

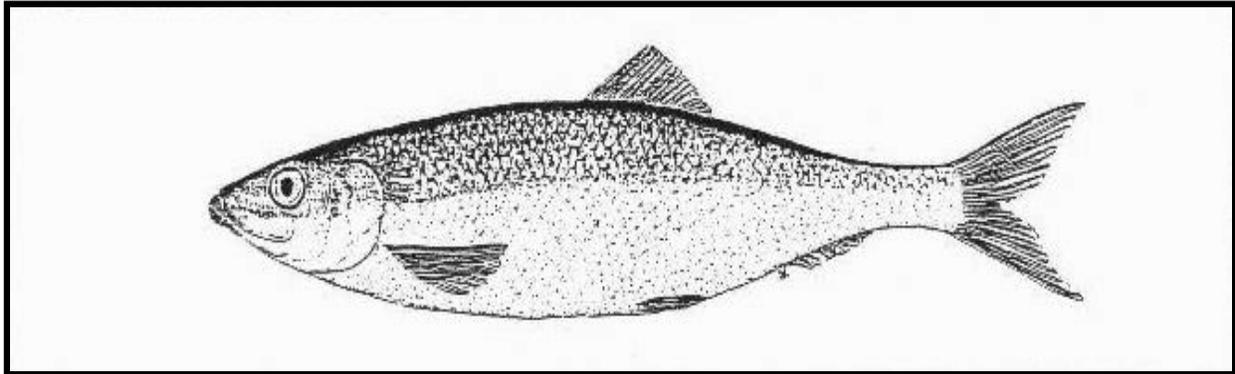
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FINAL

SUPPLEMENTAL ENVIRONMENTAL DOCUMENT

**PACIFIC HERRING
COMMERCIAL FISHING REGULATIONS**

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



**2006
STATE OF CALIFORNIA
THE RESOURCES AGENCY
DEPARTMENT OF FISH AND GAME**

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

TABLE OF CONTENTS

SUMMARY	S-1
S.1 Introduction	S-1
S.2 Proposed Project	S-2
S.3 Project Alternatives	S-3
S.4 Existing Environment	S-3
S.5 Environmental Impacts.....	S-4
S.5.1 Proposed Project	S-4
S.5.2 Alternatives	S-4
S.5.3 Cumulative	S-5
S.6 Areas of Controversy	S-6
S.7 Issues to be Resolved	S-6
 Chapter 1. INTRODUCTION	 1-1
1.1 Background	1-1
1.2 The Functional Equivalent	1-2
1.3 Scoping Process	1-3
1.4 Report Availability	1-5
1.5 Authorities and Responsibilities	1-6
 Chapter 2. PROJECT DESCRIPTION	 2-1
2.1 Project Objectives	2-1
2.2 Project Location	2-2
2.2.1 San Francisco Bay	2-4
2.2.1.1 Roe Herring Fishery	2-4
2.2.1.2 Herring Eggs-on-Kelp Fishery	2-5
2.2.1.3 Fresh Fish Market Fishery.....	2-6
2.2.2 Tomales Bay	2-6
2.2.2.1 Roe Herring Fishery	2-6
2.2.2.2 Fresh Fish Market Fishery	2-7
2.3 Project Characteristics	2-7
2.3.1 Roe Herring Fisheries	2-12
2.3.1.1 San Francisco Bay 2006-07 Quota	2-12
2.3.1.2 Tomales Bay 2006-07 Quota	2-14
2.3.1.2.1 Tomales Bay Mesh Size.....	2-15
2.3.1.3 Humboldt Bay and Crescent City 2006-07 Quotas.....	2-16
2.3.1.4 Season Dates.....	2-17
2.3.1.5 Issuance of Permits.....	2-17
2.3.1.6 Maximum Number of Permits in San Francisco Bay.....	2-18

2.3.1.7 Vessel Identification.....	2-18
2.3.1.8 Changes for Clarity or Consistency with Section 163, Title 14, CCR.....	2-19
2.3.1.9 Corrections and Clarifications.....	2-19
2.3.2 Herring Eggs-on-Kelp (HEOK) Fishery.....	2-19
2.3.2.1 Corrections and Clarifications.....	2-19
2.4 Project Alternatives.....	2-20
2.4.1 Alternative 1 (no project).....	2-20
2.4.2 Alternative 2 (existing regulations).....	2-20
2.4.3 Alternative 3 (individual vessel quota).....	2-21
Chapter 3. ENVIRONMENTAL SETTING	3-1
3.1 General	3-1
3.2 Spawning Population Estimation Methods	3-2
3.3 Status of the San Francisco Bay Spawning Population.....	3-3
3.3.1 San Francisco Bay Herring Young of the Year (YOY)	3-9
3.4 Status of the Tomales Bay Spawning Population	3-10
3.4.1 Tomales Bay Experimental Mesh Size Study.....	3-14
3.5 Status of the Humboldt Bay and Crescent City Spawning Populations	3-18
Chapter 4. ENVIRONMENTAL IMPACT ANALYSIS AND CUMULATIVE EFFECTS	4-1
Chapter 5. ANALYSIS OF ALTERNATIVES	5-1
5.1 Alternative 1 (no project)	5-1
5.2 Alternative 2 (existing regulations)	5-2
5.3 Alternative 3 (individual vessel quota)	5-2
Chapter 6. CONSULTATION	6-1
Chapter 7. RESPONSES TO COMMENTS REGARDING THE PROPOSED PROJECT	7-1
Literature Cited.....	L-1
Gill Net Mesh Size in the California Herring Fisheries: Historical Background	Appendix A
Historical Events in the Tomales-Bodega Bay Roe Herring Fishery.....	Appendix B
Summary of Changes	Appendix C

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. 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 2006-07 fishing season, supplementing, and in some cases replacing, aspects of the proposed project described in the 1998 FED and the Final Supplemental Environmental documents of 1999, 2000, 2001, 2002, 2004, and 2005. 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 six chapters. Chapter 1 discusses the authorities and responsibilities under which the FSED was developed and describes its intended use. Chapter 2 describes the proposed project and alternatives and options for regulating the commercial harvest of herring. Chapter 3 describes the existing environment where the California herring fisheries occur. Chapter 4 addresses the impacts of the proposed project and cumulative effects. Chapter 5 describes the impacts of the alternatives to the proposed project. Chapter 6 identifies consultations with other agencies, professionals, and the public. Chapter 7 describes the period for public review. Appendix F, 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.

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 2005 (sections 163,163.5, and 164, Title 14, California Code of Regulations [CCR]). It also includes regulations from section 163.1 that were adopted by the Fish and Game Commission on December 10, 2005.

The proposed regulatory changes will establish fishing quotas for San Francisco and Tomales bays for the 2006-07 herring fishing season, based on the most recent assessments of the spawning populations in these locations. Previously established quotas for Humboldt Bay and Crescent City Harbor fisheries are not affected by these regulatory changes. The proposed changes addressed in this document also include provisions for establishing the minimum mesh size as 2-inches for the roe herring fishery in Tomales Bay.

The specific regulatory changes proposed for the 2006-07 season will:

- (1) provide for a 14,505 ton quota, Option 1, for San Francisco Bay (10 percent of the 145,050 ton estimated spawning biomass for the 2005-06 season), a quota of 13,171 tons, Option 2, which represents a reduction in the quota at ten percent by the percentage of three-year old fish (8.2 percent) estimated to comprise the 2005-06 commercial landings, or a quota of 4,502 tons, Option 3, which represents 7.6 percent of the 2004-05 spawning biomass estimate;
- (2) provide a set 350 ton fishing quota in Tomales Bay (17 percent of the 2005-06 estimated spawning biomass of 3,686 tons);
- (3) set the dates of the roe herring fisheries in San Francisco Bay from 5:00 p.m. on December 3, 2006 until noon on December 22, 2006. (“DH” gill net platoon only), and 5:00 p.m. on January 2, 2007 until noon on March 9, 2007;
- (4) set the dates of the roe herring fishery in Tomales Bay from noon on December 26, 2006 until noon on February 28, 2007;
- (5) provide for the a minimum mesh size of 2 inches for the

Tomales Bay fishery; (6) specify that all herring permit applications, transfer fees, authorized agent requests and fresh fish permit applications be sent to the License and Revenue Branch in Sacramento; (7) amend the maximum number of permits in San Francisco to 80 DH permits and 160 permits for the odd and even platoons; (7) amend regulations to allow vessel signage on the side of the house to be seen from air and eliminate the signage on the top of the wheel house; and (8) modify subsections (a)(5), (b)(1), (c)(1)(D), and (e)(2) of Section 163 regarding crew lists, multiple permit ownership, lottery qualification criteria and gill net vessel fishing for consistency with Section 163.1 of Title 14, CCR.

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 established; 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.

Potential biological impacts associated with a no fishery alternative include an increased rate of natural mortality, the potential for deterioration in the condition of the

herring population as it reaches carrying capacity, and potential impacts to other species that compete with herring for food resources. Although this would be a natural process, adverse temporary impacts would nonetheless be associated with this alternative.

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 2005 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 areas of controversy have been identified regarding commercial herring fishing in prior years. Item numbers 1, 2, 4, and 5 of these areas of controversy were addressed in detail within Chapter 4 (Section 4.2.6.2) of the FED. Item number 3 was addressed in the FSED for 2005-06, and Item number 7 is addressed in Chapter 3 of this DESD:

1. Importance of herring as a forage species for sea birds, marine mammals, and other fishes;
2. Inadequate knowledge of the resource;
3. Errors in stock assessment;
4. Insufficient management resources;
5. Potential impact of unforeseen events or catastrophes (e.g., oil spills, chemical spills);
6. 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, and the 2005 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 pallasii*) in California. It was prepared by the Department of Fish and Game (Department) for the Commission following CEQA Guidelines. The project being considered is the proposed changes to the regulations for the 2006-07 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; and the FSED certified by the Commission in September 2005. 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: www.dfg.ca.gov/mrd/herring/ceqa.

The FSED of 1999, 2000, 2001, 2002, 2004, and 2005 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, and 2005-06 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 2006-07 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 (CEQA Guidelines Section 15162, Public Resources Code 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 Final supplemental

document is given the same notice and public review given to a Final 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 (CEQA Guidelines Section 15163). A Notice of Preparation (NOP) for this DSED was circulated to interested parties on April 3, 2006. Following the release of the NOP, the 30-day public comment period pursuant to CEQA for this DSED ended May 4, 2006. Pursuant to CEQA regulations, a 45-day public comment period for reviewing this DSED occurred from July 11, 2006 to August 25, 2006.

This FSED is the seventh 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, and the sixth certified by the Commission in September 2005. 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 February 24, 2006 in Sausalito, Marin County. In addition, a Director's Herring Advisory Committee (DHAC) meeting was held on April 4, 2006 in Redwood City, San Mateo County. 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, 2006. This provided a 30-day opportunity for the Lead Agency to obtain information about the scope and content of

the FSED 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 Section 7072 of the Fish and Game Code 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.

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 (Section 7050, California Fish and Game Code). 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 (Section 1700, California Fish and Game Code, Appendix 1 of the FED).

The Legislature provides further policy direction regarding herring management in Sections 8550 through 8559 of the California Fish and Game Code. Through Section 8553 of the California Fish and Game Code, the State Legislature delegated authority to the Commission, whose members are appointed by the Governor, to regulate the commercial harvest and possession of Pacific herring. The remaining code sections 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 were held for the 2006-07 season on August 3-4, 2006 in Sacramento, and August 24-25 in Santa Barbara. The authority to prepare a supplemental environmental document is given in Section 21166 of the Public Resources Code.

Chapter 2. PROJECT DESCRIPTION

2.1 Project Objectives

The proposed project, as defined in the Final Environmental Document (FED) certified by the 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 California Fish and Game Commission (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 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 (Section 8550 California Fish and Game Code). 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 2005-06 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 five 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.

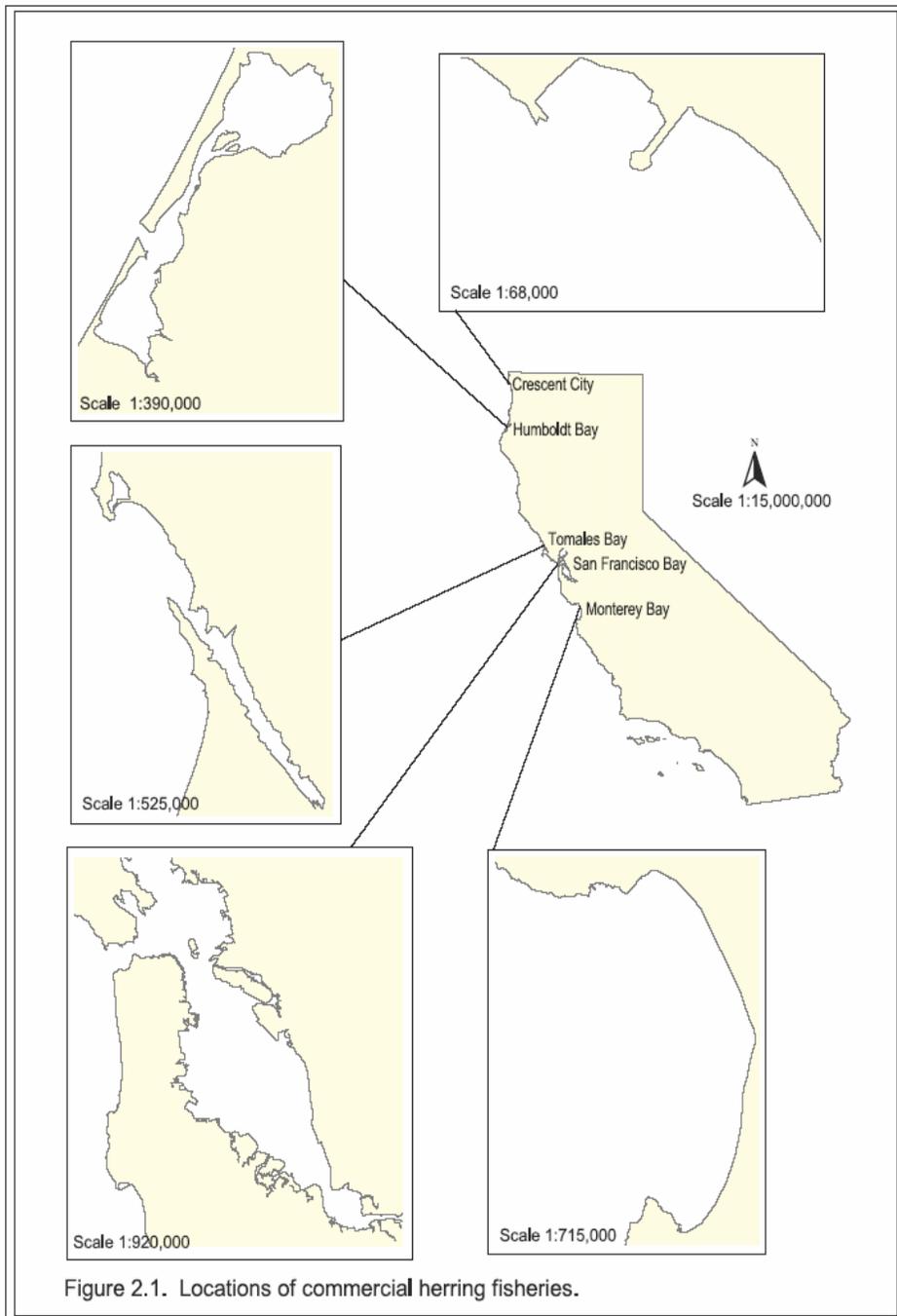


Figure 2.1. Locations of commercial herring fisheries.

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 3, 2006 until noon on December 22, 2006; and 5:00 p.m. on January 2, 2007 until noon Friday March 9, 2007.

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

Gill net permittees (DH) December 3-8, December 10-15 and December 17-22, 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 (Even #) January 2-5, January 14-19, January 28-February 2, February 11-16, February 25-March 2.

Gill net permittees (Odd #) January 7-12, January 21-26, February 4-9, February 18-23, March 4-9.

Quota: Option 1

A 14,505-ton quota which represents 10 percent of the 2005-06 spawning biomass estimate.

Option 2

A 13,171 ton quota which represents a reduction in the quota at ten percent by the percentage of three year old fish (8.2 percent) estimated to comprise the 2005-06 commercial landings.

Option 3

A 4,502 ton quota which represents 7.6 percent of the 2004-05 spawning biomass estimate.

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, 2005 to March 31, 2006

Quota: Option 1

A 14,505-ton quota for San Francisco Bay would result in a 25.6-ton individual quota for transferred "CH" gill net permits and a 7.7-ton individual quota for transferred non-"CH" gill net permits.

Option 2

A 13,171-ton quota for San Francisco Bay would result in a 23.2-ton individual quota for transferred "CH" gill net permits and 7.0-ton individual quota for transferred non-"CH" gill net permits.

Option 3

If the Commission was to adopt San Francisco Bay Quota Option 3, a 4,502-ton quota, this would result in a 7.9-ton individual quota for transferred "CH" gill net permits and a 2.3-ton individual quota for transferred non-"CH" 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, 2006 and April 1 through October 31, 2007.

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 Tuesday, December 26, 2006 until noon on Wednesday, February 28, 2007.

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, 2006 and April 1 through October 31, 2007.

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.

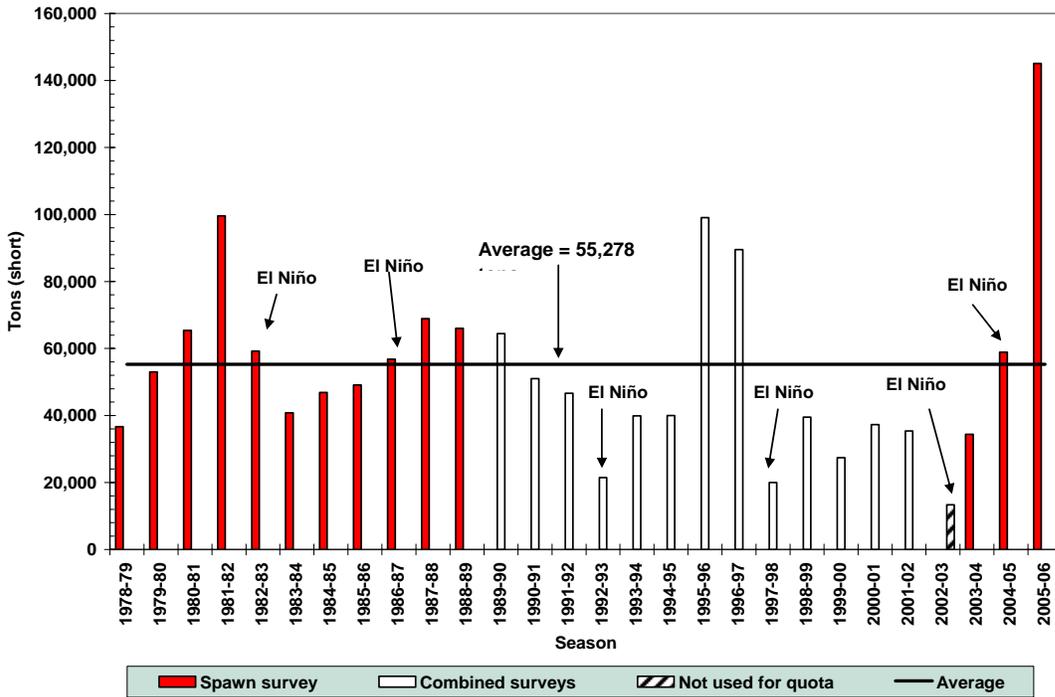
The principal regulatory changes proposed for the 2005-06 season included: a quota option (1) of 5,890 tons, ten percent of the 2004-05 season biomass, and a quota

option (2), contingent on adopting a minimum mesh of 2 inches, of 4,502 tons, 7.6 percent of the 2004-05 season biomass for San Francisco Bay; an initial quota of 400 tons for Tomales Bay; a change of the minimum mesh size in San Francisco Bay from 2 1/8 inches to 2 inches; a continuation of the mesh size study in Tomales Bay; an amendment to allow weekend fishing in Tomales Bay; and specifying that the length of a gill net shall be measured along the cork line. No quota changes were made for the Crescent City/Humboldt Bay fisheries.

Annual herring spawning population estimates from biomass surveys in San Francisco and Tomales bays have been conducted by the Department since 1973. 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).

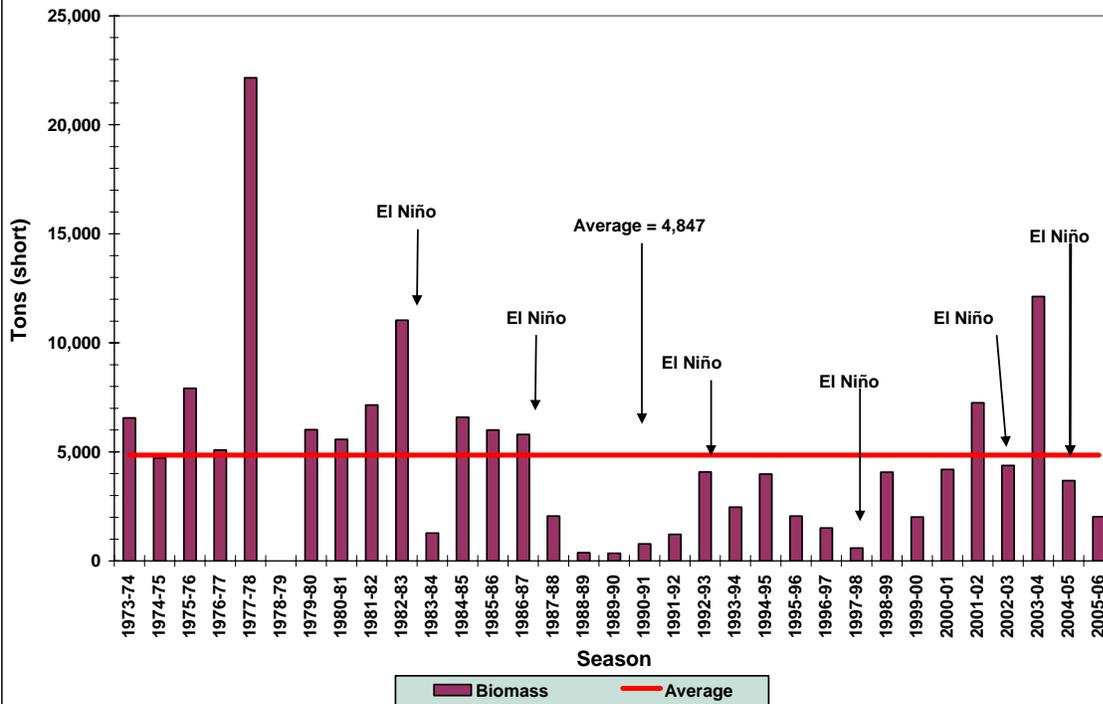
From 1990 through 2003, the Department derived the spawning biomass estimate in San Francisco Bay by meshing the results of the spawn deposition and hydroacoustic surveys. Beginning with the 2003-04 season, the Department conducted spawning deposition surveys as the primary assessment tool to estimate 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 1978-79 to 2005-2006



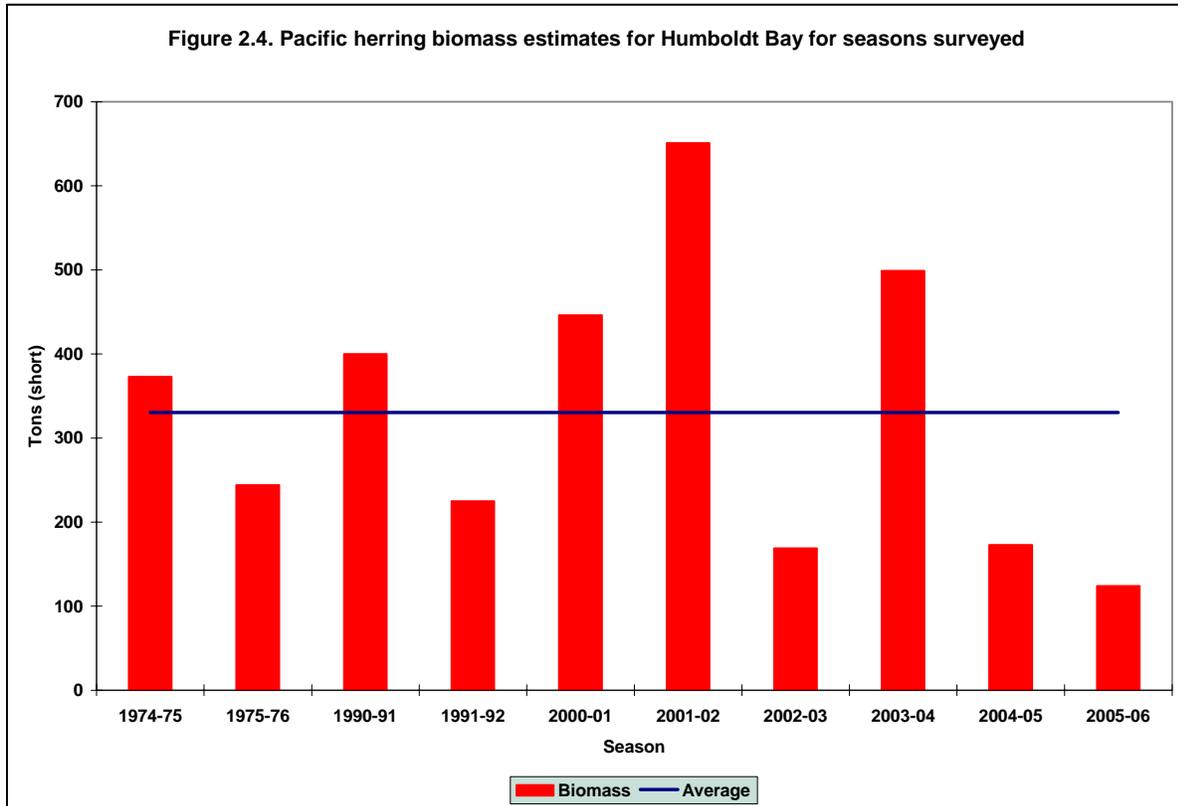
Legend: █ Spawn survey Combined surveys Not used for quota — Average

Figure 2.3. Pacific herring spawning biomass estimates for Tomales Bay 1973-74 to 2005-2006



Legend: █ Biomass — Average

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



Annual roe herring fishery quotas are conservative and limit the total commercial catch to no more than 20 percent of the previous season’s spawning biomass estimate. 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 are 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 2005-06 spawning biomass estimate for San Francisco Bay is 145,054 tons, which is above the 27-year average (2002-03 spawn deposition and hydroacoustic

surveys were not used for quota calculation and omitted in this average) of 55,278 tons. Landings from the San Francisco Bay roe herring fishery totaled 744 tons, 3,758 tons less than the 4,502-ton quota. This harvest level is 0.005 percent of the season's spawning biomass estimate. In Tomales Bay, the 2005-06 spawning biomass estimate is 2,033 tons, which is a 45 percent decrease from the 2004-05 biomass estimate of 3,686 tons, and 48 percent less than the fourteen-season average of 3,887 tons (average based on seasons since the fishery re-opened in 1992). Tomales Bay roe herring landings totaled 18.5 tons, 381.5 tons less than the 400-ton season quota, and 0.9 percent of the season's estimated spawning biomass.

The spawn escapement estimate for the 2005-06 Humboldt Bay herring spawning season is 124 tons, down 50 tons from last season's estimate of 174 tons (Figure 2.4). The spawning biomass this season represents only 31 percent of the ten year average of 402 tons and is the lowest estimate recorded from seasons when spawn assessments were conducted in Humboldt Bay. There was no fishing effort by Humboldt Bay permittees during the 2005-06 season. Landings from the previous three seasons were far below the five-year average since 2000-01 season of approximately 20 tons.

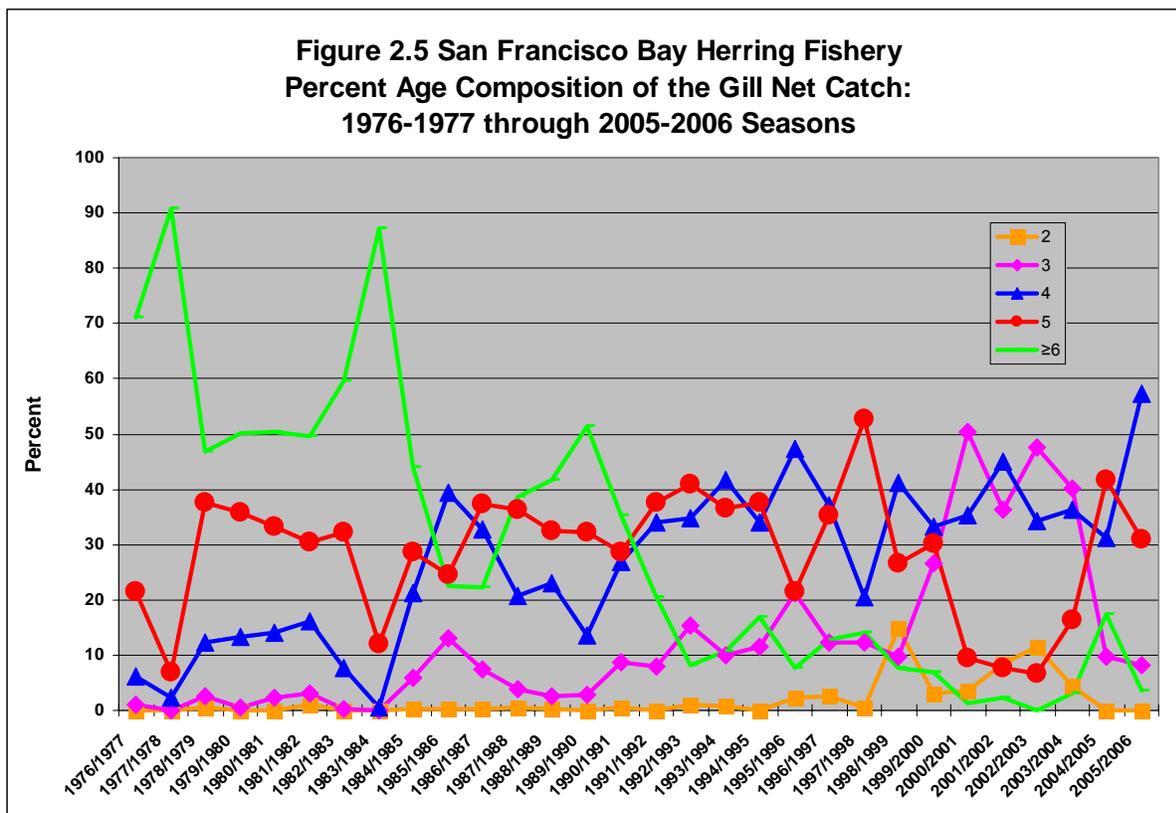
Spawning ground surveys and commercial fishery assessments were not conducted in the Crescent City area for the 2005-06 season. Although two permits are active in Crescent City, no fishing effort has taken place in Crescent City for the past four seasons. The Department does not plan to conduct spawning ground surveys and commercial fishery assessments in the Crescent City area for the 2006-07 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 2006-07 Quota

The 2005-06 spawning biomass estimate for San Francisco is 145,054 tons (including catch), which is above the 27-year average of 55,278 tons. One of the Department's herring fishery management goals is to allow the harvest of age four and older herring and to avoid the harvest of two- and three-year-old fish, many of which are first-time spawners. Since the 1997-98 El Niño, the estimated numbers of age four and older herring which support the gill net fishery have declined in the population while the number of age three herring has increased in the catch until the 2004-05 season when the numbers of 3-year-olds declined in the catch and 4-year-olds and older herring increased (Figure 2.5). The percentage of 3-year old fish in the catch decreased slightly during the 2005-06 season, and the number of 4-year old fish increased dramatically (Figure 2.5).



Note: The percent ages for six-year-old fish is for age six and above combined.

Three quota options are provided for the San Francisco Bay quota. San Francisco Bay Quota Option 1 would set the quota at 14,505 tons which represents 10 percent of the 2005-06 spawning biomass estimate. The above-average spawning biomass estimate is an encouraging sign that the population may be rebuilding. A harvest percentage of 10 percent follows the practice the Department has used for several of the past seasons of setting the quota between 10 and 15 percent of the spawning biomass.

San Francisco Bay Quota Option 2 would set the quota at 13,171 tons which represents a reduction in the quota at ten percent by the percentage of 3-year old fish (8.2 percent) estimated to comprise the 2005-06 commercial landings. This quota represents 9.2 percent of the spawning biomass estimate. The estimated percentage of 2- and 3-year old herring is suggested as an approximation of the percentage that may be caught in the 2006-07 season while using a minimum mesh size of 2 inches. No 2-year old fish were landed during the 2005-06 season; therefore, the percentage is based on the percentage of 3-year old fish only.

San Francisco Bay Quota Option 3 would set the quota at 4,502 tons which represents 7.6 percent of the 2004-05 spawning biomass estimate, and 3.1 percent of the 2005-06 spawning biomass estimate. A harvest rate of 3.1 percent will provide for stock rebuilding, address the Department's concerns regarding the population size and age structure, and help mitigate for impacts affecting the San Francisco herring fishery related to the recent 2004-05 El Niño. The rationale for providing this quota option, however, is predominantly economical. A quota of 4,502 tons will provide a viable quota for the San Francisco Bay fishery. The DHAC on their April 18, 2006 conference call voted to recommend a 4,502 ton quota option for economic reasons. The DHAC felt that a quota upwards of 14,000 tons would be unobtainable by the number of participants in the present fishery and that a smaller quota would allow all three groups, or platoons, an opportunity to reach their respective quotas. This decision was thought to be fair and economically better for all groups. However, the DHAC strongly feels that the 10 to 15 percent harvest percentage has served the resource and the fishery well in the past, and would prefer to keep that harvest percentage in the future.

There is also a biological component for the quota to remain at 4,502 tons. Approximately 85 percent of the spawning activity for the 2005-06 occurred in Richardson Bay on *Gracilaria sp.*, a genus of red algae. Herring spawning activity routinely occurs in Richardson Bay on *Zostera marina* (Eelgrass) and *Gracilaria sp.*, however, during the 2005-06 season spawning occurred over a much larger area in Richardson Bay and *Gracilaria sp.* was found at a greater density than in past seasons. The relatively high spawning biomass estimate can potentially be attributed to the greater density of *Gracilaria sp.*, as well as the larger spawning area compared to previous seasons. Because ten percent of the spawning biomass estimate would provide for a substantially higher quota than the Department has proposed for the past several seasons, the Department is proposing in Option 3 that the quota remain status quo for the 2006-07 season so that the Department may further assess the impact of the observed *Gracilaria sp.* density on calculating the spawning biomass estimate.

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 2006-07 Quota

The Tomales Bay 2005-06 spawning biomass estimate is 2,033 tons, which is 45 percent less than the 2004-05 biomass estimate of 3,686 tons. This season’s spawning biomass estimate is 45 percent less than the 14-season average of 3,887 tons. During the 2005-06 season, the commercial gill net catch for the Tomales Bay herring fishery was below the initial season quota of 400 tons. The 18.5 tons landed during the 2005-06 season was the second lowest landing since the fishery was re-opened for the 1992-93 season.

For the 2006-07 season, the Department proposes to set the Tomales Bay catch quota at 350 tons, which is 17 percent of the 2005-06 estimated spawning biomass of

2,033 tons. The Department is proposing a set quota for Tomales Bay and to discontinue the allowance of 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 2006-07 season and subsequent seasons. The shift to a fixed set quota for Tomales Bay would allow the Department to manage the herring fishery in a more cost-effective way similar to the Humboldt Bay and Crescent City Harbor herring fisheries. Managing the Tomales Bay fishery on a real-time basis is no longer feasible due to costs. The Department has decided to set a conservative fixed catch quota based upon data collected over thirty- four seasons of managing the Tomales Bay herring fishery, rather than attempt to set catch quotas seasonally considering the possibility of inadequate data in the future. Based upon the historical data, it is apparent that the Tomales Bay herring population is both dynamic and resilient. The data also suggests that ecological conditions play a far greater role in the fluctuation of the Tomales Bay population than the harvest by the commercial fishery. A quota of 350 tons is a conservative quota that would help ensure Department goals are maintained, and the Tomales Bay herring population remains healthy, and provides for a viable quota for the commercial fishery. It represents an exploitation rate of 9 percent of the average spawning biomass since the fishery was re-opened in the 1992-93 season; the actual exploitation rate for this fishery over the same period averaged 5.3 percent.

2.3.1.2.1 Tomales Bay Mesh Size

This was the sixth consecutive season of a mesh size study that allowed permittees to use gill nets with a 2-inch minimum mesh size, which is smaller than the 2 1/8-in. mesh allowed prior to the mesh size study. The experimental use of a minimum mesh size of 2 inches in the Tomales Bay gill net fishery allowed the Department to continue to: (1) evaluate the use of this mesh size on the size and age composition of the current population; and (2) assess whether increased catch per unit effort (CPUE) could be obtained for the catch and still maintain the Department's management goal of a conservative exploitation rate. The current regulation specifies that the mesh size shall revert to no less than 2 1/8 inches or greater than 2 1/2 inches after the 2005-06

season, unless otherwise designated herein. Based on the data collected from the 2-inch experimental mesh study, the Department has determined that the use of 2 inch mesh gill nets has minimal effects on the Tomales Bay herring population and its continued use is consistent with the Department goal of a conservative exploitation rate. Therefore, the Department is proposing that the mesh size in Tomales Bay be set at a minimum of two-inches and a maximum of 2 ½ inches.

2.3.1.3 Humboldt Bay and Crescent City 2005-06 Quota

The 2005-06 herring season marked the sixth 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 spawning biomass estimate for the 2005-06 season is 124 tons, down 50 tons from last season's estimate of 174 tons. The spawning biomass this season represent only 31 percent of the 10-year average of 402 tons and is the lowest estimate from seasons when spawn assessments were conducted in Humboldt Bay.

There was no fishing effort this season 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 five 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. For the last three seasons biomass estimates were far below average; however, the exploitation rate during 2002-03 and 2003-04 seasons remained below one percent with no exploitation occurring 2005-06. The average yearly biomass estimate from the last six spawn assessment surveys

conducted since the 2000-01 season is 464 tons. A 60-ton quota based on this average would result in a 13 percent exploitation rate, which is considered a conservative rate of harvest. Spawn assessment data from current and historic surveys suggests that the Humboldt Bay spawning population can support the 60-ton seasonal quota established in 1983. The Department proposes no changes to quotas for the Humboldt Bay or Crescent City herring fisheries for the 2006-07 season. The previously set quota for Humboldt Bay and Crescent City 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. The consensus of the DHAC, which met on April 4, 2006, was to recommend that the dates of the roe herring fisheries in San Francisco Bay be set from 5 p.m. on Sunday, December 3, 2006 until noon on Friday, December 22, 2006 ("DH" gill net platoon only). Recommended dates for the odd and even platoons are from 5:00 p.m. on Tuesday January 2, 2007 until noon on Friday, March 9, 2007. The consensus among Tomales Bay permittees was to recommend opening at noon on Tuesday, December 26, 2006 until noon on Wednesday, February 28, 2007. The Department concurs with these recommendations.

2.3.1.5 Issuance of Permits

Sections 163 and 164 of Title 14, CCR specify that permit applications, transfer fees and authorized agent forms are to be submitted to the Department's San Francisco Bay Area Marine Region office. The Department is proposing that references to submitting these documents be amended to direct their submission to the License and Revenue Branch, Sacramento.

Subsection (c)(1) specifies that the Department will send issued permits by certified mail, return receipt requested, to the permittees. The Department is proposing that this language be modified to read that permits will be mailed first class to the

permittees. The cost of mailing the herring permits through certified mail has become economically prohibitive for the Department.

2.3.1.6 Maximum Number of Permits in San Francisco Bay

Subsection (c)(1) of Section 163 specifies the maximum number of permits, or threshold, in each fishing area. The number of permits must fall below this maximum number before any new permits shall be issued. The DHAC is proposing that a reduction in the threshold at which the Department must issue new herring gillnet permits, from 348 (116 DH and 232 Odd and Even) to 240. The DHAC feels that there are currently a lot of un-used and un-wanted herring permits, (e.g. 29 were not renewed and reverted back to the state this year), and that this is due to a steep and prolonged economic decline along with changes in cultural and demographic practices in Japan. The Japanese market is the only market for San Francisco Bay herring. In 1997, the price of herring peaked at \$2,300 a ton and in the following years it dropped to \$500 a ton, and declined further in 2006 to \$400 a ton. The DHAC has expressed that many permit holders only hold the permit and are either without boats and/or without the intention of ever participating directly in the fishery (i.e., they find temporary substitutes to fish their permit). The DHAC feels that a low number of active participants and a high number of individuals finding a temporary substitute is no longer a viable way to operate the fishery. The proposed number of 240 permits, 80 permits for the DH platoon and 160 for odd and even platoons, is derived from the necessity of 40 boats to operate six permits per boat. The DHAC feels that the fishery has evolved into one net per permit, two nets per boat in each platoon, and three platoons fished per season fishery.

2.3.1.7 Vessel Identification

Subsection (d) of Section 163 specifies the signage required for a vessel engaged in taking herring. The DHAC, during their April 4, 2006 meeting, proposed that the language specifying an additional sign on the top of the vessel house be removed to facilitate ease of switching signage each week when alternating fishing groups. This

proposal would remove the phrase, “and on top of the house” from subsection (d), and instead allow signage on the side of the house to be placed as to be seen from the air.

2.3.1.8 Changes for Clarity or Consistency with Section 163.1, Title 14, CCR

Section 163.1 of Title 14, CCR, was added in March 2006 to specify qualifications for permit transfer and ownership of multiple permits in the commercial herring fishery in San Francisco Bay. The Department is proposing to amend or remove language in several subsections from Section 163 which are in direct conflict with Section 163.1. Specifically, (1) subsection (a)(5) states that lists of crewmembers have to be submitted; and (2) subsection (b)(1) specifies that no person shall submit more than one application per season which is in direct conflict with subsection (b)(1) of Section 163.1, therefore, the Department proposes to remove this language. Subsection (c)(1)(D) defines the conditions for preferential status, or criteria, for applications in a herring permit lottery. These criteria describe a point system which is no longer in use and the Department is proposing to remove this language and all reference to the point system. Subsection (e)(2) identifies when crew lists must be filed with the Department. The Department proposes to amend this section since crew lists are no longer required.

2.3.1.9 Corrections and Clarifications

The following change relating to the first paragraph of Section 163 is proposed by the Department for the sake of clarity: change the fifth sentence to read ...“pursuant to this paragraph may request a hearing before the commission...” and remove the reference to “paragraph one”.

2.3.2 Herring Eggs-on-Kelp (HEOK) Fishery

2.3.2.1 Corrections and Clarifications

The following changes are proposed by the Department to correct the Herring Eggs on Kelp Application number to coincide with the 2006-07 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 reexamined 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 2003-04 season. This alternative would apply those 2003-04 season regulations to the

2004-05 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 three gill net groups (platoons) in San Francisco Bay, allowing individual permittees to take and land as much fish (tonnage) as they are capable of until the overall quota for their respective group is reached. An individual permit quota has been suggested each season for the past several years. However, there has never been a clear consensus of support or opposition among industry members about this issue. The Department is concerned about the level of enforcement effort that would be necessary to effectively monitor and enforce this alternative. See Section 2.4.3 of the FED for a full description of this alternative.

Chapter 3. ENVIRONMENTAL SETTING

3.1 General

Pacific herring, *Clupea pallasii*, are found throughout the coastal zone from northern Baja California on the North American coast, around the rim of the North Pacific Basin and Korea on the Asian coast (Outram and Humphreys 1974, Hart 1973). In California, herring are found offshore during the spring and summer months foraging in the open ocean. Beginning as early as October and continuing as late as April, schools of adult herring migrate inshore to bays and estuaries to spawn. Schools first appear in the deep water channels of bays to ripen (gonadal maturation) for up to two weeks, then gradually move into shallow areas to spawn. The largest spawning aggregations in California occur in San Francisco and Tomales bays. San Francisco Bay is also near the southern end of the range for 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 ten days, determined mainly by water temperature. Larval herring metamorphose into juvenile herring in about ten to twelve weeks. In San Francisco Bay, juvenile herring typically stay in the Bay through summer, and then migrate out to sea. Where juvenile herring migrate to once they leave the bays and estuaries is not known or understood.

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 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 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. 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 2005-06 spawning biomass estimate is 145,054 tons (including catch), a 146 percent increase over last season's estimate of 58,934 tons (Figure 2.2). It is the second consecutive spawning biomass estimate to exceed the 27-year long-term average, 55,278 tons, since the 1996-97 season, following seven consecutive seasons of below-average spawning biomass. The spawning biomass estimate for this season is the largest recorded estimate in the history of the roe herring fishery. There were 23 spawning events this season, over twice the amount of an average season (11 spawning events). The combined area for all spawns covered an estimated 37,360,505 m² and was 313 percent greater than the historical average (9,043,509 m²).

The first recorded spawn of the season occurred on December 1, 2005, and the latest spawn occurred on April 2, 2006 (Table 3.1). Spawning events were recorded throughout San Francisco Bay, from as far north as the Marin Islands in San Rafael Bay to Oyster Pt. in the south bay. This season's vegetation survey revealed a dramatic increase of *Gracilaria spp.* in Richardson Bay. Density values for *Gracilaria spp.* in Richardson Bay were slightly greater this season (2.33 kg/m) than the previous season (2.28 kg/m), but the extent of the area covered by *Gracilaria spp.* was much larger. A substantial amount of *Gracilaria spp.* was again located in the subtidal area south of Candlestick Point for the second consecutive season.

Table 3.1. 2005-06 Pacific Herring Spawning Biomass Estimates for San Francisco Bay
Spawns recorded as of 4/14/2006; all weights in short tons

Wave Number	Approx. Spawn Date(s)	Location(s)	Spawn Escapement Estimate	Catch	Spawning Biomass Estimate
1	December 1-3, 2005	Candlestick/Hunters Pt.	1,940		1,940
2	December 9-10, 2005	Richardson Bay	6,526		6,526
3	December 11-12, 2005	Candlestick/Hunters Pt	1,080		1,080
4	December 25, 2005	Candlestick/Hunters Pt	1,659		1,659
5	December 29-30, 2005	Richardson Bay	16,970		16,970
6	January 7-9, 2006	Oyster Pt/Sierra Pt	8,655		8,655
7	January 6-8, 2006	Richardson Bay	20,773	81	20,854
8	January 12-15, 2006	Richardson Bay	8,185		8,185
9	January 24-26, 2006	Richardson Bay	9,052		9,052
10	January 24-26, 2006	Belvedere Cove	176		176
11	January 24-26, 2006	Candlestick to SF Waterfront	5,652	434	6,086
12	February 3, 2006	Richardson Bay	30,297	1	30,298
13	February 8-13, 2006	Richardson Bay	1,607		1,607
14	February 13, 2006	Paradise	25	80	105
15	February 20, 2006	Richardson Bay	2,100		2,100
16	February 20, 2006	San Quentin	1,437	148	1,585
17	February 20, 2006	Marin Islands	805		805
18	February 25, 2006	Richardson Bay	1,071		1,071
19	March 3, 2006	Richardson Bay	24,413		24,413
20	March 5-6, 2006	Belvedere Cove	28		28
21	March 5-6, 2006	Kiel Cove	327		327
22	March 16-17, 2006	Richardson Bay	1,038		1,038
23	April 1-2, 2006	Richardson Bay	493		493
Totals			144,309	744	145,053

The spawning season started off slowly with no recorded spawns in the month of November, but quickly gained momentum at the beginning of December. Spawning was consistent between December and March, averaging almost six spawning events per month. A sizeable spawn was even recorded in the month of April. The majority of spawning events this season were located in the subtidal, versus intertidal, zone, and focused in areas with high concentrations of *Gracilaria spp.* (i.e. Candlestick area and Richardson Bay).

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). Eighty-eight percent of the 2005-06 season total spawn escapement biomass occurred in North-Central Bay, with 85 percent of the season's total occurring within Richardson Bay, primarily in the subtidal beds of eelgrass and *Gracilaria spp.* A total of twelve spawns occurred in Richardson Bay this season and at times spawning seemed almost continuous. However, spawning events were distinguished by determining egg development and observing shifts in the areas spawned upon over time (i.e., from the main subtidal bed to the cross channel beds). North-Central Bay spawning activity also included a spawn at the Marin Islands and Pt. San Quentin, which included spawn along the shoreline from northwest of the Marin Rod and Gun Club pier to the west end of San Quentin Prison. This was the second spawn of measurable size documented at Pt. San Quentin, and the first documented spawn at the Marin Islands in the 33-year history of the spawn survey.

The current age composition indicates strong recruitment of 3-year-old herring. The estimated number of 3-year-olds was the highest ever recorded, approximately 309 percent above the long-term mean and 149 percent higher than the 2004-05 season estimate (Table 3.2). There were also significant increases in the numbers of 4-, 5-, and 6-year-old herring (164, 424, and 34 percent by number respectively from the 2004-05 season). The estimated numbers of 4- and 5-year-olds were above average; however, the numbers of 6-year-olds were below the long-term mean. Although the numbers of six-year-old herring increased from the 2004-05 estimate, herring older than six years remain nearly absent from the population. The greatest increase in spawning biomass by age group appears to be the three-year-old cohort (Figure 3.1) from the 2003 year class.

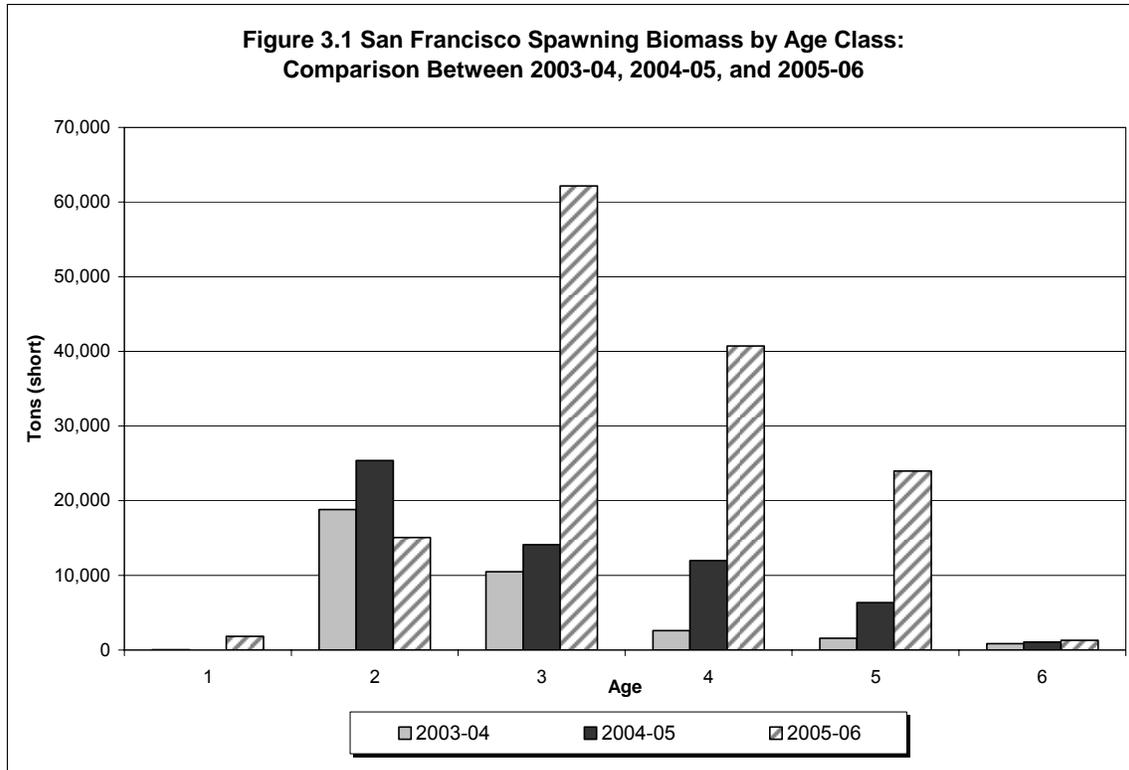
Table 3.2 Estimated Numbers (x 1,000) of Herring-at-Age in the San Francisco Bay Spawning Population, 1982-83 to present

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
Mean	24,671	3.3	185,580	29.8	219,388	32.0	136,538	22.0	62,790	10.0	15,753	2.7	3,537	0.6	763	0.1	61	0.0	649,081

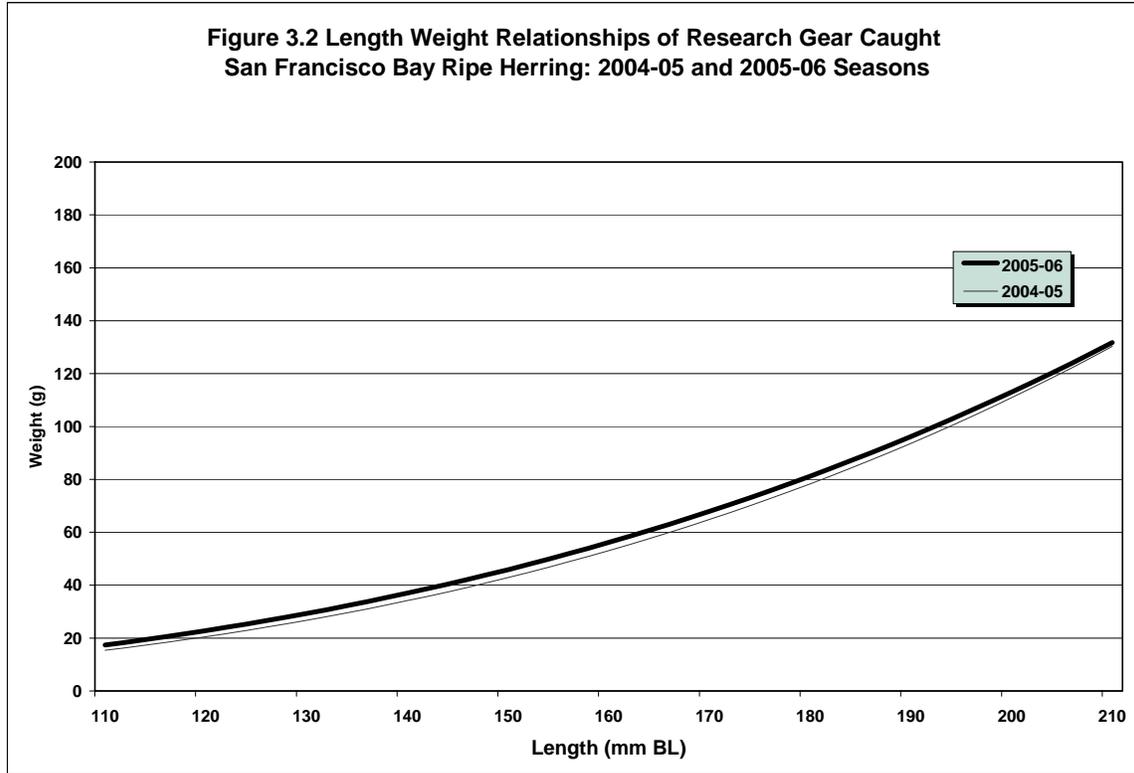
Note: 1990-91 season was not included due to incomplete data set for that season; 2002-03 season spawning biomass estimate unresolved.

^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



Length weight regression analysis of data taken from ripe herring sampled this season with research gear (midwater trawl) indicates that herring were slightly heavier in weight for a given length compared to the 2004-05 season (Figure 3.2). This indicates there was a slight improvement in the condition of herring after the 2004-05 El Niño. Additionally, samples taken from the commercial gill net fishery also indicate herring were in better condition compared to the previous season. The mean length of commercial gill net samples for the 2004-05 season was 191 millimeters (mm) Body Length (BL) and weights averaged 98 grams (g). This season, the average length of the commercial catch decreased to 188 mm BL and, average weight of sampled fish declined to 97 g. Despite being 3 mm smaller on average, commercially caught herring this season were only a gram lighter which indicates herring may have been in better condition. A decline in the average size was not unexpected due to the change in minimum mesh size from 2 1/8 inches to 2 inches this season. The mean length of commercially caught San Francisco Bay herring this season

Figure 3.2 Length Weight Relationships of Research Gear Caught San Francisco Bay Ripe Herring: 2004-05 and 2005-06 Seasons



(188 mm) is similar to the mean length (189 mm) of commercially caught herring during the Tomales Bay 2 inch experimental mesh study period (2000-01 to present). Both bays currently have a relatively similar age structure that lack older herring.

Although the annual estimated spawning biomass is 146 percent higher than the 2004-05 season, and 4-year-old and older herring increased a total of 46,571 tons from the previous season (Figure 3.1), the commercial catch, while larger than last season, has remained quite low. A number of factors are most likely responsible for this result. This season's spawning population was dominated by 3-year old and younger fish, approximately 63 percent of the estimated numbers. In addition to the large numbers of young fish, a majority of the spawning took place in Richardson Bay, an area closed to the commercial fishery. Also, most of the spawning was subtidal, with only a small portion of intertidal spawning along the San Francisco waterfront providing the majority of the season's catch. The result was an extremely low exploitation rate (0.5 percent) of the spawning population.

In summary, because of the record spawning biomass there was a significant increase in the number of fish from age 4 through 6 from the 2004-05 season. This increase and the apparent strong recruitment of age 3 fish are both signs of improvement in the San Francisco Bay spawning population. If the population continues to persist at a high level, and the diversity of age classes increase in number, the outlook for the stock to rebuild and improve its age structure is good. However, the continuing trend of below average numbers of six-year-old herring and absence of older herring continue to be a cause for concern. This truncation in the age structure since the 1997-98 season and apparent reduction in size at age provide cause for continued conservative management measures for the stock.

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

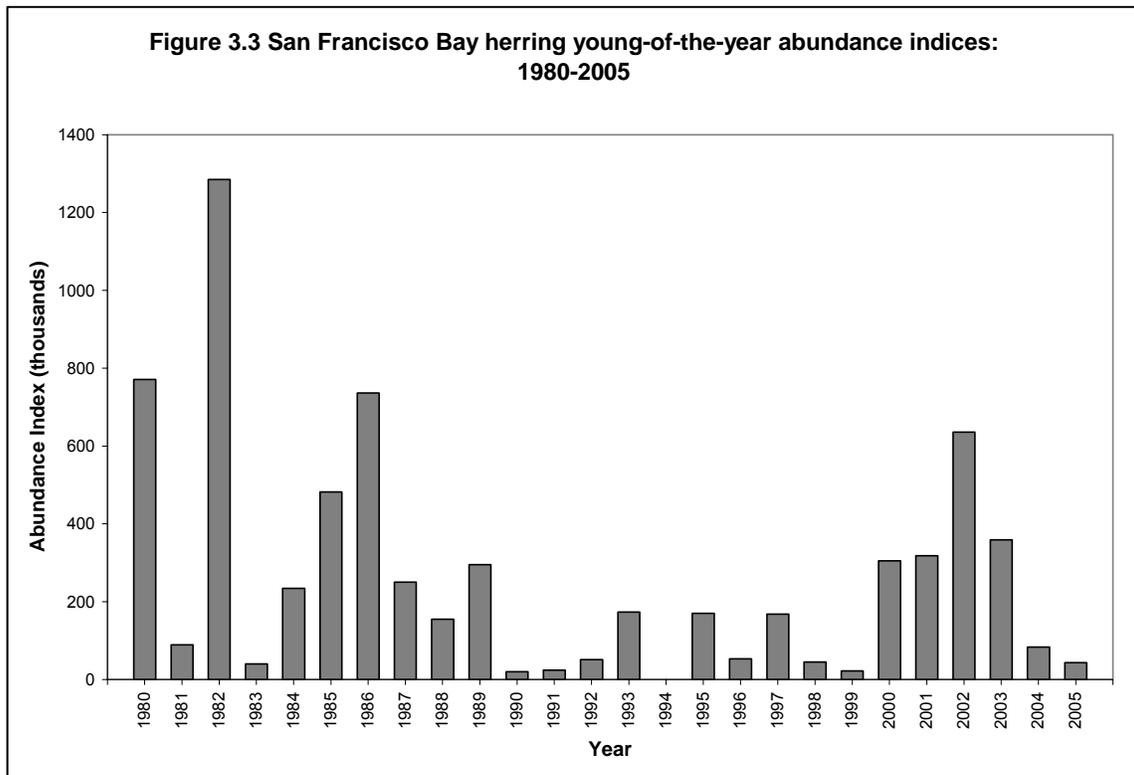
Pacific herring young-of-the-year (YOY) are commonly caught by the Department's Central Valley Bay-Delta Branch San Francisco Bay Study (SFBS) during the spring and summer of each year. The SFBS conducts surveys to determine the abundance and distribution of invertebrates and fishes in the Western Delta 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 Technical Report 63).

The herring YOY abundance index for 2005 shows a decline to pre-2000 levels (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 2005 may reflect unfavorable conditions relative to growth. The low index may indicate poor recruitment of this cohort as it recruits to the spawning population in 2007-08 and 2008-09 seasons as 2- and 3-year-olds. However, there is no strong predictive relationship, historically, between the YOY abundance index and the subsequent numbers of two and three year-old herring that return to spawn. Survival to first

reproduction is affected by a number of factors during the first two to three years of life, including predation, food availability, and competition.

3.4 Status of the Tomales Bay Spawning Population

The Tomales Bay 2005-06 spawning biomass estimate is 2,033 tons, a 45 percent decline from the 2004-05 biomass estimate of 3,686 tons. The spawning biomass estimate is 48 percent less than the 14-season average of 3,889 tons (i.e., since the fishery was re-opened for the 1992-93 season). It is not uncommon for the spawning biomass population in Tomales Bay to fluctuate from season to season (Table 3.3). The spawning biomass estimate for the 2005-06 season remained below-average and was the second consecutive season of decline. The declining spawning biomass could be caused by separate or combined effects from two anomalous events that created unfavorable environmental conditions. The first, an unusual warm water event off of Northern California, Oregon, and Washington occurred last Spring and



Summer. This event was not considered an El Niño, in which warm water typically progresses northward from the equatorial Pacific. In this event, warm offshore water moved onshore decreasing coastal upwelling in the nearshore environment. This effect may have created unfavorable oceanic conditions for herring, resulting in temporal effects in the food web, competition, predation, and altered migration patterns. Second, the extraordinary amount of rainfall this season greatly increased the freshwater in-flow to Tomales Bay. The reduced salinities in the bay, lead to poor spawning conditions and displacement of spawning herring to areas with more favorable conditions.

There were four major spawning events during the 2005-06 season totaling 2,014 tons of spawning escapement. Seven different spawning areas were utilized from November through January. The location of spawning events showed a similar pattern to previous seasons, as spawning was confined to the southern half of Tomales Bay; however, the timing and magnitude of spawning changed this season.

It was the second time since the 1999-2000 season that December spawning escapement did not account for at least 50 percent of the season's spawn escapement, as larger spawn events occurred in January. The spawning escapement total for January was above average for the 14-year period after the Tomales Bay fishery was re-opened for the 1992-93 season, but monthly totals for November, December, February, and March were below average.

Eelgrass (*Zostera marina*) and *Gracilaria spp.* resources in Tomales Bay appeared healthy and provided ample spawning substrate suitable for herring. Environmental conditions in Tomales Bay (i.e., freshwater inflow and salinity) may be a factor in the decline in spawning biomass this season. The high amount and duration of rainfall in Tomales Bay maintained low salinity levels for prolonged periods that may have created poor spawning conditions and deterred more herring from utilizing Tomales Bay as a spawning area. A similar event occurred in the 1997-98 season, when large amounts of rainfall reduced bay salinities and appeared to deter herring from entering Tomales Bay to spawn.

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
AVERAGE	4,496	339	8.7%	4,847
'92-93 to '05-06 AVG	3,712	175	5.3%	3,887
Mesh Study Average	5,434	177	3.0%	5,611

^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.

Commercial catch and independent research population data collected for the 2005-06 season were insufficient to characterize the Tomales Bay fishery and spawning population. Small commercial landings occurred on one day, from only one spawning wave, and were inadequate to provide comparisons with previous seasons. Research catch data for this season were also limited because of a reduction in sampling effort due to a lack of Department personnel. Due to these factors, only limited assessment was made of the 2005-06 spawning biomass and commercial fishery. 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. There is a predicted continuation of a weak La Niña, i.e., cool water event, which often is considered to be beneficial for a cold-water species like herring. As the oceanic conditions improve there is the potential for a greater return of herring to Tomales Bay next season.

3.4.1. Tomales Bay Experimental Mesh Size Study

After six consecutive seasons the Department is discontinuing the experimental mesh size study for the Tomales Bay fishery. This study allowed permittees to use a gill net mesh size of 2-in., which is smaller than the 2 1/8-in. mesh required by regulation. The Department has evaluated the effects of using 2-in. mesh on the age classes caught by the commercial fleet to ensure that the younger fish (\leq 3-year-olds) are not significantly impacted, thus potentially causing the fishery to become unsustainable. It is not surprising, given the smaller mesh size, that commercial catch data show an increased take (203% from pre-mesh study levels, 1993-94 to 1999-2000 seasons) of 3-year-old herring during the mesh study period, however, the take of 3-year-olds has remained at higher than expected levels. The expectation that the Tomales Bay age structure was primarily older fish (\geq 4-year-olds) was based on population assessments prior to the use of 2-in. mesh beginning in the 2000-01 season.

From 1993-94 to 1999-2000 (prior to the mesh study), 3-year-old herring averaged approximately seven percent of the commercial harvest in Tomales Bay. During the mesh study (2000-01 to the present), 3-year-olds averaged 25 percent of the commercial catch. The increase in the percentage of 3-year-old herring taken by the fishery during the mesh study is a function of a number of factors including: large numbers of 3-year-olds in the spawning population (Table 3.4); below-average numbers of 5-year-old and older herring; and the expected shift in size selectivity to include smaller younger herring, due to the gill net mesh size reduction to 2-in. It is unlikely that the use of 2-in. mesh gill nets in Tomales Bay has had a detrimental effect on the age structure of the spawning population due to the low harvest rate (average 3.0 percent) during the study period. However, the trend of increased harvest of 3-year-old herring is cause for concern. Alleviating some of the concern is the dramatic increase in the proportion of younger fish in the population during the mesh study (435% increase in the average estimated number of 2- and 3-year-old herring from pre-mesh study period, 1993-94 to 1999-00 seasons).

Length data gathered since the commercial fishery was re-opened in 1992-93 season have shown that the mean length of commercially caught herring (191 mm) has changed very little from the pre-mesh study period (192 mm) to the mesh study (189 mm). The slight differences in means could be attributed to both the change in Tomales Bay stocks age structure and changes in mesh size. The selectivity of gill nets is a function of mesh size and the size distribution of herring present at the time the nets are fished. The school composition and timing of spawning runs greatly affect the age compositions of the commercial catch. Early spawning runs are composed of larger herring which are typically older fish, and later runs are usually dominated by smaller younger fish. During the mesh study period much of the spawning biomass was not catchable because spawning occurred prior to the commercial season. The fish in these earlier schools are often the larger herring. The weather is another factor related to timing that can affect the commercial industry ability to target larger herring. Weather events sometimes prevent fishermen from fishing on earlier schools dominated by larger herring. Therefore fishing effort is shifted to later schools that are usually dominated by smaller fish.

Table 3.4 Estimated Numbers (x 1,000) of Herring-at-Age in the Tomales Bay Spawning Population, 1993 to present

Age and Percent Composition

Season	1	%	2	%	3	%	4	%	5	%	6	%	7	%	8	%	9	%	Total
93-94	0	0	567	2.8	3,329	16.7	6,021	30.1	3,329	16.7	5,171	25.9	1,062	5.3	425	2.1	71	0.4	19,974
94-95	0	0	4,446	13.9	10,209	32.0	4,281	13.4	3,293	10.3	5,846	18.3	2,717	8.5	988	3.1	165	0.5	31,945
95-96	0	0	1,000	5.6	1,643	9.2	7,287	40.6	5,930	33.1	1,072	6.0	214	1.2	786	4.4	0	0	17,932
96-97	0	0	117	1.0	2,225	18.4	4,625	38.2	4,098	33.8	820	6.8	234	1.9	0	0	0	0	12,118
97-98																			
98-99	0	0	11,655	25.1	14,127	30.5	14,598	31.5	4,827	10.4	1,177	2.5	0	0	0	0	0	0	46,383
99-00	0	0	487	2.2	5,606	25.4	10,603	48.1	4,753	21.5	244	1.1	366	1.7	0	0	0	0	22,059
00-01	0	0	6,983	16.7	17,642	42.1	15,437	36.8	1,838	4.4	0	0	0	0	0	0	0	0	41,900
01-02	0	0	19,379	25.3	35,776	46.8	17,060	22.3	4,306	5.6	0	0	0	0	0	0	0	0	76,521
02-03	0	0	15,113	29.3	22,589	43.8	11,613	22.5	2,148	4.2	80	0.2	0	0	0	0	0	0	51,542
03-04	0	0	45,193	31.7	55,565	39.0	26,548	18.6	11,483	8.1	2,593	1.8	1,235	0.9	0	0	0	0	142,616
04-05	0	0	10,560	25.0	18,170	43.1	9,498	22.5	3,481	8.3	472	0	0	0	0	0	0	0	42,181
05-06																			
Mean	0	0	10,500	16.2	16,989	31.5	11,597	29.5	4,499	14.2	1,588	5.7	530	1.8	200	0.9	21	0.1	45,925

Note: 1997-98 and 2005-06 seasons not included due insufficient data set for expansion

Another possible cause for the increased take of 3 year-old herring is that fishermen are retrieving their gear faster. Due to increased predation by marine mammals fishermen tend to have shorter sets and retrieve their gear faster to reduce predation of catch and gear damage by marine mammals. There is speculation that faster sets and gear retrieval may prevent a portion of smaller herring that would normally escape the gill net to be retained.

Despite an increased take of 3-year-old herring during the mesh study period, the average exploitation rate from the estimated Tomales Bay population for both the pre-mesh study period (1993-94 to 1999-00) and mesh study period was the same (0.4 percent). The average percentage of 3-year-olds commercially taken from the estimated number of 3 year-olds in the population is less during the mesh study period (0.8 percent) than the pre-mesh study period (2.2 percent). It is unknown why the Tomales Bay spawning stock structure has changed to include more young fish (2- and 3-year-old herring), and the persistent lack of older fish (≥ 6 year-old herring) in the population. However, it appears that the commercial exploitation of the Tomales Bay herring is not a major factor. Little is known about the offshore portion of the herring life history, and other factors (e.g., predation and/or prey abundance) maybe responsible for recent trends observed in the population.

Based on the data collected from the 2-inch experimental mesh study, the Department has determined that the use of 2 inch mesh gill nets has minimal effects on the Tomales Bay herring stock and its continued use is consistent with the Department goal of a conservative exploitation rate. If the Tomales Bay stock should continue rebuilding, the commercial catch composition may shift to older age classes if they persist in the population. Therefore, the Department is proposing that the mesh size in Tomales Bay be set at a minimum of two-inches and a maximum of 2 ½ inches.

3.5 Status of the Humboldt Bay and Crescent City Spawning Populations

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 for the 2005-06 season is 124 tons, down 50 tons from last season's estimate of 174 tons. The spawning biomass this season represents only 31 percent of the 10-year average of 402 tons and is the lowest estimate recorded from seasons when spawn assessments were conducted in Humboldt Bay. There were three separate spawn events found in the bay this year. The first spawn detected occurred in the North Bay on January 7th and was estimated at 4 tons. The next spawn took place between January 28 and February 6 in the South Bay and was estimated at approximately 57 tons. The last spawn detected this season occurred in the North Bay on February 8th and was estimated at 63 tons.

There was no fishing effort this season by Humboldt Bay permittees. For the last five 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 three seasons biomass estimates were far below average; however, the exploitation rate during 2002-03 and 2003-04 seasons remained below one percent with no exploitation occurring 2005-06. The average yearly biomass estimate from the last six spawn assessment surveys conducted since the 2000-01 season is 464 tons. A 60-ton quota based on this average would result in a 13 percent exploitation rate, which is considered a conservative rate of harvest.

During the winter of 2006-2006 the Department of Fish and Game, University of California Sea Grant, Humboldt State University, and Humboldt Bay Harbor District completed the fifth and final year of a study monitoring the population characteristics of eelgrass in Humboldt Bay. Eleven sites in the north, central and the south regions of Humboldt Bay were surveyed. Above-ground eelgrass biomass (fresh weight) for winter 2005-06 had a mean of 0.47 kg/m² (range 0.06-0.66 kg/m²), which is a 29 percent decrease from the winter 2004-05 mean of 0.61 kg/m² (range 0.17-1.58 kg/m²). These

data are essential for herring research and has greatly improved the accuracy of the season's spawning biomass estimate.

Spawning ground surveys and commercial fishery assessments were not conducted in the Crescent City area for the 2005-06 season. Although two permits are active in Crescent City, no fishing effort has taken place in Crescent City for the past four seasons. The Department does not plan to conduct spawning ground surveys and commercial fishery assessments in the Crescent City area for the 2006-07 season. The 30-year average catch of 22 tons per year for Crescent City permittees is far below the set 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 FED. The proposed project and two of the three alternatives will permit a continuation of the regulated commercial harvest of Pacific herring in California. An analysis of the impacts of the proposed project is discussed in this FSED.

Existing regulations permit the commercial harvest of herring in five 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 five 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 SED. The basis for this assessment is provided in detail in section 4.1 of the FED.

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

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

The FED divided potential impacts into two categories: (1) direct harvest impacts; and (2) trophic level impacts. Short and long term potential adverse impacts exist within each of these categories. Many of these potential impacts are mitigated by current management practices including annual stock assessments and regulations that control harvest and fishery impacts. Others are considered localized, short-term and less than significant.

Chapter 5 of the FED provided a detailed analysis of the factors that have the capacity to influence future 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 Department identified and addressed impacts and cumulative effects of the proposed project on the existing environment described in Chapter 3 of the FED, subsequent FSEDs, and this FSED. No impacts were identified that were not already addressed in the FED or prior FSEDs. Other impacts identified were determined to be localized, short-term, and less than significant.

Chapter 5. ANALYSIS OF ALTERNATIVES

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

5.1 Alternative 1 (no project)

The "no project" alternative would eliminate the commercial harvest of Pacific herring resources within California waters. Selection of this alternative would be expected to: (1) reduce total mortality and allow herring stocks to increase to carrying capacity; (2) 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 2005, were for the 2005-06 Pacific herring commercial fishing season. These regulations reflect the amendments as adopted by the Commission in September 2005. Under alternative 2, the only changes to the 2006-07 regulations would be to revise the herring fishing seasons by location, and adjust quotas to reflect the 2005-06 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. Some of the changes and amendments in the proposed project address a set fishing quota in Tomales Bay, the minimum mesh size in Tomales Bay, the new address where all herring permit applications, transfer fees, authorized agent requests, and fresh fish permits be sent, the maximum number of permits in San Francisco Bay, modifications to vessel signage, consistency with Section 163.1 regarding crew lists, multiple permit ownership and lottery criteria, or are simply clarification changes and are without apparent environmental implications.

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. 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 Department's 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 Fish and Wildlife Service, NOAA National Marine Fisheries Service, Environmental Protection Agency, and other state and federal agencies received all environmental documents that have been prepared regarding Pacific herring. To date, we have not received any comments from these agencies.

Consultations also occur during the annual review of regulations guiding the commercial harvest of herring. The process began this year when the Department presented the results of its annual population assessment and discussed possible regulatory changes for the 2006-07 season with the Director's Herring Advisory Committee (DHAC) on April 4, 2006.

Proposed changes to the regulations for the 2006-07 were modified, as necessary, based on comments from the DHAC. These recommendations were presented to the Fish and Game Commission at their August 4, and August 25, 2006 meetings.

Prior to preparation of the FSED, the Department initiated a broader consultation by distributing an NOP that announced the intent to prepare the document dated April 3, 2006. 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 August 25, 2006, 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 4, 2006 meeting in Sacramento. No comments were received by either the Commission, or the Department, on the DSED.

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Appendix A

Gill Net Mesh Size in the California Herring Fisheries Historical Background

**Gill Net Mesh Size in the California Herring Fisheries
Historical Background Notes – Summary Table**

Season	Regulation/Change/Why? (if no reference as to why indicated, none was found)
1976-77	The length of meshes of any gill net shall not be less than 2 inches or greater than 2 ½ inches (all bays). The upper limit of 2 ½ inches was specified for districts 11, 12, and 13 in the Fish and Game Code. Industry concern.
1977-80	No information on mesh change in files.
1980-81	Provision for fresh fish mesh size of no more than 1 ¾ inches and distinction between roe fishery and fresh fish fishery.
1981-82	No information on mesh change in files.
1982-83	In Tomales and Bodega Bay the length of the meshes of any gill net used in the roe fishery shall not be less than 2 inches or greater than 2 ½ inches. In all other permit areas the length of the meshes of any gill net used in the roe fishery shall not be less than 2 ¼ inches or greater than 2 ½ inches from November 28 through January 14. On or after such date the Director may, if the established fishing quotas are not filled and such action will not impact the herring resource, authorize the use of 2 1/8 inch or 2 inch minimum mesh for gill nets used in the roe fishery. Industry request.
1983-84	Date change to allow minimum 2 1/8 inch mesh, essentially, for the odd and even platoons in San Francisco Bay. A maximum mesh size was established for the fresh fish fishery. Language was also added on mesh measurement.
1984-85	Regulatory change to allow minimum 2 1/8 inch mesh for the XH fishery in San Francisco Bay, making the mesh size uniform in all areas (Crescent City, Humboldt and San Francisco) other than Tomales and Bodega bays. Decision made as a result of industry questionnaire.
1985-86	Increase in maximum mesh size in the fresh fish fishery to 2 inches. Industry request.
1986-87	Removal of subsection describing method of measurement for gill net mesh. Enforcement proposal.
1987-88	Minimum mesh for Humboldt Bay and Crescent City changed increased to 2 ¼ inches. Industry request.
1988-92	There are no changes to mesh size or mesh measurement methods in regulation. In 1991-92 the ‘Banzai’ area closure in San Francisco Bay was added to the regulations.
1992-93	The minimum mesh size in Tomales Bay was increased to 2 1/8 inches to reduce the potential take of younger, smaller fish and outer Bodega Bay was closed to fishing. There were no other changes to regulations in other bays. Tomales Bay had been closed to fishing since the 1989-90 season while fishing continued in Bodega Bay during this period.
1993-96	There are no changes to mesh size or mesh measurement methods in regulation.
1996-97	Mesh measurement method implemented with 3 percent tolerance for all herring fisheries in California. Language was added to provide for three permittees to participate in a Department sponsored mesh size study in San Francisco Bay.
1997-98	No tolerance included in mesh measurement; last season of round haul fishery.
1998-99	No changes to mesh size or mesh measurement in regulation.
1999-2000	Language was proposed to allow four permittees to participate in a Department sponsored mesh size study in Tomales Bay.
2000-01	Tomales Bay mesh size study using a minimum mesh of 2 inches. Study was provided to allow the Department to evaluate the use of this mesh length on the current population (shorter length at age) and assess whether increased CPUE could be obtained for the catch and still maintain the Department’s management goal of a conservative 10 percent exploitation rate.
2001-02	Continuation of the fleet-wide Tomales Bay mesh size study. Clarification of the size of peg and weight used in the measurement of mesh was added to subsection (f)(2)(B).
2002-03	Continuation of the fleet-wide Tomales Bay mesh size study. Revised the quota designated for the mesh size study and increased the number of study participants from three to six in San Francisco Bay.
2003-04	Continuation of the fleet-wide Tomales Bay mesh size study. Peer review of San Francisco Bay stock and methodology (prior to season).
2004-05	Continuation of the fleet-wide Tomales Bay mesh size study.
2005-06	Final year of the fleet-wide Tomales Bay mesh size study. Minimum mesh size in San Francisco Bay reduced to 2 inches.

Gill Net Mesh Size in the California Herring Fisheries Historical Background Notes – Detailed Notes

This information is a summary of mesh size and mesh measurement changes to regulations for herring gill net fisheries in California from the 1976-77 season to 2003-04. The information covers all fisheries, Crescent City, Humboldt Bay, Tomales Bay and San Francisco Bay. In summary, none of the mesh size changes are based on experimental data or study conducted prior to regulatory change. All of the changes to the mesh size are on the minimum mesh allowed; the maximum has remained unchanged since a mesh size range was specified for the 1976-77 season. The maximum mesh size was stated, originally, in Fish and Game Code, and was most likely the source of establishing the limit; there is no reference in the files as to the rationale for a maximum mesh size. Many of the mesh size changes were at the request of the industry. The changes to the method of mesh measurement have been at the request of industry, Department enforcement and Department biologists.

The references for this information are the Director's Herring Advisory Committee (DHAC) meeting minutes and the Section 163, Title 14 CCR regulatory documents (Pre-publication of Notice/Initial Statement of Reasons, Pre-Adoption Notice and Final Document and regulations) unless otherwise noted. Information in quotation marks is a direct quote; all other information is paraphrased from the document referenced for that year. Personal names have been removed and replaced with "Industry", "Department staff", or "Department enforcement personnel" where appropriate. Information on regulations under each of the bulleted sections comes from Section 163 of Title 14 unless otherwise noted. Information under the section "Notes from the DHAC meeting minutes" is taken directly from the DHAC meeting minutes on file for that year. Information on regulatory changes is from DHAC meeting minutes and regulatory documents. See table at the end of this section for documents used for each year.

- 1975-76 Season. Draft regulations for this season are on file. There is no reference to minimum or maximum mesh size.
- 1976-77 Season. Mesh size regulations: The length of meshes of any gill net shall not be less than 2 inches or greater than 2 ½ inches. (Section 163, Title 14, CCR) The upper limit of 2 ½ inches for districts 11, 12 and 13 was stated in §8688 of the Fish and Game Code. "These changes will alleviate the concerns expressed by the commercial fishermen regarding the use of gill nets to take herring while still affording adequate protections to the herring resource as well as important sport species (October 6, 1976 letter from the Director to the Commission). The October 6, 1976 letter specifies a minimum of 1 ½ inches; a 2 inch minimum was specified in the regulations apparently as a result of earlier industry input and correspondence dated December 15, 1976.
- 1980-81 Season. Mesh size regulations: Provision for fresh fish mesh size of no more than 1 ¾ inches and distinction between roe fishery and fresh fish fishery. (Section 163, Title 14, CCR)

Notes from the March 17, 1981 DHAC meeting minutes:

(Net measurement and mesh size) A survey questionnaire was distributed to gill net permittees prompted by the differences in production which resulted from the use of various mesh sizes. A DHAC member stated that many gill netters switched to smaller (2 inch) mesh nets this year because of the abundance of smaller fish and there was concern that extensive use of 2 inch mesh would impact the resource. Department staff presented the following results from the fish samples collected during the season:

Mesh size (inches)	Average Roe Recovery (Percent)	Percent Females	Ave. Length (cm)	Age Composition
2 ¼	18.1	75	20	93% of samples age 4-6
2 1/8	17.3	70	19.5	93% of samples age 3-5
2	14	58	?	84% of samples age 3-4

A lengthy discussion followed on the issue of minimum mesh size. It was decided to recommend 2 ¼ inch minimum mesh size for San Francisco Bay, Humboldt Bay and Crescent City and a 2 1/8 inch minimum mesh size for Tomales Bay, with a provision that would allow the Director to reduce the minimum mesh size to 2 inches after February 1 if warranted.

- 1981-82 Season. Mesh size regulation unchanged. However in the August 12, 1981 Pre-Adoption Statement under “Summary of primary considerations raised in opposition to the proposed action and reason(s) for rejecting those considerations” in response to item 3, “Restrict the length of meshes of gill nets to 2 ¼ - 2 ½ inches”, the response reads, “Current regulations provide that the meshes of gill nets shall not be less than 2 inches or greater than 2 ½ inches. This request is based on a desire, by some fishermen and processors, to restrict the catch to larger herring which are economically more valuable in the marketplace. However, there is no biological justification for implementing more restrictive mesh size regulations and such considerations are beyond the scope and authority of the Department.”

File Notes: There are two interesting letters from industry that consider the option of increasing the minimum mesh size from 2 to 2 ¼ inches. There is a lot more information in both of these letters; here are excerpts from both:

“As you know, although 2 to 2 ½ inch has been the legal range of mesh size, the 2 ¼ inch mesh has been used by approximately 90 percent of the fishermen. This mesh size produces primarily five year olds and up herring and the best roe recovery available.” “The problems with the 2 inch mesh are several: 1. It harvests stocks down into the three-year age class. This defeats the idea of harvest by gill net to take mature, older age herring while allowing younger stocks to spawn and return to sea.” DHAC member, letter to the Director dated July 19, 1981.

“As a resource held as a public trust, the department should look beyond merely protecting the resource and assure that the maximum value is gained from this resource.” “Without the department making clear its intent soon on mesh sizes, there will be a mad dash for nets with fishermen being uncertain of what mesh size to purchase. The industry, by itself, cannot regulate mesh sizes, since there is one overall quota and each fisherman must work to catch as much as possible.” Industry Representative, letter to the Director dated July 10, 1981.

- 1982-83 Season. Mesh size regulations: In Tomales and Bodega Bay the length of the meshes of any gill net used in the roe fishery shall not be less than 2 inches or greater than 2 ½ inches. In all other permit areas the length of the meshes of any gill net used in the roe fishery shall not be less than 2 ¼ inches or greater than 2 ½ inches from November 28 through January 14. On or after such date the Director may, if the established fishing quotas are not filled and such action will not impact the herring resource, authorize the use of 2 1/8 inch or 2 inch minimum mesh for gill nets used in the roe fishery. (Section 163, Title 14, CCR)

Notes from the March 29, 1983 DHAC meeting minutes:

(Net measurement and mesh size) “A general discussion followed regarding minimum mesh sizes and current measuring techniques used by the Department’s enforcement personnel in determining mesh size. It was noted that present methods were not adequate for the highly elastic small mesh monofilament webbing used for herring gill nets. As a result, some fishermen were actually using nets which were constructed of webbing less than minimum size, although legal when measure by the standard means. The director stated that the Department would develop an alternative measuring method for herring nets which would ensure compliance with the minimum mesh requirements established by the Commission.” (New paragraph) “It was also suggested, and agreed upon, that the minimum mesh size for gill nets used

in the XH fishery would remain at 2 ¼ inches, with a minimum of 2 1/8 inch mesh provided for beginning with the opening of the regular season on January 2, 1984.” (DHAC Meeting Minutes, March 29, 1983)

Complaints were registered, by enforcement and industry, of the use of undersize webbing and the possible development of a standard measurement device using knot to knot measurement. (April 14, 1983 Herring (Public) Meeting Minutes/Notes)

- 1983-84 Season. Mesh size and measurement regulations: In Tomales and Bodega Bay the length of the meshes of any gill net used in the roe fishery shall not be less than 2 inches or greater than 2 ½ inches. In all other permit areas the length of the meshes of any gill net used in the roe fishery shall not be less than 2 ¼ inches or greater than 2 ½ inches from November 27 through December 16. From January 2 through March 30 the length of the meshes of any gill net used in the roe fishery shall not be less than 2 1/8 or greater than 2 ½ inches. The meshes of any gill net used by the fresh fish permittees shall not be greater than 1 ¾ inches.

Subsection (f)(2)(G) was added to read:

(G) Mesh size of gill nets authorized to take herring will be determined by the following method:

- (1) Suspend a minimum of eleven meshes between a fixed point and a maximum of one pound weight.
- (2) At least 50% of the meshes, when measured between the knots of or inside the points at which the meshes are joined of each mesh, using a standard stainless steel wedge of appropriate gauge without force, shall not be less than the mesh size of nets authorized pursuant to subsection (f)(2)(B) of these regulations.
- (3) Beach nets may only be used in Tomales Bay. No permittee may fish more than 75 fathoms of beach net. (Section 163, Title 14, CCR)

Notes from the March 26, 1984 DHAC meeting minutes:

(Net measurement and mesh size) Industry brought up the issue of undersized nets used in the fishery and the measuring method and there was a general discussion as to whether it was appropriate, or necessary, to amend or change the existing regulations.

Industry also discussed the questionnaire sent out to all San Francisco Bay gill net permittees, and the responses (43) received to date:

Minimum mesh size	2 ¼ inch	2 1/8 inch	2 inch
December (XH)	56%	37%	7%
January – March	21%	62%	17%
Individual Quota (bag limit)	Yes = 67%	No = 33%	

One DHAC member recommended a minimum mesh size of 2 1/8 inches for the entire season, including the XH fishery. A general discussion followed on mesh size, manufacturer’s specifications, lead time when changing mesh size regulation, etc. The general consensus of the group was to retain the current regulations.

Subsequent results of this questionnaire (183 responses/386 questionnaires sent = 47%. This is broken down into December and Odd/Even Platoon responses:

XH returned 54 responses

Minimum mesh size	2 ¼ inch	2 1/8 inch	2 inch
December (XH)	28%	54%	19%
January – March	9%	52%	17%

Odd/Even returned 129 responses

Minimum mesh size	2 ¼ inch	2 1/8 inch	2 inch
December (XH)	50%	29%	7%
January – March	11%	63%	20%

As a result of this questionnaire, the Department amended proposals for the 1984-85 season regulations to provide for the use of 2 1/8 inch minimum mesh for San Francisco Bay gill nets used in the December (XH) fishery. “The majority of permittees responding to the latest herring questionnaire clearly supported this proposal which will provide uniform mesh size requirements for all San Francisco Bay gill nets used in the herring-roe fishery.” (Letter from the Director to the DHAC members dated July 12, 1984)

In a letter dated July 3, 1984, Department biologists expressed the opinion that the minimum mesh size for the December fishery remain the same and provided rationale and catch curves from variable mesh gill nets and commercial catch in explanation.

- 1984-85 Season. Mesh size regulations: In Tomales and Bodega Bay the length of the meshes of any gill net used in the roe fishery shall not be less than 2 inches or greater than 2 ½ inches. In all other permit areas the length of the meshes of any gill net used or possessed in the roe fishery shall not be less than 2 1/8 inches or greater than 2 ½ inches. The meshes of any gill net used by the fresh fish permittees shall not be greater than 1 ¾ inches (Section 163, Title 14, CCR)

Notes from the March 19, 1985 DHAC meeting minutes:

(Net measurement and mesh size) There were no complaints about mesh size noted in the DHAC meeting minutes. Department staff noted the higher proportion of males and 3 year old fish in the December gill net catches were a reflection of the use of smaller mesh gear.

An increase to the fresh fishery mesh size from 1 ¾ to 2 inches was recommended by industry based on the difficulty of obtaining 1 ¾ inch mesh from local dealers and the use of 2 inch mesh would allow fresh fish permittees the opportunity to take larger fish for marketing purposes. "The Department has determined that the use of 2 inch mesh will not result in any adverse impact to the resource, and has proposed such an amendment in the 1985-85 herring regulations." (Pre-Adoption Notice, July 8, 1985)

- 1985-86 Season. Mesh size regulations: In Tomales and Bodega Bay the length of the meshes of any gill net used in the roe fishery shall not be less than 2 inches or greater than 2 ½ inches. In all other permit areas the length of the meshes of any gill net used or possessed in the roe fishery shall not be less than 2 1/8 inches or greater than 2 ½ inches. The meshes of any gill net used by the fresh fish permittees shall not be greater than 2 inches (Section 163, Title 14, CCR)

Notes from the March 4, 1986 DHAC meeting minutes:

(Net measurement and mesh size) A proposal was made by Department enforcement personnel to remove the language in subsections (f)(2)(G)(1) and (2) of Section 163, Title 14, CCR because the "method of measurement which is impractical and in conflict with Fish and Game Code Section 8602. Fish and Game Code Section 8602 has been upheld in court (Pennisi vs. California) and I see no benefit to the measurement described in Section 163." (Memorandum dated March 4, 1986 from Enforcement personnel to the Department) Subsection (f)(2)(G)(3) remained in the regulations under subsection (f)(3). This language was removed for the 1986-87 season.

A DHAC member proposed to limit gill nets to 2 ¼ inch mesh size only in the Humboldt Bay fishery.

- 1986-87 Season. No changes to mesh size or mesh measurement methods in regulation.

Notes from the March 4, 1987 DHAC meeting minutes:

(Net measurement and mesh size) Department enforcement noted that following the seizure of an undersized net, a number of abandoned nets with undersized mesh were found on the docks the following day.

A DHAC member proposed establishing the minimum legal mesh size at 2 ¼ inches in Humboldt Bay and Crescent City, because essentially all existing permittees are using 2 ¼ inch mesh nets at the present time and they wish to insure that the quality of the fish remains the same in the future should new, or additional, permittees enter the fishery.

- 1987-88 Season. Mesh size regulations: In Tomales and Bodega Bays the length of the meshes of any gill net used or possessed in the roe fishery shall not be less than 2 inches or greater than 2 ½ inches. In Humboldt Bay and Crescent City Harbor the length of the meshes of any gill net used or possessed in the roe fishery shall not be less than 2 ¼ inches or greater than 2 ½ inches. In San Francisco Bay the length of the meshes of any gill net used or possessed in the roe fishery shall not be

less than 2 1/8 inches or greater than 2 1/2 inches. The meshes of any gill net used or possessed by fresh fish permittees shall not be greater than 2 inches. (Section 163, Title 14, CCR)

Notes from the March 25, 1988 DHAC meeting minutes:

(Net measurement and mesh size) Industry noted that “under the present system, 2 inch mesh can easily pass as 2 1/8 inch mesh because of the elasticity of the monofilament webbing”.

- 1988-89 Season. No changes to mesh size or mesh measurement methods in regulation.

Notes from the March 20, 1989 DHAC meeting minutes:

(Older fish in catch) “The Department biologist noted that gill net catches were dominated by 4, 5 and 6 – year old fish, similar to the previous season (1987-88). However, it had been expected that the landing would be dominated by 5, 6, and 7 – year old fish. In the biologist’s opinion, the fact that they were not is reflective of the need to go to larger mesh gill nets. Also, the landing showed a 50/50 sex ration when it should have been 60/40 (females to males) or higher. This is further evidence of the need for larger mesh gill nets.” The minutes also note an abundance of 3 and 4 – year old fish in the Tomales Bay catch “reflective of the need for larger mesh gill nets”.

(Net measurement and mesh size) “He (Department enforcement) noted that the elasticity of today’s net material made it possible for 2 inch nets to easily meet the standards of a 2 1/2 in net gauge.” “(Department enforcement) said that the fishermen’s concern is that next year some individual will use less than 2 inch mesh”. “In his (DHAC member) opinion, the gill net mesh size is critical and 2 1/8 inch mesh is the absolute minimum that should ever be used. He favored a previous regulation of several years ago that require 2 1/4 inch minimum mesh in December through the first two weeks in January. After that date 2 1/8 inch mesh was allowed. He stated that much of the fleet was using 2 1/16 inch mesh and some were even using 2 inch mesh. He believes the Department need to change the “measuring” law and suggests that legislation be introduced to do so.”

(Recommendations for 1989-90) “The first recommendation was to increase the minimum mesh size for gill nets to 2 1/4 inch, with at least #7 monofilament webbing, beginning with the 1990-91 season.”

Two options were provided to the Commission to address the issue of the decrease in average size and quality of fish landed in the herring fishery (“apparently due to the increased use of smaller-mesh nets”). Option One: An increase in the gill net minimum mesh and twine size to 2 1/4 inch, using No. 7 monofilament for San Francisco Bay and 2 1/8, using No. 7 monofilament for Tomales-Bodega Bay, beginning with the 1990-91 season. Also, a gill net closure in south San Francisco Bay (i.e. “BANZAI”) beginning with the 1989-90 season. Option Two: Individual gill net quota of 17 tons per permittee in San Francisco Bay. This option also would include provisions to restrict the number of herring buying locations to four areas (Sausalito, Oakland, Pier 33, and Pier 45 – San Francisco), prohibit the unloading of fish between 10 p.m. and 6 a.m., and shortening the overall fishing season by two weeks. It appears that neither of these options was chosen, and there is no justification reflected in the notes.

- 1989-90 Season. No changes to mesh size or mesh measurement methods in regulation. Apparently a new method of measuring mesh size was implemented, but is not reflected in the regulations or in the DHAC meeting minutes (Pre-Adoption Notice dated July 11,1990).

Notes from the March 14, 1990 DHAC meeting minutes:

(Net measurement and mesh size) The Department attributed an increase in roe count in the XH fishery to better compliance with the 2 1/8 inch mesh. A DHAC member noted that although the average roe counts were up during the past season, he attributed it to an influx of larger fish, rather than better enforcement of the minimum mesh size. He (DHAC member) believed that there was continue use of 2 inch mesh; Department enforcement personnel stated that many nets had been checked but there were no violations for undersize mesh. Apparently 2 1/16 inch multi-strand mesh would pass the measuring test. There was some discussion and some disagreement among industry members in attendance at the meeting as to whether the measuring technique was accurate and/or effective at eliminating the use of 2 inch mesh. There was no resolution on the matter reflected in the notes.

(Recommendations for 1990-91) Industry proposal to reduce all quotas by 30% and increase the minimum mesh size to 2 3/16 inches.

- 1990-91 Season. No changes to mesh size or mesh measurement methods in regulation. A letter dated October 24, 1990 states that “at the October 5, 1990 Fish and Game Commission meeting the Commission chose not to take any action on the proposed herring regulations for the 1990-91 season. Therefore, the existing herring regulations that were in effect for the 1989-90 fishing season shall remain in effect and shall govern the fishery during the 1990-91 season. The Commission chose this course of action because of threatened legal action based on a perceived failure to comply with California Environmental Quality Act (CEQA) requirements as regards the herring fishery.”

Notes from the March 21, 1991 DHAC meeting minutes:

(Net measurement and mesh size) “Department enforcement personnel stated that enforcement had difficulty prosecuting cases involving the measuring of gill net mesh using the plastic “credit card” given to permittees. A Department enforcement officer demonstrated a measuring device that he felt would withstand a court challenge because it follows guidelines set forth by the Pennisi decision. He stated that near the end of the season, every net he measured (22) using this device was illegal. He also recommended restricting net to #7 twine and prohibiting the use of multi-strand nets. A Department biologist stated that the method of measuring mesh evolved from the trawl fishery, with four meshes stacked together. He added that the plastic card should work. An industry member reiterated the Department biologist’s statement regarding the measuring of four meshes and wondered why the size of mesh was restricted for gill nets and not for round haul nets. Department enforcement personnel noted that the Alameda courts threw out cases involving illegal small mesh measured using the plastic cards. The criteria, bending of the card, were considered subjective.” A discussion of multi-strand and single-strand gill nets followed with no resolution to the issue.

(Recommendations for 1991-92) In the July 11, 1990 Pre-Adoption statement, in response to an industry proposal for an increase in the minimum mesh size for gill nets from 2 1/8 inch to 2 3/16 inch, the Department responded that due to a new technique for measuring mesh, instituted prior to the 1989-90 season, which accounted for the elasticity of the net material, and an increase in the average size of the fish landed during the past season, there did not appear to be significant justification or support to increase the minimum mesh size at the present time.

A DHAC member proposed a two-week later opening date, bag limits, and that drift nets be allowed in Humboldt Bay and Crescent City.

- 1991-92 Season. No changes to mesh size or mesh measurement methods in regulation. The closure of the ‘Banzai’ area to gill nets from November 28 through February 14 is included in the regulations.

Notes from the March 17, 1992 DHAC meeting minutes:

(Net measurement and mesh size) “Department enforcement personnel stated that enforcement intended to look into a different net measuring procedure for next season in order to reduce the use of undersized mesh. The procedure that we are looking at involves the use of a weight and would be similar to the method employed in the State of Alaska.” There was a short discussion of this method and the fact that enforcement was unable to make any cases involving mesh size with the current method. Following

another lengthy discussion an industry member volunteered to work with enforcement and attempt to find a solution to the problem.

(Recommendations for 1992-93) “Enforcement to investigate potential alternative net measuring procedures.”

“Increase the minimum mesh size for gill nets used in the Tomales Bay fishery from 2 inches to 2 1/8 inches.” This proposal, along with a reduction in the amount of fishing gear allowed, “will reduce the potential take of younger, smaller fish, while a reduction in the amount of fishing gear will minimize potential disruption of herring schools and spawning activities.” The Department and the herring industry agreed on this proposal. (June 4, 1992 Statement of Purpose for Regulatory Action)

- 1992-93 Season. Mesh size regulations: The minimum mesh size in Tomales and Bodega Bays was changed to 2 1/8 inches. No other changes to mesh size or mesh measurement methods in regulation in any other bays.

Notes from the March 16, 1993 DHAC meeting minutes:

(Net measurement and mesh size) Enforcement reviewed the problems associated with the measuring of small mesh gill nets. There was discussion that the courts had indicated that specific standards such as twine size needed to be established. Several industry members noted that it would take at least one year’s notice for the manufacturers to supply new nets. The Department Deputy Chief stated that if the minimum mesh size was increased to 2 ¼ then those fishermen using the smallest nets would have to increase the minimum mesh that they used (in order to comply), and although it would resolve the problem it would improve the situation until such time that industry standards could be established and implemented. There was no resolution on this matter reflected in the notes.

(Recommendations for 1993-94) The Department recommended a 26,000 ton baseline spawn escapement as a threshold by which to open and close the fishery, which is equal to 50% of the average escapement value estimated over the 12 year period from the 1980-81 season through the 1991-92 season.

The allowance of beach seine gear in Tomales and Bodega Bays was removed because it was no longer necessary (no more beach seine permittees). (May 28, 1993 Statement of Purpose for Regulatory Action)

⇒ Note: Department staff introduced the proposal to encourage the transfer of round haul permits to the gill net fishery.

- 1993-94 Season. No changes to mesh size or mesh measurement methods in regulation.

Notes from the DHAC Meeting minutes:

There were no comments specific to problems with mesh size or measurement. There was a comment from industry that although the Commission had requested the conversion to an all gill net fishery in 1979, the Commission now consisted of entirely different members and they may not want the conversion. It was reiterated that the Commission had reaffirmed its position in August, 1993 when it directed the Department Deputy Chief, representing the Department, to submit a conversion proposal for consideration in 1994.

A proposal to amend Subsection 163 (b)(2) to provide for the voluntary conversion from round haul gear to gill net gear, followed by a mandatory conversion after October 2, 1998 for all remaining round haul permits was included in the Statement of Purpose for Regulatory Action.

- 1994-95 Season. No changes to mesh size or mesh measurement methods in regulation. There were no comments specific to problems with mesh size or measurement, and there were no proposed changes to regulations specific to mesh size or measurement.

- 1995-96 Season. No changes to mesh size or mesh measurement methods in regulation.

Notes from the March 14, 1996 DHAC meeting minutes:

(Net measurement and mesh size) “Advisors were informed that the Department will vigorously enforce mesh size regulations, as a result of widespread use of undersized mesh and better net measuring

procedures. Department staff spoke of salvaging a herring net, obviously in recent use, from a dumpster outside a herring buying stations. This problem is not one of a very minor decrease under the 2 1/8 minimum side, but of substantially smaller mesh. Advisors asked that the Department settle on a new measuring procedure as soon as possible and the measuring tools be easily obtained by the industry to ensure that they are ordering legal gear.”

(Recommendations for 1996-97) Specify the method for measuring mesh size of herring gill nets. Following the receipt of public testimony and discussion of the regulations, the Commission modified subsection 163 (f)(2)(B) to include provisions that nets be measured “when wet after use,” and that a three percent tolerance mesh measurement be allowed for the 1996-97 season only in Tomales and San Francisco bays. Language was also added to provide for research on mesh size.

The section language reads: “Length of the mesh shall be the average length of any series of 10 consecutive meshes measured from the inside of the first knot and including the last knot when wet after us; the 10 meshes, when being measured, shall be an integral part of the net as hung and measured perpendicular to the selvages; measurements shall be make by means of a metal tape measure while 10 meshes are suspended vertically from a single peg or nail, under one-pound weight. In Humboldt Bay and Crescent City Harbor, the length of any series of 10 consecutive meshes as determined by the above specifications shall not be les than 22 ½ inches or greater than 25 inches. In Tomales and San Francisco bays, the length of any series of 10 consecutive meshes as determined by the above specifications shall not be less than 21 ¼ inches or greater than 25 inches. For the 1996-97 season only, in Tomales and San Francisco bays, a 3 percent tolerance will be allowed in the mesh measurement; thus, the length of any series of 10 consecutive meshes as determined by the above specifications shall not be less than 20 5/8 inches or greater than 25 ¾ inches.”

There was considerable public comment during the regulatory process regarding the round-haul conversion. The following are some excerpts from the September 13, 1996 Final Statement of Reasons as to the biological benefits of the conversion.

“Two benefits are derived by reducing the catch of two and three-year-old herring: the reproductive potential of the population is increased, and management is improved because year-class strength (i.e., the size of an age group) can be assessed before that year class enters the fishery. The reproductive potential of the population is increased when young fish have the opportunity to spawn. Egg production-per-recruit analysis indicates a substantial increase in population egg production as a result of a shift in recruitment to the fishery (i.e., the age or size at which fish are first catchable by the fishing gear) from age two (age of recruitment to the round haul fishery) to four (age of recruitment to the gill net fishery).

The second improvement that results from reducing the take of two and three-year-old herring is that it allows managers to better assess the size of an incoming year class before it is fished. We don’t know the size of a year class until the fish are three years old, because not all two year olds spawn. Round haul gear fishes on each year class for two seasons before the year-class strength is known. Conversion to a gill net only fishery will give managers a one year planning horizon to adjust harvest levels to protect weak year classes.”

- 1996-97 Season. Mesh size and measurement regulations: Mesh measurement method implemented with 3 percent tolerance for one year only. Language was added to provide for three permittees to participate in a Department sponsored mesh size study in San Francisco Bay.

Notes from the March 21, 1997 DHAC meeting minutes:

(Net measurement and mesh size) Many members of the DHAC expressed the desire to have the 3 percent tolerance in measurements continue. One of the concerns expressed was that a net’s mesh size varied considerably depending on whether it had been soaked recently or pulled hard. Opinion on net mesh size varied considerably; some spoke of the advantages of taking larger fish while others expressed concern over reduced catch rates. Concern was also expressed over the amount of herring roe that occurred on nets and the influence of mesh size on the rate of occurrence.

The Department was asked if this was still a resource question given current enforcement efforts directed toward detecting small mesh nets. In response, Department staff indicated that the goal was still

to reduce the take of 2 and 3 year-old fish. Mesh size below that allowed by regulation does negatively affect the age structure of the catch. The discussion ended with general support for keeping the 3 percent tolerance and no resolution on changes to mesh size regulations.

(Recommendations for 1997-98) It was proposed to clarify that when measuring mesh size, the 10 meshes will not include "guard mesh".

- 1997-98 Season. Mesh size and measurement regulations: End of tolerance in mesh measurement; the length of any series of 10 consecutive meshes shall not be less than 21 ¼ meshes or greater than 25 inches. No other changes to mesh size or to mesh measurement methods in regulation.

Notes from the March 23, 1998 DHAC meeting notes, not minutes:

(Net measurement and mesh size) Concern over the lack of tolerance in mesh measurement was expressed by several DHAC members. Some members wanted the three percent tolerance in mesh measurement, some didn't, some members wanted 2 1/8 inch mesh, some didn't; in the end the discussion turned to proposing a mesh size study.

(Recommendations for 1998-99) There were no proposed changes to mesh size or mesh measurement method.

- 1998-99 Season. The round haul conversion was completed. No other changes to mesh size or mesh measurement in regulation.

Notes from the March 23, 1999 DHAC meeting minutes:

(Net measurement and mesh size) There was much discussion around the method of mesh measurement, and in summary, several industry members were felt that the problem in San Francisco Bay was not necessarily with the mesh size, but with the measurement method. Enforcement noted that although 200-250 nets were measured, only four nets were considered to be sufficiently undersized to warrant a citation and net seizure. In Tomales Bay, it was felt that the mesh size was too large. It was requested by that a mesh study be conducted as soon as possible, and it was agreed that fishermen would be included in a study design.

(Recommendations for 1999-2000) Language was proposed to allow four permittees to participate in a Department sponsored mesh size study in Tomales Bay.

- 1999-2000 Season. Mesh size regulations: Four permittees (designated by the department in writing) participating in department-sponsored research on mesh size in Tomales Bay may use gill nets approved by the department with mesh less than 2 1/8 inches.

⇒ Mesh study conducted in San Francisco Bay using 2 1/16 and 2 1/8 inch mesh. Four permittees (three odd, one special ed.) participated in the study using two-paneled nets, half 2 1/16 inch and half 2 1/8 inch mesh. The total catch for the study was 22 tons. The roe percentage was 13 and 14 percent for 2 1/16 and 1 1/8 inch mesh, respectively. A fish count of 91 and 85 per 10 kg sample of 2 1/16 and 2 1/8 inch mesh, respectively, was also recorded. These data, in general, indicate that smaller mesh catch smaller fish and larger mesh catch larger fish. The data collected represented a relatively small time period (six sampling days during a two week period), and a longer term, i.e. subsequent seasons, would be preferable.

Notes from the March 23, 2000 DHAC meeting minutes:

(Net measurement and mesh size) A Tomales Bay DHAC member expressed concern that they were using the wrong mesh size, and that since the increase in mesh size to 2 1/8 inches they have been unable to catch fish. Department staff explained that Department data indicated that Tomales Bay catch consisted of age four and older fish and that this is the management goal of the Department. The Tomales Bay DHAC member felt that 2 inch mesh would be more appropriate. A San Francisco Bay DHAC member expressed concern over the quantity of spawn seen on the gill nets, belly-caught fish and the length of time it now took to catch the quota. He felt that a mesh size reduction to 2 1/8 inches would address these concerns.

(Recommendations for 2000-01) The length of meshes of any gill net used or possessed in the roe fishery in Tomales Bay for the 2000-01 season only shall be no less than 2 inches or greater than 2 ½ inches. The proposed one-year amendment will allow the Department to evaluate the effect of reduced mesh length on the size and age composition of herring caught in 2 inch mesh gill nets. Preliminary aging of Tomales Bay herring suggested that reduced growth of herring in offshore waters and loss of older fish from the spawning population has resulted in a mean length of herring in the commercial catch below the 5-year average. However, the 1995 and 1996 year-classes are well represented and, by number, comprised more than 50 percent of the spawning population this season.

- 2000-01 Season. Mesh size regulations: Fleet-wide mesh size study conducted in Tomales Bay using a minimum 2 inch and maximum 2 ½ inch mesh.

Notes from the March 20, 2001 DHAC meeting minutes:

(Net measurement and mesh size) There was a brief discussion of the mesh size study in San Francisco Bay. Department staff explained that more data was needed in order to consider any further reduction in the mesh size. A DHAC member proposed contracting one of the herring boats to be used exclusively in the study, rather than having to compete with other gill-netters simultaneously, and he suggested increasing the quota for that boat to attract “high-liners”. He also suggested that the Department keep a portion of the proceeds from the sale of product from the higher quota and use it to pay for Departmental research costs. The DHAC members supported this idea and one DHAC member volunteered the use of his boat.

(Recommendations for 2001-02) Amend subsection (f)(2)(B) to specify the size of peg or nail used on certified net measuring devices.

- 2001-02 Season. Mesh size and measurement regulations: Continuation of the fleet-wide mesh size study in Tomales Bay. Clarification of the size of peg and weight used in the measurement of mesh was added to Section 163, subsection (f)(2)(B) to read: ...while 10 meshes are suspended vertically under one-pound weight, from a stainless steel peg or nail of no more than 5/32 inch in diameter under one-pound weight. A provision was also added to subsection (g)(4)(B) to allow ten tons of the fresh fish quota to be transferred to gill net permittees participating in Department sponsored research.

Notes from the March 27, 2002 DHAC meeting minutes:

(Net measurement and mesh size) There was a discussion of re-initiating the mesh size study in San Francisco Bay for the 2002-03 season. A Department biologist stated that no funding was available for the Department to conduct the study and suggested that the industry form a subcommittee to discuss and form a proposal for a collaborative study with the Department. A DHAC member voiced concern that the mesh size being used could be harming the resource by not catching fish efficiently, i.e. causing latent mortality of the squeezed fish through the net and also increasing the fleet’s fishing effort and subsequent disturbance of schools. He also questioned the biological rationale for enforcing the 2 1/8 inch mesh size. Department staff explained that the reason for the 2 1/8 inch mesh is to concentrate the fishing effort on herring in the 4-year and older age classes, and reducing the mesh size could increase the number of two and three year old herring in the commercial catches. Another DHAC member questioned why the data from the mesh size study in Tomales Bay could not be extrapolated for San Francisco Bay and Department staff explained that the Tomales Bay fishery was managed separately from the San Francisco Bay and has always had different environmental conditions and concerns. He detailed these differences, emphasizing the importance that the study be specific to San Francisco Bay and that any changes must be based on localized scientific data.

(Recommendations for 2002-03) Revise the individual quota provisions for permittees participating in a mesh size study in San Francisco Bay to 0.5 percent of the sac roe quota for each platoon to which a permittee is assigned, and increase the maximum number of permittees that may participate in a mesh size study in San Francisco Bay from three to six. Continue the provision to transfer ten tons of the fresh fish quota to gill net permittees participating in the Department sponsored research.

- 2002-03 Season. Mesh size regulations: Continuation of the Tomales Bay mesh size study. Subsection (g)(4)(A) was amended to read: ...Each gill net permittee (designated by the department in writing) participating in research sponsored by the department shall be assigned an individual quota equal to 0.5 percent of the season gill net quota per assigned platoon, unless provided for pursuant to subsection (g)(4)(B) of these regulations.

Notes from the March 25 and 26, 2003 DHAC meeting minutes:

(Net measurement and mesh size) The Department discussed development of a model based on historical data rather than conducting a mesh size study, as was discussed at the pre-season DHAC meeting. Several DHAC members expressed concern that the use of 2 1/8 inch mesh in San Francisco was harmful to the resource, i.e. fish were squeezing through the nets and possibly injured or killed in the process. One member suggested that a smaller mesh size will help reduce egging on nets while allowing the fishermen to catch the population that exists. The concern of one DHAC member was that the fishery was not managed for economic viability. Several San Francisco Bay DHAC members noted that they used to use the 2 1/16 inch mesh without any problems belly-catching or scaling fish, but the change (in mesh) took place because of regulatory capabilities. Department enforcement personnel clarified that San Francisco fishermen are actually fishing with nets that are 2 3/32 inch which stretch to be 2 1/8 inch when they are wet. A discussion of the regulatory language ensued and it was agreed the two different interpretations could be drawn from the way the regulations are written, and that they should be clarified to eliminate contradiction.

A change to Title 14 was proposed on behalf of Cal Herring, a herring fishermen's association, to reduce the mesh size to 2 1/16 inch mesh measure dry. A previous Department study examining stretch length after 11-12 hours of soaking was cited as a basis for the dry measure. The stretch study found that the nets would stretch from 3/8 inch to 7/8 inch over ten mesh lengths. Later, other DHAC members expressed that a dry mesh measurement is important for the fishery management.

(Recommendations for 2003-04) Due to several concerns, expressed by the Department, regarding the status of the San Francisco Bay stock two quota options were given to the Fish and Game Commission to consider. Option one, the Department preferred option, was a fishery closure (zero quota). Some of the concerns regarding the status of the stock included a shrinking age class structure (fewer age classes represented in the population), a lack of strong recruitment to the fishery, a decline in catch per unit effort, and several years of below average biomass. The Department had been developing a stock assessment model, Coleraine, to evaluate both the status of the stock and the accuracy of the two survey methods used to estimate biomass. The model results indicated that the stock was at approximately twenty percent of its un-fished level. Given the above concerns, and the increasing divergence in both size and trend of the results from the two survey methodologies, the Department sought an independent peer review of the Coleraine model and the survey methodologies. The peer review results confirmed the Coleraine model results and enumerated several suggestions for improving the survey methodologies.

- 2003-04 Season. Continuation of the fleet-wide Tomales Bay mesh size study. No other changes to mesh size or measurement in the other bays.

Notes from the March 25 and April 30, 2004 DHAC meeting minutes:

(Net measurement and mesh size) The format of the meeting minutes changed from a summary of the meeting discussions to bulleted comments on various topics. Comments on mesh size by DHAC and industry members included the desire to decrease mesh size to take a broader cross-section of the population, that the current mesh measurement method resulted in citations, a request for the Department to sell "official" standardized measuring devices, use existing data to reduce minimum mesh size to 2 inches, appreciation for implementing and enforcing a larger mesh size, a request for a response as to why the mesh measurement method was changed when the previous method was successful, and a proposal to go to 2 1/16 inch mesh or to 20 5/8 inch over ten meshes measured dry. The Department responded to all requests of the DHAC March 25 meeting in a detailed letter dated April 23, 2004. At the April 30, 2004 DHAC meeting, DHAC representatives were told that they could submit proposals for a mesh study directly to the Commission, or to the Department, for consideration. The Department received one proposal directly from a DHAC representative, and two proposals through the Commission process. In

summary, two of the proposals outlined a fleet-wide study reducing the minimum mesh size to 2 1/16 inches measured dry. The third proposal outlined the used of a minimum mesh size of 2 inches measured wet and a change to the method of measurement (i.e. change in peg size).

(Recommendations for 2004-05) Continuation of the fleet-wide Tomales Bay mesh size study. No other changes to mesh size or measurement in the other bays.

Summary of source documents. This is a list of the documents that are available in the Belmont office for each year. A checkmark ✓ indicates that the document was used as a reference for the above information.

Season	Regulatory documents	Regulations	DHAC meeting minutes
1975-76	none on file in Belmont	draft available ✓	
1976-77	none on file in Belmont	draft available ✓	
1977-78	none on file in Belmont	draft available ✓	available
1978-79	none on file in Belmont	draft available ✓	available
1979-80	none on file in Belmont	draft available	available
1980-81	pre-pub	draft available	available ✓
1981-82	all docs ✓	draft available	available
1982-83	pre-adopt	draft available ✓	available ✓
1983-84	pre-adopt	available ✓	available ✓
1984-85	pre-adopt ✓	draft available ✓	available ✓
1985-86	pre-adopt	draft available ✓	available ✓
1986-87	none on file in Belmont	available	available ✓
1987-88	none on file in Belmont	draft available ✓	available ✓
1988-89	pre-pub ✓	available	available ✓
1989-90	pre-pub, pre-adopt ✓	available	available ✓
1990-91	pre-pub, pre-adopt ✓	available	available ✓
1991-92	all docs ✓	available ✓	available ✓
1992-93	all docs ✓	available ✓	available ✓
1993-94	all docs ✓	draft available	available
1994-95	all docs	draft available	available ✓
1995-96	all docs ✓	available	available ✓
1996-97	pre-adopt, final	available ✓	available ✓
1997-98	all docs	available ✓	available ✓
1998-99	all docs ✓	available	available ✓
1999-2000	ISOR, final ✓	available ✓	available ✓
2000-01	ISOR, final ✓	available ✓	available ✓
2001-02	all docs ✓	available ✓	available ✓
2002-03	all docs ✓	available ✓	available ✓
2003-04	all docs ✓	available	available ✓

Appendix B

Historical Events in the History of the Tomales- Bodega Bays Roe Herring Fishery

Timeline: Events in the Tomales-Bodega Bays Roe Herring Fishery

1972-73

The Tomales Bay roe herring fishery was under way on January 6, 1973. The California State Legislature assumed control of the fishery over concerns of an unrestricted fishery, when the Governor signed the emergency legislation on January 17, 1973. Emergency legislation established a temporary (61 day) catch quota of 750 tons for Tomales Bay and San Francisco. Catch was made with round haul gear.

1973-74

With the last season's emergency regulations expired, the California State Legislature passed legislation establishing a 450 ton quota for the 1973-74 and 1974-75 season. The Department was asked to conduct a 2-year study and assess the spawning biomass in Tomales Bay and San Francisco. At the end of the 2-year study, regulatory authority of the fishery would revert to the Fish and Game Commission who would set quotas based on the field studies. The concern for the safety of other bay users led to limiting the number of herring permits. A lottery was conducted for the five herring permits issued for Tomales Bay.

1974-75

Three lampara boats, one purse seiner, and one drift gill netter were drawn by lottery for the Tomales Bay roe fishery. The 450 ton quota was exceeded by 68 tons.

1975-76

Legislative control expired after the 1974-75 season and regulatory authority over the herring roe fishery reverted to the Fish and Game Commission. Five special permits were issued for Tomales Bay for herring bait and fresh fish markets. There were a total of fourteen herring permits issued for Tomales Bay (There was nothing in the record explaining the additional four permits for Tomales). The Bodega Bay fishery began without a catch quota, or limited by permit.

1976-77

The Fish and Game Commission obtained control of the fishery in all state ocean waters. The Tomales Bay quota was increased to 825 tons, and a separate quota limit of 350 tons was set for Bodega Bay. Seventeen herring permits were issued for Tomales Bay (5 round haul, 7 gill net; and 5 special-gear permits (beach seine) available on a first come, first serve basis. Twenty-four gill net permits were issued for the Bodega Bay fishery. Due to concerns regarding potential conflicts with other bay user groups, weekend fishing in Tomales Bay and Bodega Bay was prohibited from noon Friday to sunset on Sunday. Anchored or "set" gill nets were allowed. Gill net mesh size was regulated with a 2 inch minimum to 2 ½ inch maximum gill net mesh size range. The maximum amount of gill net a permittee could use was limited to 300 fathoms of gill net. Round haul gear was prohibited in all District 10 waters except Tomales Bay (San Francisco Bay is in District 11, 12, and 13).

1977-78

Tomales Bay roe herring fishery gear was restricted to gill net use only due to public sentiment. The maximum amount of gill net used was restricted to a total of 195 fathoms of net.

1978-79

Tomales and Bodega Bays were combined into one permit area. The permit area was split into two platoons that fished alternate weeks. A spawning ground survey for Tomales Bay not conducted this season. A maximum amount of 130 fathoms (2 shackles; one shackle of net is 65 fathoms) of gill net was allowed for Tomales Bay.

1979-80

Tomales-Bodega Bay area roe herring permits capped at sixty-nine permits. No new permits would be issued until the total permits fell below sixty-nine permits. The depth of a gill net was restricted to no more than 120 meshes deep. No more than 260 fathoms (4 shackles) of net were allowed in Bodega Bay waters.

1980-81

Tomales-Bodega Bay area herring permits fell below sixty-nine permits, when one permit was not renewed. The Fish and Game Commission then issued two new roe herring permits.

1981-82

Tomales-Bodega Bay area herring permittees were allowed to exchange their permits for available San Francisco Bay permits to help alleviate crowding on Tomales Bay.

1982-83

Tomales-Bodega Bay area herring permittees were allowed to transfer their permits to San Francisco Bay to help alleviate crowding on Tomales Bay. The number of Tomales Bay herring permits was reduced to forty-one permits, and no new permits would be issued, until there were less than 35 permits in Tomales Bay.

1985-86

Spawning ground surveys were conducted. However, due to the inability to locate spawning, which was indicated by bird and fishing activity, the spawning ground survey results were poor for this season. As a result, a cohort analysis was used to estimate the spawning biomass.

1986-87

The total gill net restriction in Bodega Bay was changed from 260 fathoms (4 shackles) of gill net to 130 fathoms (2 shackles) of gill net to make the amount of gear consistent in all permit areas. One shackle of gill net is 65 fathoms of net.

1989-90 to 1991-92

The provision for the use of drift gill nets was removed; therefore, only set gill nets were allowable. There is no explanation in the record as to why drift gill nets were removed from accepted gear. The Tomales Bay herring fishery was closed after a record low 167 tons of spawning escapement in the 1988-89 season, which followed several seasons of low spawning and herring abundance. The Tomales Bay herring fishery remained closed (1989-90, 1990-91, and 1991-92 seasons) because spawning escapement did not exceed minimum escapement levels to support a fishery. Fishing was allowed to continue in the outer Bodega Bay. The outer bay fishery was modified by an increased closure zone around the mouth of Tomales Bay, and fishing was permitted only in Bodega Bay waters north of a line drawn due west, 240° magnetic, from the mouth of Estero de San Antonio. The closure zone around the mouth of Tomales Bay was designed to allow unimpeded access to Tomales Bay for spawning herring. Department biologists speculated that herring were displaced from Tomales Bay by unfavorable environmental conditions in the bay. Biologists hypothesized that herring would return, if environmental conditions (i.e. normal rainfall to reduce bay salinity) in Tomales Bay were more conducive for spawning.

1992-93

The 1992-93 season coincided with a remarkable return of spawning herring to Tomales Bay, and the end of a six year drought. The Tomales Bay fishery was re-opened for the 1992-93 season, when spawning ground survey results during the closure indicated improvement in spawning, and signaled that the spawning herring population was potentially recovering. The mechanism responsible for the increase in spawning escapement is unknown. Good recruitment is one possibility along with possible movement of herring from other spawning areas to Tomales Bay. The outer Bodega Bay fishery was partially closed and the fishery was restricted to Bodega Bay and Tomales Bay waters south of line drawn due west, 240° magnetic, from the mouth of Estero de San Antonio. The Tomales Bay fishery was re-opened with conservative measures that included a quota based upon ten percent of the previous season biomass, an increase in the commercial gill net minimum mesh size to 2 -1/8 inches, and a reduction of the maximum allowable amount of gill net used to one shackle (65 fathoms). An initial quota of 120 tons was established, with a maximum quota of 200 tons, if the spawning surpassed the 2000 ton escapement goal.

1993-94 to 1996-97

Corresponding to the re-opening of the Tomales Bay fishery was the partial closure of the outer Bodega Bay fishery. In the 1993-94 season the Tomales Bay fishery boundary was confined within Tomales Bay, to District 10 waters south of a line drawn 252° magnetic, from the western tip of Tom's Point to the opposite shore. The outer Bodega Bay fishery was closed due to concern that this fishery intercepted potential Tomales Bay spawning fish. Additionally, the Department felt that an accurate estimate

of the biomass of herring that held in the outer bay could not be obtained, and that quotas for the outer bay fishery could not be based on a spawning biomass, as stated in management documents.

1997-98 to Present

The 1997-98 El Niño event had a detrimental effect on herring spawning populations throughout the state causing a loss of older age classes and a reduction in growth rates. Tomales Bay herring fishermen expressed concerns that the 2-1/8 inch gill net mesh size was no longer efficient in capturing herring after the 1997-98 El Niño event and requested that the Department consider changing the minimum mesh size to 2 inches. The industry stated that the increased number of “belly caught” herring indicated that the 2 1/8 inch mesh size was too large; a proper mesh size should capture herring at the gills and not at the belly. The industry also pointed to poor catch rates caused by an improper mesh size, which reduced both the quality and quantity of the roe herring landed. These two factors made the Tomales Bay fishery prohibitively unprofitable. The Department recommended to the Commission that a fleet wide gill net mesh study be done to assess the effects of a minimum 2 inch mesh size on the current population structure.

Appendix C
Summary of Changes

Summary of Changes to the 2006 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 F, Summary of Changes was added.

Summary

- The following text was added to S.1 Introduction: Chapter 7 describes the period for public review. Appendix F, 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

- Paragraph 2.3.1.1 was updated using final age data. The following sentences were replaced: The number of 3-year-old fish in the catch increased slightly during the 2005-06 season; however the number of 4-year-old fish increased dramatically (Figure 2.5).
- 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 2005-06.

Chapter 3. Environmental Setting

- Section 3.3 - The following text was deleted and replaced with updated using final age data based on otolith readings: The estimated number of two-year-olds was 72 percent higher than the long-term mean and

approximately 14 percent higher than the 2004-05 season estimate (Table 3.2).

- Section 3.3, paragraph 5 – The following text was updated using final age data based on otolith readings: The current age composition indicates above average to strong recruitment of 3-year-old herring. The estimated number of 3-year-olds was the highest ever recorded, approximately 264 percent above the long-term mean and 116 percent higher than the 2004-05 season estimate. There were also significant increases in the numbers of 4-, 5-, and 6-year-old herring (76, 173, and 74 percent respectively from the 2004-05 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 2005-06.
- 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 2005-06.
- Section 3.3, paragraph 7 – The following text was updated using final age data based on otolith readings: Although the annual estimated spawning biomass is 146 percent higher than the 2004-05 season, and the 4-, 5-, and 6-year-old herring increased a total of 29,469 tons from the previous season (Figure 3.1), the commercial catch, while larger than last season, has remained quite low. A number of factors are most likely responsible for this result. This season's spawning population was dominated by younger fish; approximately 71 percent by number of the spawning biomass was composed of 2- and 3-year-old sized herring.
- Minor editorial changes were made.

Chapter 4. Environmental Impact Analysis and Cumulative Effects

- Minor grammatical changes were made.

Chapter 5. Analysis of Alternatives

- No changes

Chapter 6. Consultation

- No changes

Chapter 7. Responses to Comments

- This chapter is added to all Final Supplemental Environmental Documents. No comments were received.

Appendix F Summary of Changes

- Added