 (existing regulations). 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 existing regulations for the commercial herring fishery are for the 2006-07 season. This alternative would apply those 2006-07 season regulations to the 2007-08 season, with changes in the quotas to reflect current biomass estimates and changes in season dates to reflect annual changes in the calendar. None of the other amendments to the regulations contained in the proposed project would be considered.

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 3 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, *Clupea pallasi*, 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 2 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 Pacific 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 Pacific 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 of the 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) in the females which are 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.

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 served as an appetizer typically during New Year's celebrations.

The only open ocean fishery for herring in California occurs during the non-spawning season in Monterey Bay. Landings from this fishery enter the aquarium food and bait markets. Small fisheries for fresh fish are also permitted during the non-spawning season in Tomales Bay and San Francisco Bay. 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 Pacific 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

Estimates of spawning biomass are made by the Department in Tomales and Humboldt bays using spawn deposition surveys (refer to Sections 3.4 and 3.5 below). For San Francisco Bay, the Department estimated spawning biomass using spawn deposition surveys from 1973-1974 through 1988-89 seasons. From the 1990-91 through 2001-02 seasons, the Department estimated spawning biomass from a combination of spawn deposition and hydroacoustic surveys for San Francisco Bay. In 2002-03, the Department was unable to generate a spawning biomass due to a wide discrepancy between the 2 survey methods. The Department assessed the 2 methods using the Coleraine Model, as well as having 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 estimates of spawning biomass, the Department collects fishery independent age composition data from the population, as well as 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 Bay Spawning Population

The 2006-07 spawning biomass estimate is 10,935 tons (including catch), a 92 percent decrease from last season's estimate of 145,054 tons (Figure 2.2). The spawning biomass estimate for this season is the lowest recorded estimate in the history of the roe herring fishery (1978-79 season to present). The precipitous drop in spawning biomass from a record high in 2005-06 to a record low in 2006-07 may have been caused by unfavorable environmental conditions associated with an El Niño event and an unusually dry winter.

Vegetation density is a key factor in the spawning biomass equation and small sample size was identified as a potential source of error because a few abnormally high density samples may have caused an upward bias in the 2005-06 spawning biomass estimate. Accurate vegetation density estimates are necessary to reduce the potential of spawn sampling bias especially when Gracilaria spp. is utilized as a spawning substrate. The Department conducted an extensive vessel-based vegetation survey prior to our annual vegetation dive surveys. The intention of the pre-dive survey was to rapidly assess vegetation over large areas, and increase the accuracy of vegetation density estimates in key spawning areas by allowing the use of random stratified sampling during the highly accurate but time-intensive dive surveys.

The decline in subtidal vegetation (*Zostera marina* and *Gracilaria spp*.) in key spawning areas this season may have led to the displacement of herring to areas with a more favorable spawning substrate. For example, in Richardson Bay there was a 43 percent decline in eelgrass and 99.5 percent decline in *Gracilaria spp.* densities from the 2005-06 season. The Department was unable to conduct dive surveys in the Hunters Point-Candlestick area this season, but observations recorded from the pre-dive survey in this area indicated a dramatic decrease in *Gracilaria spp*. similar to what was seen in Richardson Bay. During the 1982-83 (an El Niño) spawning season there was a similar decline in subtidal vegetation in Richardson Bay, when the mean vegetation density declined to 92 percent from the previous season. San Francisco Bay herring spawning biomass for that season declined 42 percent from the previous season (Spratt 1983). The majority of spawning events in 2005-06 were located in the subtidal zone versus the intertidal zone, and also were focused in areas with high concentrations of *Gracilaria spp.* (i.e. Candlestick area and Richardson Bay). The shift this season is likely an effect of the decline in subtidal vegetation (*Zostera marina* and *Gracilaria spp*.) in commonly used spawning areas. A similar shift was observed during the 1982-83 season, when the dramatic decrease in subtidal vegetation corresponded with the increase in intertidal spawning.

There were 13 recorded spawning events this season. The spawning season started off slowly with no recorded spawns in the month of November.

The first recorded spawn of the season occurred on December 4, 2006, and the last recorded spawn occurred on March 16, 2007 (Table 3.1). After the first spawning event subsequent spawns occurred approximately every 2 weeks. During the period January 15-26, spawning in Richardson Bay was unusually prolonged. Typically, spawning events take place over a few days, but during this time herring were observed spawning continuously with light egg coverage in the main channel and in marinas. Environmental conditions such as the lack of rainfall and unusually cool water temperatures (as low as 8.3 ºC) may have temporarily affected herring spawning behavior.

Spawning events were recorded throughout San Francisco Bay, from as far north as Pt. San Quentin and south to Pt. San Bruno. Continuing the trend of recent years, the majority of spawning occurred in the North-Central Bay (Pt. Bonita to Pt. San Quentin, Pt. San Pablo to the Bay Bridge). Ninety-three percent of the 2006-07 season total spawn escapement occurred in North-Central Bay. North-Central Bay spawning activity also included a spawn along the shoreline from northwest of the Marin Rod and Gun Club pier to just past the west end of San Quentin Prison. This was the third consecutive season that a spawn of measurable size was documented at Pt. San Quentin.

While the herring population has experienced a truncation of age classes, the current age composition reflects significant declines in the estimated numbers of herring across all age classes as might be expected with a record low spawning biomass. The estimated numbers of 2- and 3-year old herring this season are at historic lows, and the estimated numbers of other age classes are well below average (Table 3.2). The percentage of 4-, 5-, and 6-year old herring in the spawning population, which have historically comprised the majority of the catch, increased, but the available biomass at those age classes declined (Fig 3.1). These factors along with smaller-at-age herring contributed to the low commercial catch of roe herring (292 tons) for the 2006-07 season.

Table 3.1 2006-2007 Pacific Herring Spawning Biomass Estimates for San Francisco Bay (all weights in short tons)

Spawn #	Approximate Spawn Dates	Location	Subtidal	Intertidal	Catch	HEOK	Total
1	4-7 Dec-06	Richardson Bay	253				253
2	7-12 Dec-06	Candlestick & Hunter's Point??	90		4		94
3	26-Dec-06	Keil Cove	Trace				Trace
4	26-Dec-06 to 3-Jan-07	Oyster point, Sierra Point, Pt. San Bruno	433	143			576
5	12-Jan-07	Oyster Point	Trace				Trace
6	15-16 Jan-07	Paradise-Tiburon	1,226	393	95		1,714
7	15-26 Jan-07	Richardson Bay					
8	26-29 Jan-07	Richardson Bay-Keil Cove, Paradise-Tiburon	3,251	2,063	149		5,463
9	29-Jan-07	Golden Gate - Sausalito waterfront					
10	9-13 Feb-07	Richardson Bay	42		3	10	45
11	13-Feb-07	Pt. San Quentin		1,406			1,406
12	20-Feb-07	Paradise Cay-Sausalito waterfront	666	478	41	7	1,185
13	16-Mar-07	Keil Cove, Belvedere Cove, Richardson Bay	105	52		24	157
Totals			6,066	4,535	292	42	10,935

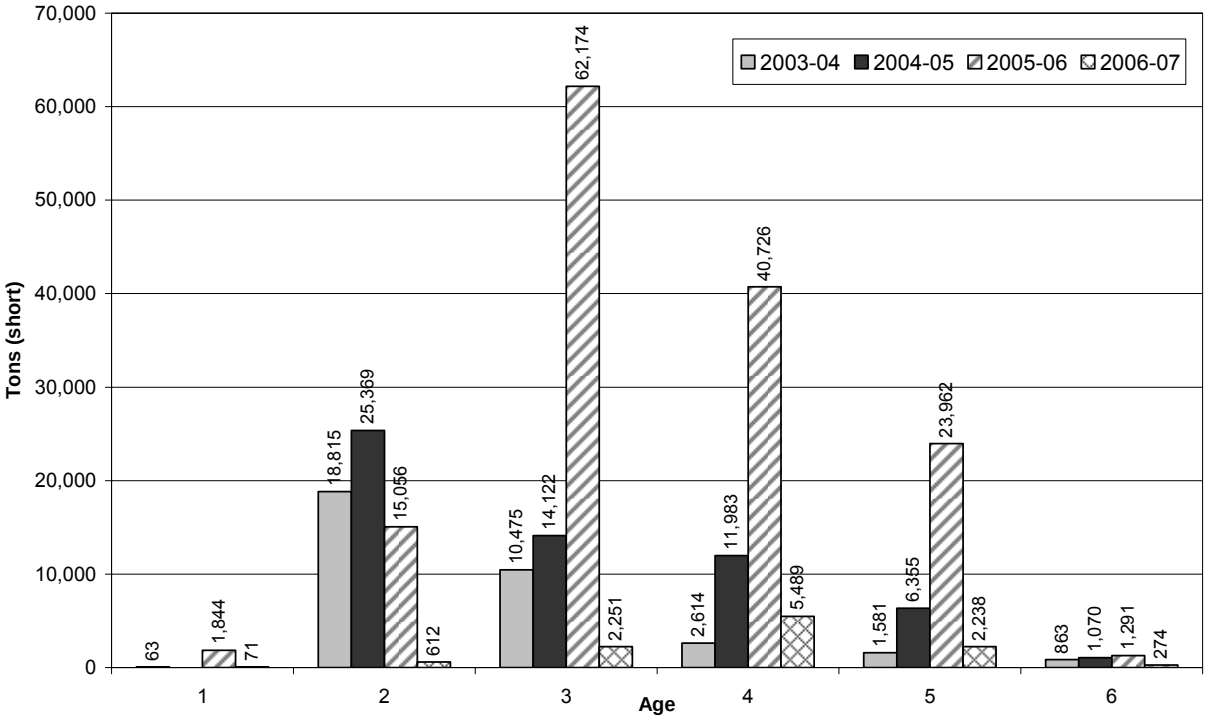

Figure 3.1 San Francisco spawning biomass by age class for the 2003-04 to 2006-07 seasons

Length-weight regression analysis of data taken from ripe herring sampled this season with Department research nets indicates that herring above 160 millimeters (mm) were lighter in weight for a given length compared to the 2005-06 season (Figure 3.2). Additionally, samples taken from the commercial gill net fishery this season showed the mean length and weight of San Francisco Bay herring were below the fish caught during the 2005-06 season. The mean length of herring in commercial gill net samples for the previous 2005-06 season was 188 mm body length (BL) and weight averaged 97grams (g). This season, the average length of herring in the commercial catch decreased to 186 mm BL and the average weight showed a substantial decline to 91 g. For the 2006-07 season, ripe female herring averaged five grams less than the previous season, which resulted in lower fecundity and decreased contribution to overall egg production.

In summary, the record low spawning biomass may be the result of unfavorable oceanic conditions which led to herring returning to San Francisco Bay in a poorer condition than in 2005-06. Decline in subtidal vegetation (eelgrass and *Gracilaria spp*.) this season may indicate that conditions in San Francisco Bay were less than optimal and potentially led to the displacement of herring to other spawning areas with more favorable conditions. The poor growth rate of spawning herring resulted in reduced weight and girth, which leads to lower fecundity and low commercial roe herring catches. Decreased fecundity related to poor growth in the spawning population could lead to an underestimate of the spawning biomass. The age structure of the population is a concern due to the truncation of age classes combined with low estimated numbers across all age classes. If this combination persists, it may lead to an unhealthy herring population, an unsustainable fishery, and delayed stock rebuilding. There is potential for improvement next season if herring were displaced and return, and as seen in a number of previous spawning seasons, if the 2- and 3-year old age classes recruit fully to the spawning population in high enough numbers.

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	0.3	182,936	30.7	118,040	19.8	30,478	5.1	17,177	3	8,121	1.4	797	0.1	595,428
83-84	[a]	N/A	332,699	56.6	69,654	0.1	92,565	15.8	73,840	12.6	17,306	2.9	1,168	0	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	688	0.1	0	0	383,033
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	2	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	1,065	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	1	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	1	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	1	0	0	0	0	783,159
90-91																			
91-92	1,356	0.3	13,666	3.0	126,016	28	206,930	45.2	82,870	18.1	23,764	5.2	3,490	1	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	2.6	22,403	5.1	134,870	31	160,335	36.9	63,331	14.6	25,926	6	4,808	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	1	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	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	1	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	1	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	978	0.2	[b]	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	[b]	0	340,650
00-01	255,158	36	178,401	35.4	185,748	36.9	65,555	13	24,267	4.8	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[c]	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
04-05[d]	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*
Mean	23,171	3.2	178,032	28.8	211,458	31.7	133,677	23.2	61,101	10.3	15,163	2.7	3,383	0.6	730	0.1	58	0.0	626,696

Note: 1990-91 season was not included due to incomplete data set for that season; 2002-03 season spawning biomass estimate unresolved. [a] 1-year-olds were not estimated, [b] 9-year-olds were not estimated, [c] includes corrected estimated number of two-year-olds, [d] no 1-year-olds were sampled in spawning condition

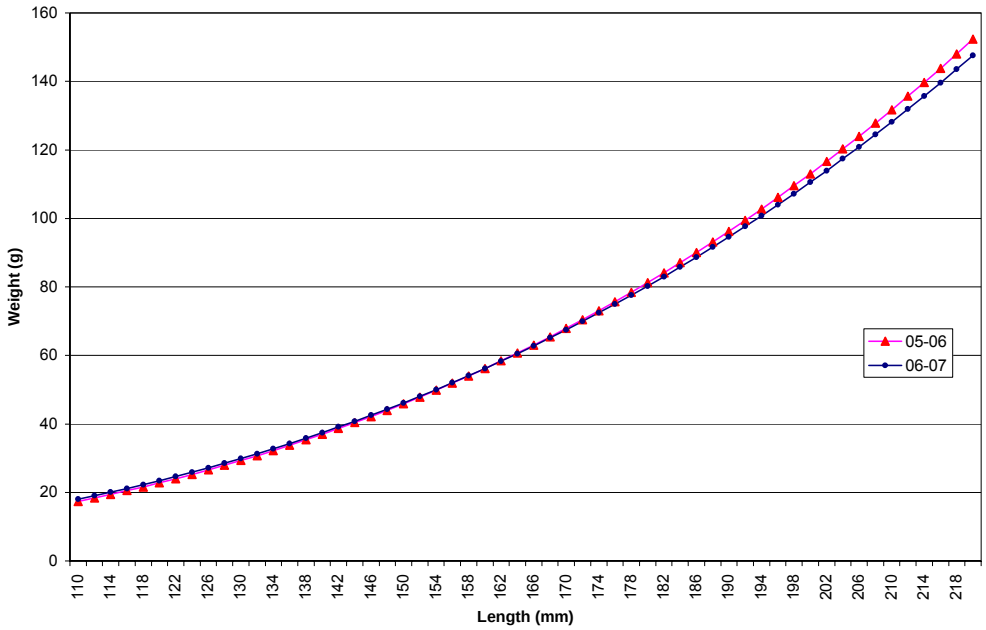

Figure 3.2 Length-weight relationships of ripe San Francisco Bay herring captured with research gear during the 2005-06 and 2006-07 seasons

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

Pacific herring young-of-the-year (YOY) are commonly caught by the Department's Water Branch 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 Western Delta and San Francisco Bay. Stations are sampled using a variety of research nets and other equipment, including a midwater trawl that is towed obliquely through the water column to capture species inhabiting varying depths. An index of abundance is calculated for YOY Pacific herring (Interagency Ecological Program 1999).

The herring YOY abundance index for 2006 shows a continuing decline for the fourth consecutive year (Figure 3.3). The strength of the YOY indices for the 2000 to 2003 year classes indicated favorable environmental conditions for YOY survival and growth within San Francisco Bay; however, the low indices for 2006 (Kath Hieb, DFG,

Water Branch, San Francisco Bay Study, personal communication 2007) may reflect unfavorable conditions relative to growth. The low index may indicate poor recruitment of this cohort to the spawning population in 2008-09 and 2009-10 seasons as 2- and 3-year old herring. However, there is no strong predictive relationship, historically, between the YOY abundance index and the subsequent numbers of 2- and 3-year old herring that return to spawn. Survival to first reproduction is affected by a number of factors during the first 2 to 3 years of life, including predation, food availability, competition, and environmental conditions.

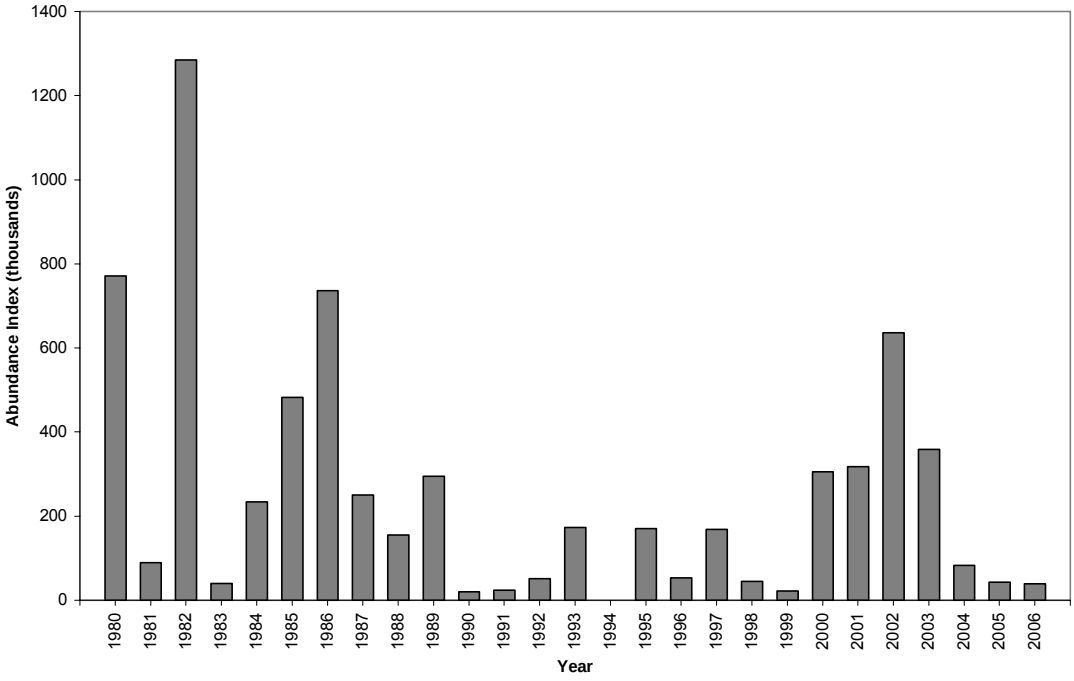

Figure 3.3 San Francisco Bay herring young-of-the-year abundance indices: 1980-2006

3.4 Status of the Tomales Bay Spawning Population

Due to staffing changes, no spawning biomass assessment or commercial catch assessments were conducted in Tomales Bay during the 2006-07 season. However, limited monitoring was undertaken when time and weather permitted. Spawn surveys were conducted to determine absence or presence in preferred spawning areas.

Tomales Bay has extensive eelgrass (*Zostera marina*) beds as well as large areas of *Gracilaria spp*. All beds appeared to be in good condition with ample spawning substrate. Trace spawns were detected on several occasions with much of the spawn activity located in the southern portion of the Tomales Bay between Marconi Cove and Millerton Point. The location of spawning events showed a similar pattern to previous seasons.

The quota for 2006-07 in Tomales Bay was set at 350 tons with no provision for in-season adjustment. This season, 2 landings were made by the only 2 actively fishing vessels. These landings were made on a single day in December with a total catch of 1.2 tons. Because no herring samples were obtained from the commercial fishery, it was not possible to determine the age structure of the catch for the 2006-07 herring season. Anecdotal reports by fisherman indicated several schools entered the bay. Commercial fishermen and the herring buyer believe the fish were uncatchable due to their small size. Numerous reports were given of herring "swimming through nets." The buyer reported that landed herring were of average length but under weight. Based on buyer records for Tomales Bay, the weight of female herring landed in December, 2006, ranged from 90-94 g, down from the historical range of 102-105 g. Fisherman indicated that the smaller size could be attributed to unusually warm ocean conditions and lower food availability typical in an El Niño year.

It is not uncommon for the spawning biomass population in Tomales Bay to fluctuate from season to season (Table 3.3). Environmental conditions offshore and in Tomales Bay play a key role in the fluctuation of spawning biomass. El Niño events often create unfavorable environmental conditions for herring due to changes in ocean dynamics. These changes may lead to temporal effects in the food web, increased competition, predation, and altered migration patterns. The 2006-07 spawning season occurred during a weak El Niño with warmer than average sea surface temperatures (SST). Warmer SSTs were reported from August through December of 2006. Warmer SSTs often decrease coastal upwelling, which in turn decreases primary productivity. This could help to explain the lower body weight due to food availability. Environmental

conditions in Tomales Bay may also have contributed to fewer spawn events. During the 2006-07 season rainfall totals were down across much of Northern California, and herring spawning in Tomales Bay has historically been tied to rainfall events. Tomales Bay received only 53 percent of its average annual rainfall. Herring entering the bay may not have encountered optimal salinities for spawning and these unfavorable spawning conditions may have deterred some herring from utilizing Tomales Bay as a spawning area.

The Department will continue to maintain a conservative fishery management strategy (closure of the outer Bodega Bay fishery and conservative quotas) to help ensure the sustainability of the Pacific herring population in Tomales Bay. Based upon the historical data, it is apparent that the Tomales Bay herring population is both dynamic and resilient. These data also suggest that ecological conditions play a far greater role in the fluctuation of the Tomales Bay population than the harvest by the commercial fishery.

Table 3.3 Season Spawning Biomass for Tomales Bay

Season	Spawn Escapement (tons)	Catch (tons)	Percent Catch (Exploitation Rate)	Spawning Biomass (tons)
1972-73 [a, 1]	---	598	---	---
1973-74 [a]	6,041	521	7.9%	6,562
1974-75 [a]	4,210	518	10.9%	4,728
1975-76 [b]	7,769	144	1.8%	7,913
1976-77 [b]	4,739	344	6.7%	5,083
1977-78 [b]	21,513	646	2.9%	22,163
1978-79 [c, 1]	---	448	---	---
1979-80 [c]	5,420	603	10.0%	6,023
1980-81 [c]	5,128	448	8.0%	5,576
1981-82 [c]	6,298	851	11.9%	7,149
1982-83 [c]	10,218	822	7.4%	11,040
1983-84 [c]	1,170	110	8.5%	1,280
1984-85 [d]	6,156	430	6.5%	6,586
1985-86 [d, 2]	435	771	12.8%	6,000
1986-87 [d]	4,931	867	14.9%	5,798
1987-88 [d]	1,311	750	36.4%	2,061
1988-89 [d]	167	213	56.0%	380
1989-90 [e]	345	0	0.0%	345
1990-91 [e]	779	0	0.0%	779
1991-92 [e]	1,214	0	0.0%	1,214
1992-93 [f]	3,857	222	5.4%	4,079
1993-94 [f]	2,244	219	8.9%	2,463
1994-95 [f]	3,704	275	6.9%	3,979
1995-96 [f]	1,704	355	17.2%	2,059
1996-97 [f]	1,288	222	14.7%	1,510
1997-98 [f]	586	0	0.0%	586
1998-99 [f]	4,015	54	1.3%	4,069
1999-00 [f]	1,969	42	2.1%	2,010
2000-01 [g]	3,898	298	7.1%	4,196
2001-02 [g]	6,889	354	4.9%	7,243
2002-03 [g]	4,304	78	1.8%	4,382
2003-04 [g]	11,844	280	2.3%	12,124
2004-05 [g]	3,656	30	0.8%	3,686
2005-06 [g]	2,014	19	0.9%	2,033
2006-07 [g, 1]	---	1	---	---
AVERAGE	**4,369**	**330**	**8.7%**	**4,847**
'92-93 to '06-07 Avg	**3,712**	**163**	**5.3%**	**3,887**

Notes:

a Catch with round haul gear from Tomales Bay.

b Catch includes the use of round haul and gill net gear types, and herring caught from both Tomales Bay and Bodega Bay.

c Catch is by gill net only, includes catch from Tomales and Bodega Bay. Use of round haul gear prohibited since 1978-79 season, in Tomales Bay and Bodega Bay.

d Catch is by gill net only with minimum mesh size of 2-in., includes catch from Bodega Bay.

e Tomales Bay fishery is closed. Bodega Bay fishery remains open with gill nets, minimum mesh size of 2-in.

f Bodega Bay fishery is closed and Tomales Bay fishery is re-opened with gill nets with a minimum mesh size of 2 1/8–in.

g Bodega Bay fishery remains closed. Gill nets with a minimum mesh size of 2-in. are allowed during the gill net mesh study, in progress. The mesh study is being conducted to evaluate the use of a minimum mesh size of 2-in. gill nets on the Tomales Bay herring population.

1 Spawning ground escapement survey not conducted to generate the spawning biomass.

2 Spawning biomass estimated by cohort analysis for this season.

3.5 Status of the Humboldt Bay and Crescent City Harbor Spawning Populations

Pacific herring appear to spawn almost exclusively on the vast eelgrass beds found in both the North and South Bays of Humboldt Bay. During a typical spawn event, herring schools may deposit eggs in low density over 300 acres of eelgrass. The spawning biomass estimate in Humboldt Bay for 2006-07 season is 7 tons. This is the lowest biomass estimate recorded in the 11 seasons of spawn assessment surveys conducted in Humboldt Bay, and is just a fraction of the 11-year average of 386 tons. The 2004-05 and 2005-06 seasons were also below the 11-season average with an estimated 157 and 111 tons estimated, respectively.

Department biologists encountered only a few small fast-moving herring schools in Humboldt Bay this spawning season. Because only 2 small spawn events were detected in Humboldt Bay, both during the last week of January, it appears that some of these schools may have left the bay without spawning. Although December 2006 rainfall was slightly above normal, January 2007 was the sixth driest January on record for Humboldt Bay, possibly keeping salinities in the bay too high for optimal herring spawning conditions. For the second season in a row there was no fishing effort by Humboldt Bay permittees. From the 2000-01 through 2004-05 seasons, when fishing occurred, the average total landings per year was close to 20 tons with a range of just below 0.6 tons in 2003-04 to 61.2 tons in 2000-01.

For the last 4 seasons biomass estimates were far below average. Concurrently, the exploitation rate during 2002-03 and 2003-04 seasons was below 1 percent and no exploitation occurred in 2005-06 and 2006-07. The average yearly biomass estimate from the last 7 spawn assessment surveys conducted since the 2000-01 season is 375 tons. A 60-ton quota based on this average would result in a 16 percent exploitation rate, which is considered a conservative rate of harvest. With reduced fishing effort during the last few seasons and a set quota of 60 tons, the Department has decided that it is not necessary to monitor the herring spawning population on an annual basis in Humboldt Bay. Starting with the 2007-08 season the Department will conduct Pacific

herring spawn assessment surveys on a 3-year cycle in Humboldt Bay with the next spawn assessment survey to be conducted during the 2009-10 season. A spawn assessment survey may be conducted sooner if the Department receives data that raises concern about the health of the Humboldt Bay Pacific herring spawning population.

Spawning ground surveys and commercial fishery assessments were not conducted in the Crescent City Harbor area for the 2006-07 season. Although 2 permits are active in Crescent City, no fishing effort has taken place in Crescent City for the past 5 seasons. The Department does not plan to conduct spawning ground surveys and commercial fishery assessments in the Crescent City Harbor area for the 2007-08 season. The 30-year average catch of 22 tons per year for Crescent City permittees is far below the fixed 30-ton quota for this fishery.

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 2 of the 3 alternatives will permit a continuation of the regulated commercial harvest of Pacific herring (*Clupea pallasi*) 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 5 geographical areas: San Francisco Bay, Tomales Bay, Humboldt Bay, the Crescent City Harbor area, and the open ocean. 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 5 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 10 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 2 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 Pacific 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 California Department of Fish and Game (Department) identified and addressed impacts and cumulative effects of the proposed project on the existing environment described in Chapter 3 of the FED, subsequent Final Supplemental Environmental Documents (FSED), 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 3 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 California 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 2 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 (*Clupea pallasi*) 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) reduce the health of stocks through density dependent competition between individual herring; (3) increase competition between species (e.g., sardines and anchovies) occupying the same ecological niche as Pacific herring and reduce standing crops of these species; (4) increase the availability of herring to predators by reducing search effort and increasing capture success; (5) 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 (6) 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 (no change)

Existing regulations, adopted in 2006, were for the 2006-07 Pacific herring commercial fishing season. These regulations reflect the amendments as adopted by the Commission in October 2006. Under alternative 2, the only changes to the 2007-08 regulations would be to revise the herring fishing seasons by location, and adjust quotas to reflect the 2006-07 biomass estimates 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 7 of the Final Environmental Document (FED) explains the role that consultation with other agencies, professionals, and the public plays in the California Department of Fish and Game (Department) marine resource management programs. Department staff, involved in herring resource management, is in contact with other agencies, professional biologists and researchers involved in herring management on a regular 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 Pacific herring (*Clupea pallasi*). 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 2007-08 season with the Director's Herring Advisory Committee (DHAC) on March 16, 2007.

Proposed changes to the regulations for the 2007-08 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 July 13, 2007 meeting.

Prior to preparation of the DSED, the Department initiated a broader consultation by distributing an NOP that announced the intent to prepare the document dated April 3, 2007. 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 also 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 September 3, 2007, to the Fish and Game Commission office in Sacramento. Written and oral comments relative to the DSED were also solicited by the Commission at its August 10, 2007 meeting in Santa Barbara.

7.1 Summary of Comments Received

Written comments regarding the DSED were received by the Commission office from Dan Yoakum Letter dated July 31, 2007 and Joe Aliotti Letter dated July 31, 2007.

7.2 Department Responses to Comments

Dan Yoakum Letter dated July 31, 2007

Comment 1

The 1,094 ton harvest proposal is a radical jump (down) from the season before and will lead to instability of the market because it is based on an unbalanced representation of the returning biomass.

Department Response

The Department's recommendation for the 2007-08 season is 1,094 tons, which is roughly 10 percent of the 2006-07 spawning biomass. The Department continues to be concerned about the status of the herring population in San Francisco Bay; however, we believe that our recommendation is based upon an unbiased evaluation of the current status of the stock, and takes into account the long term sustainability of the fishery.

Comment 2

The 2005-06 spawning biomass of 140,000 tons and the 2006-07 estimate of 10,000 plus tons dramatically reflects the inaccurate assessment of returning biomass.

Department Response

The Department's spawning deposition survey methods are comparable to methods used by resource management agencies that oversee commercial herring roe fisheries in Alaska and British Columbia. It is also the recommended methodology from a recent independent peer-review of Department herring assessment work. The precipitous drop in spawning biomass from a record high in 2005-06 to a record low in 2006-07 is not fully understood, and may have been related to unfavorable environmental conditions associated with an El Niño event and an unusually dry winter. There were also large declines in the spawning biomass following the 1981-82 and 1996-97 seasons in San Francisco Bay when the spawning biomass dropped 46,600 tons and 69,570 tons, respectively. Both of these drops occurred during strong El Niño events. Further, during the 2005-06 spawning season herring utilized large beds of the red algae (Gracilaria spp.) as a spawning substrate. The small number of red algae samples taken during the pre-season vegetation surveys was identified as a potential source of error because a few abnormally high density samples may have caused an upward bias in the 2005-06 spawning biomass estimate. To address this possible source of error DFG increased the number pre-season vegetation samples taken during the 2006-07 season.

Comment 3

The (DFG) spawn survey team's methods may fall short of accuracy because herring spawn differs in depth and location continually, as in the 2005-06 season when the spawn was primarily in Richardson Bay, Sausalito. This area is easily accessed by Department biologists making spawn samples and biomass estimates easier to obtain.

Department Response

Pacific herring are known to spawn on all types of substrate (except mud) in intertidal and shallow subtidal areas of San Francisco Bay. During the herring spawning season (November-April) Department biologists systematically survey shoreline areas throughout the bay looking for signs of herring spawning activity. Biologists also receive information on the location of spawning activity from herring fishermen. While some of the smaller spawn events may have gone undetected by biologists and fishermen during the 2006-07 season, the

Department notes that these spawns, if surveyed, would probably not have contributed significantly to the overall spawning biomass.

Comment 4

Mr. Yoakum proposes that the Commission adopt a policy that averages the previous three seasons of spawning biomass estimates (to set the quota) which will create a more accurate assessment of the returning spawn as well as providing a wider sample based on the approximate three-year spawning age of herring.

Department Response

The previous season's biomass is considered by the Department as the best available estimate to quantify herring returning the following season. Coastal pelagic species such as herring are comprised of comparatively few year classes, the strength of which may vary greatly from year to year. Consequently, annual abundance and availability may be expected to change from year to year due in part to the strength of each new incoming year class. Multi-year biomass averages would tend to mask inter-annual variability, which could lead to overexploitation when the stock declines.

In addition, the quotas for the San Francisco Bay herring fishery are not determined by a fixed percentage, but rather from within a range of values, the upper bound of which should not be exceeded in order to maintain a sustainable fishery. The selection of a quota from within that range is based on additional biological and fishery data collected each season, such as growth rates, strength and importance of individual year-classes, recruitment of incoming year-classes, and oceanographic conditions.

Comment 5

Mr. Yoakum agrees with most other Department proposals and is in favor of the Fish and Game Director determining the season's quota with the help of the Director's Herring Advisory Committee (DHAC) which will result in less red-tape, paperwork, and unnecessary expense.

Department Response

Comment noted.

Joe Aliotti Letter dated July 31, 2007

Comment 1

The San Francisco herring industry was with started with seining. Harvesting was spread out through out the bay in deep water as well as shallower areas. Fishing pressure was not concentrated in any general or specific area. There appeared to be normal cycles with a strong, steady spawning biomass.

Department Response

Comment noted.

Comment 2

Seiners and gill netters worked together for 20 years. Even with the expansion of gill netting into three groups, the biomass held steady. Except for 2-3 years following the El Niño, the biomass held constant between 80,000 to 100,000 tons or greater at times.

Department Response

From the 1978-79 season (when the Department began estimating both intertidal and subtidal spawns) to the 1997-98 season (the last season round haul gear was used in San Francisco Bay) the spawning biomass exhibited a notable degree of year-to-year variability. During this period it averaged 55,726 tons per year, with a range of 20,000 to 99,600 tons.

Comment 3

The year the Department decided to terminate seining the biomass was at 100,000 tons. Starting with the first year without seining the biomass has crashed dramatically and is now short of total destruction. Doesn't anybody see that there might be a relationship between the termination of seining with the collapse of the biomass and this industry?

Department Response

The conversion of round haul permits to gill net permits in the San Francisco Bay Pacific herring fishery was adopted by the Commission in August 1994 and implemented in September 1994. A principle reason for the conversion was that the round haul gear tended to capture smaller and younger herring than the gill net gear, which disproportionally reduced the spawning potential of the stock. The spawning biomass for the 1994-95 season was 40,000 tons. The last season round haul gear was used in San Francisco Bay was during the 1997-98 season which coincided with a very strong El Niño event. There are indications that this

El Niño event negatively impacted California Pacific herring stocks for several years.

Comment 4

There has been no abatement of the herring runs. We all know they are still coming into the bay because large masses of herring are detected annually in deep water that doesn't come into the shallows.

Department Response

Comment noted.

Comment 5

Mr. Aliotti suggests that the Commission try reinstating seining permits, if nothing else, as an experiment.

Department Response

The regulations that phased out round haul gear in the San Francisco Bay herring fishery were adopted due to conservation concerns. These regulations represent the culmination of a carefully considered process that included analysis on the biological, social and economic effects of the transition to an all gill net herring fishery. The Department's previous concern over the high percentage of 2- and 3-year old herring found in the round haul catch is still valid today, especially with the current status of the San Francisco Bay herring population. One of the Department's herring fishery management goals is to allow the harvest of age 4 and older herring and to avoid the harvest of 2- and 3-year old fish, many of which are first-time spawners.

Comment 6

The proposed changes make fishing economically infeasible because of the expenses incurred (e.g. gearing up, cost of fuel, berthing, etc.).

Department Response

Comment noted.

Comment 7

Mr. Aliotti submits that the Commission dispense with the season, including herring-eggs-on-kelp, for the next 2 or 3 years until the biomass will support a quota of 5,000 tons.

Department Response

The Department's recommendation for the 2007-08 season is 1,094 tons, which is roughly 10 percent of the 2006-07 spawning biomass. The Department continues to be concerned about the status of the herring population in San Francisco Bay. Consequently, our recommendation provides for a sustainable harvest while taking into account the depressed condition of the stock.

The number of boats fishing the San Francisco herring fishery has decreased substantially in the last several years. Since the 2004-05 season, the number of boats actively fishing has gone from over 40 to 25 and both herring permittees and herring buyers anticipate that the number of boats actively fishing during the 2007-08 season could decrease further. Given the decline in the number of active participants in the fishery and the possibility for improved environmental conditions the Department believes that a 1,094 ton quota will provide for a small fishery while maintaining conservation safeguards against overexploitation.

7.3 Copy of Letters Received

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Dan Yoakum
S. F. Herring Roe on Kelp Advisor
P.O. Box 583
Albion, CA 95410
Phone (707) 937-1404
Fax (707) 937-1405

State of California Fish and Game Commission
1416 Ninth Street
P.O. Box 944209
Sacramento, CA 94244-2090
Phone (916) 653-4899
Fax (916) 653-5040

July 31, 2007

Re: Comments to proposed regulatory changes for 2007-08 San Francisco Herring Season.

Dear Commissioners:

I am writing in response to the California Fish and Game Department's proposal dated July 26, 2007. The 1.094 ton harvest proposal is the lowest proposed quota on record. This is a radical jump from the season before of an agreed lower quota than the large biomass had called for. This proposal will lead to instability in the market because it is based on an unbalanced representation of the returning spawning biomass. (1)

The 2005-06 season of 140,000 tons and 2006-07 season of 10,000 plus tons dramatically reflects this inaccurate assessment of the returning biomass. (2) The spawn survey team's methods may fall short of accuracy because the herring spawn differs in depth and location continuously, as in the 2005-06 season when the spawn was primarily in Richardson Bay, Sausalito, which as a sampling location was easily accessed and estimated. (3)

I propose that the Commission adopt a policy that averages the previous three seasons of spawning biomass estimates which will serve to create a more accurate assessment of the returning spawn as well as providing a wider sample based on the approximate three year spawning age of the herring. (4)

In conclusion I would like to state my agreement with most of the other proposals and that I am certainly in favor of the F & G Director determining each season's quota, with the help and guidance of the DHAC, which will result in less red-tape, paperwork and unnecessary expense. (5)

Sincerely,

Dan Yoakum

Dan Yoakum – S.F. HEOK Advisor

Dan Yoakum letter, page 1 of 1

Adrianna Shea
Dept.of Fish and Game
State of California Fish and Game Commission
Sacramento, CA 95814

RE: TITLE 14, F.& G.COMMISSION PROPOSED CHANGES SEC.163,164,CCR.

The Herring Fishing Industry started in San Francisco Bay with Seining. This is where I was initiated in this industry. We harvested fish in deep water along with shallower areas. This spread out the capture areas broadly throughout the San Francisco Bay and vicinity. There was no pressure concentrations in any specific nor general area; and every year it varied. At times, it appeared to be the experiencing of normal cycles; the spawning biomass held strongly steady (1)

With the introduction of Gillnetting, we worked together for 20 years, and even with the expandsion of gillnetting permits to three groups, the biomass held up steady. Except for 2-3 years following the El Nino, biomass held constant, between 80,000 to 100,000 tons and more at times. (2)

The year you decided to terminate seining, the biomass was at 100,000 tons. Starting with the first year without seining the biomass has crashed dramatically and has come to this point, just short of total destruction. (3)

Does'nt anybody see that there might be a relationship between the termination of seining with the collapse of the biomass and this industry? There have been no abatement of the herring runs, we know they are still coming into the bay because large masses of herring schools are detected annually in deep water that don't come to the shallows. (4)

I suggest you try reinstating seining permits, if for nothing else, as an experiment. Try it and see what happens! (5)

As for the proposed changes, it makes this fishing economically infeasable. Nobody will incur the expense of gearing up, taking their boats to the bay and engage in this industry (with today's cost of fuel, berthing, etc) for such quota. (6) Instead, I respectfully submit that you dispense the season, incl.Kelp Harvesting, for the next 2 or 3 years, until you get the biomass that will support a quota of at 5,000 tons. But when you re-open, try a probation period re-allowing seining. THANK YOU. (7)

August 3,2007

Joe Aliotti
1101 McClellan Ave.
Monterey CA 92940

Joe Aliotti

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Appendix A

Summary of Changes

Summary of Changes to the 2007 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.

Table of Contents

- The table of contents was **revised** to match any page numbers that changed during the process of finalizing the FSED document.
- Appendix A, Summary of Changes was added.

Summary

- The following text was added to S.1 Introduction: Chapter 7 describes the period for public review. Appendix A, Summary of Changes, was added to illustrate what changes were made to the DSED in order to finalize the supplemental document. References used throughout this FSED are listed in the Literature Cited section.

Chapter 1. Introduction

- The following text was changed to Section 1.2 in order to update the public review timeline: Pursuant to CEQA regulations, a 45-day public comment period for reviewing this DSED is from July 10, 2006 to August 18, 2006.

Chapter 2. Project Description

- Section 2.3.1.1, paragraph 1 was updated using final age data. The following sentences were replaced: Additionally, since the 1997-98 El Niño, the estimated numbers of age 4 and older herring which support the gill net fishery have declined in the population and the number of age 3 herring has increased in the catch. The number of 3-year old fish in the catch increased during the 2006-07 season potentially due to the decreases in 4-, 5-, and 6-year old herring which continues to indicate a truncated age structure (Figure 2.5). The use of 2 inch mesh gillnets in the San Francisco Bay fishery may have also increased the take of age three and potentially age two fish in the commercial catch. One of the Department's herring fishery management goals is to allow the harvest of age 4

and older herring and to avoid the harvest of 2- and 3-year old fish, many of which are first-time spawners.
- Figure 2.5 was updated using final age data of herring based on otolith readings. The DSED has preliminary age data based on lengths for 2006-07.

Chapter 3. Environmental Setting

- Section 3.3, paragraph 7 - The following text was deleted and replaced with updated using final age data based on otolith readings: The estimated numbers of 5-year old herring this season is at an historic low, and the estimated numbers of other age classes are near record lows (Table 3.2). The percentage of 4-, 5-, and 6-year old herring in the spawning population, which have historically comprised the majority of the catch, declined along with the available biomass at those age classes (Fig 3.1). These factors contributed to the low commercial catch of roe herring (292 tons) for the 2006-07 season.
- Table 3.2 was updated using final age data of herring based on otolith readings. The DSED has preliminary age data based on lengths for 2006-07.
- Figure 3.1 was updated using final age data of herring based on otolith readings. The DSED has preliminary age data based on lengths for 2006-07.
- Minor editorial changes were made.

Chapter 4. Environmental Impact Analysis and Cumulative Effects

- Minor grammatical changes were made.

Chapter 5. Analysis of Alternatives

- Minor grammatical changes were made.

Chapter 6. Consultation

- No changes

Chapter 7. Responses to Comments

- This chapter is added to all Final Supplemental Environmental Documents where comments are received.

Appendix A Summary of Changes

- Added