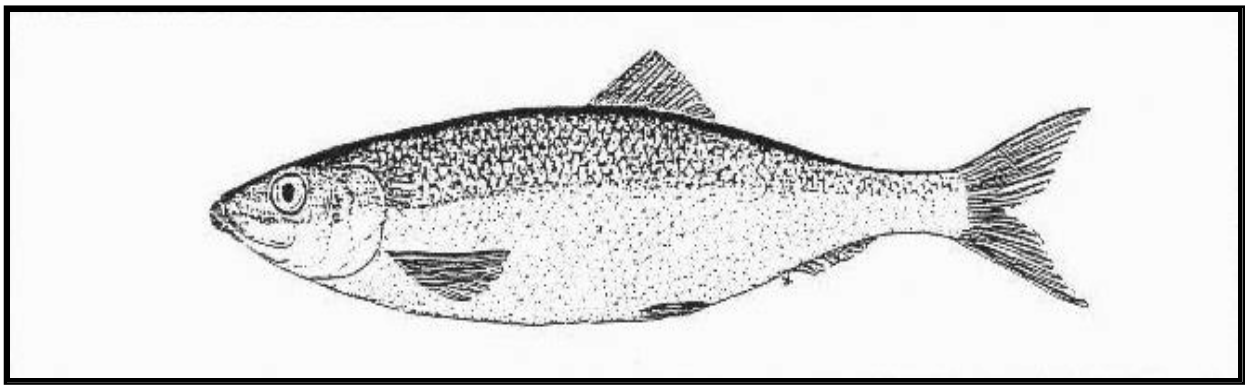
SCH No. 98052052

FINAL

SUPPLEMENTAL ENVIRONMENTAL DOCUMENT

PACIFIC HERRING
COMMERCIAL FISHING REGULATIONS

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



2005
STATE OF CALIFORNIA
THE RESOURCES AGENCY
DEPARTMENT OF FISH AND GAME

FINAL SUPPLEMENTAL ENVIROMENTAL DOCUMENT
PACIFIC HERRING COMMERCIAL FISHING REGULATIONS

TABLE OF CONTENTS

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 2005-06 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, and 2004. A Notice of Preparation (NOP) and public scoping meetings were 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 seven chapters. Chapter 1 discusses the authorities and responsibilities under which the FSED was developed and describes its intended use. Chapter 2 describes the proposed project and alternatives and options for regulating the commercial harvest of herring. Chapter 3 describes the existing environment where the California herring fisheries occur. Chapter 4 addresses the impacts of the proposed project and cumulative effects. Chapter 5 describes the impacts of the alternatives to the proposed project. Chapter 6 identifies consultations with other agencies, professionals, and the public. Chapter 7 identifies the comment letters received during the public comment period and the Department's responses to those comments. 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 November 1, 2004 (sections 163, 163.5, and 164, Title 14, California Code of Regulations [CCR]).

The proposed regulatory changes will establish fishing quotas for San Francisco and Tomales bays for the 2005-06 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 the continued experimental use of 2-inch mesh size nets used in the roe herring fishery in Tomales Bay for the 2005-06 season only, and possible weekend fishing in Tomales Bay. Other changes, such as the reduction of the minimum mesh size to 2-in. in San Francisco Bay as proposed by industry members, a reduction of the transfer fee.

The authorization of permit holders in San Francisco Bay to hold permits in more than one platoon, the elimination of the point system and establishment of new eligibility criteria for permit transfer, the specification of the documents needed to demonstrate eligibility, the elimination of the requirements that a permit holder mail a notice of intention to transfer to everyone on the Department's list of individuals with experience points (commonly called the 20-point list), the specification of the requirements for requesting a permit transfer, and provide a process to appeal a

Department denial of a transfer changes, will be considered for adoption by the Commission at their November 4, 2005 meeting (Section 2.3.1.7.2 of this FSED), and minor editorial changes recommended to improve the clarity of the regulations, to provide for the efficient harvest and orderly conduct of the fishery, and for the protection of the resource.

The specific regulatory changes proposed for the 2005-06 season will: (1) provide for a 5,890-ton quota, Option 1, for San Francisco Bay (10 percent of the 58,900-ton estimated spawning biomass for the 2004-05 season), or a quota of 4,502-tons, Option 2, should the Commission choose to adopt a minimum mesh size of 2 inches (2) provide an initial 400-ton fishing quota in Tomales Bay (11 percent of the 2003-04 estimated spawning biomass of 3,686 tons) for Tomales Bay with provisions to increase the quota in season if escapement goals are achieved by February 15, 2006; (3) set the dates of the roe herring fisheries in San Francisco Bay from 5:00 p.m. on December 11, 2005 until 6:00 a.m. on December 23, 2005, and 5:00 p.m. on December 26 until 6:00 a.m. December 30 ("DH" gill net platoon only), and 5:00 p.m. on January 2, 2006 until noon on March 17, 2006; (4) set the dates of the roe herring fishery in Tomales Bay from 5:00 p.m. on Sunday, December 25, 2005 until noon on Friday, December 30, 2005, and from 5:00 p.m. on Sunday, January 1, 2006 to noon on Friday, February 24, 2006; (5) provide for the Tomales Bay fishery a one-year continuation of a mesh size of no less than 2 inches or greater than 2 ½ inches, for the 2005-06 season only; and (6) specify that the length measurement of a gillnet will be at the corkline.

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 FESD, 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 described by this FSED identified the possible effects of reducing the minimum mesh size to 2-in. in the San Francisco Bay fishery. This potential impact was not identified in the FED. However, several areas of potential concern were identified in the FED. 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. Potential impacts of reducing the minimum mesh size are discussed in section 2.3.1.5 of this FSED. 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 through 6 of these areas of controversy are addressed in detail within Chapter 4 (Section 4.2.6.2) of the FED. An update on Item number 2 is provided in Section 3.6 of this FSED. Item numbers 7 through 11 were identified during three public scoping meetings held on February

25, 2005 in Sausalito, and April 12, 2005 in Sausalito and Bodega Bay and during the Director's Herring Advisory Committee Meeting held on April 5, 2005 in Sausalito; further details of items 7 through 11 are presented in Section 3.6 of this FSED:

1. Potential interactions between marine mammals and commercial fishing activities;
2. Importance of herring as a forage species for sea birds, marine mammals, and other fishes;
3. Inadequate knowledge of the resource;
4. Errors in stock assessment;
5. Insufficient management resources;
6. Potential impact of unforeseen events or catastrophes (e.g., oil spills, chemical spills);
7. Status of the herring population in San Francisco Bay;
8. The independent Peer Review the Department sought and the alleged violation of the Marine Life Management Act;
9. Use of spawn survey alone for biomass estimation;
10. Minimum mesh size reduction in San Francisco Bay to 2-in.; and
11. Comparison of Tomales Bay and San Francisco Bay Age Structure.

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, and the 2004 FSED include a review and discussion of the proposed project as well as alternatives.

Chapter 1. INTRODUCTION

1.1 Background

This Final Supplemental Environmental Document (FSED) presents the review and analysis necessary to assist the California Fish and Game Commission (Commission), the lead agency pursuant to the California Environmental Quality Act (CEQA), in taking action regarding the regulation of the commercial harvest of Pacific herring (*Clupea pallasi)* in California. It was prepared by the Department of Fish and Game (Department) for the Commission following CEQA Guidelines. The project being considered is the proposed changes to the regulations for the 2005-06 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; and (6) the FSED, certified by the Commission in August 2004. 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, and 2004 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, and 2004-05 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 2005-06 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 draft supplemental document is given the same notice and public review given to a draft environmental document, and may be circulated by itself without the previous FED. The lead agency when deciding whether to approve the proposed project, considers the previous FED as revised by the supplemental environmental document (CEQA Guidelines Section 15163). A Notice of Preparation (NOP) for this FSED was circulated to interested parties on March 21, 2005. Following the release of the NOP, the 30-day public comment period pursuant to CEQA for this DSED ended April 21, 2005. Pursuant to CEQA regulations, a 45-day public comment period for reviewing the DSED occurred from July 8-2005 to August 22, 2005.

This FSED is the sixth Supplemental Environmental Document (SED) 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, and the fifth certified by the Commission in August 2004. As provided for by CEQA, the Department will continue to use this method of revising sections 163, 163.5, and 164, Title 14, CCR for a period of approximately five to ten years. After this period, or sooner if deemed necessary, the Department will prepare a new environmental document or a fisheries management plan (FMP).

1.3 Scoping Process

The Department invited industry members and interested parties to a town hall meeting held on January 25, 2005 in Sausalito, Marin County. In addition, a Director's Herring Advisory Committee (DHAC) meeting was held on April 5, 2005 in Sausalito, Marin 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 March 21, 2005. This provided a 30-day opportunity for the Lead Agency to obtain information about the scope and

content of the DSED from interested federal, state and local agencies as well as the general public. Along with the NOP, two public scoping meetings were held on April 12, 2005, in Bodega Bay, Sonoma County, and in Sausalito, Marin County.

During the scoping process, 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 2005-06 season on August 18-19, 2005 in San Luis Obispo, and September 29-30, 2005 in Susanville. 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 2004-05 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.

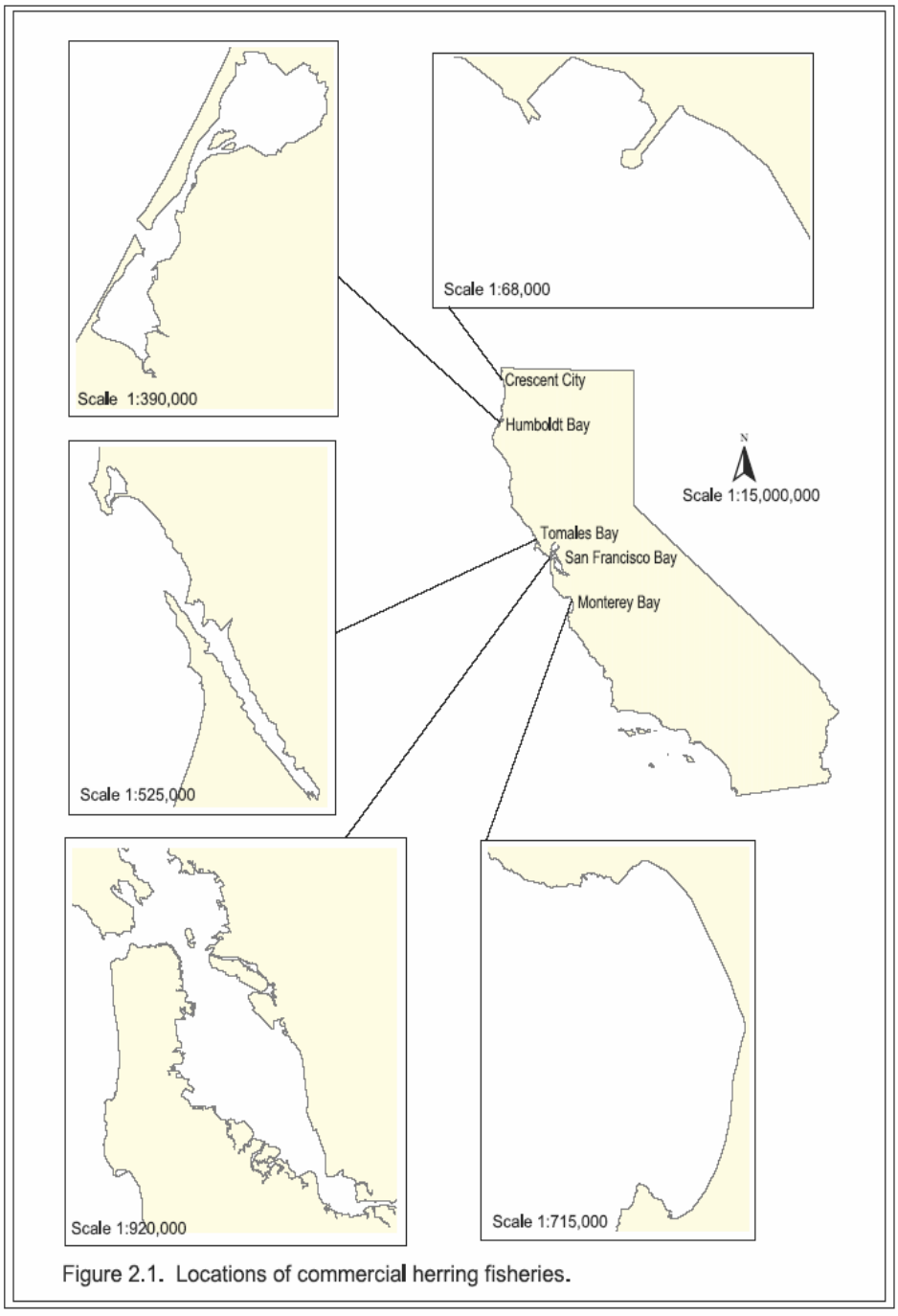


Figure 2.1. Locations of commercial herring fisheries.

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 11, 2005 until 6:00 a.m. on December 23, 2005; December 26, 2005 at 5:00 p.m. until December 30, 2005 at 6:00 a.m.; and January 2, 2006 at 5:00 p.m. until noon Friday March 17, 2006.

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 11-16, December 18-23, December 25-30, and, if necessary, after other platoons have reached their quotas, until the DH quota is reached or the last day of the season.

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

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

Quota: Option 1
A 5,890 ton quota if the minimum mesh size remains at 2 1/8 in.

Option 2
A 4,502 ton quota if the minimum mesh size is changed to 2-in.

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
An individual quota of 3.0 tons for transferred gill net permits, and an individual quota of 10.4 tons for transferred "CH" permits.

Option 2
An individual quota of 2.3 tons for transferred gill net permits, and an individual quota of 7.9 tons for transferred "CH" 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, 2005 and April 1 through October 31, 2006.

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: 5:00 p.m. on Sunday, December 25, 2005 until noon on Friday, December 30, 2005, and from 5:00 p.m. on Sunday, January 1, 2006, until noon on Friday, February 24, 2006.

Note: Herring fishing is not permitted from noon on Friday through 5:00 p.m. on Sunday (Section 163 (h)(5), Title 14, CCR). However, there is a proposal from Tomales Bay fishermen to allow fishing on the weekends (Section 2.3.1.4.1.)

Quota: The total take of herring for roe purposes shall not exceed 400 tons for the season. However, if spawning escapement reaches or exceeds 4,000 tons prior to February 15, 2006, the quota shall be increased as follows: 1) if the spawning escapement is more than 4,000 tons, the total take of herring shall not exceed 500 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, 2005 and April 1 through October 31, 2006.

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 2004-05 season included: a 10 percent harvest guideline based on the 34,400-ton estimated spawning biomass resulting in a 3,400-ton quota for the San Francisco Bay herring fishery (the Department's preferred option) with a season ending date of March 11, 2005, and a 400-ton opening season quota for Tomales Bay. No quota changes were made for the Crescent City/Humboldt Bay fisheries. The regulatory changes proposed for the 2004-05 season were approved by the Commission in August 2004.

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 were conducted during the 1974-75, 1975-76, 1990-91, and in discontinued in Humboldt Bay 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 by meshing the results of the spawn deposition and hydroacoustic surveys. Beginning with the 2003-04 season, the Department conducted hydroacoustic surveys, but primarily as a secondary assessment tool to the spawn deposition survey. The hydroacoustic survey was 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 2004-2005

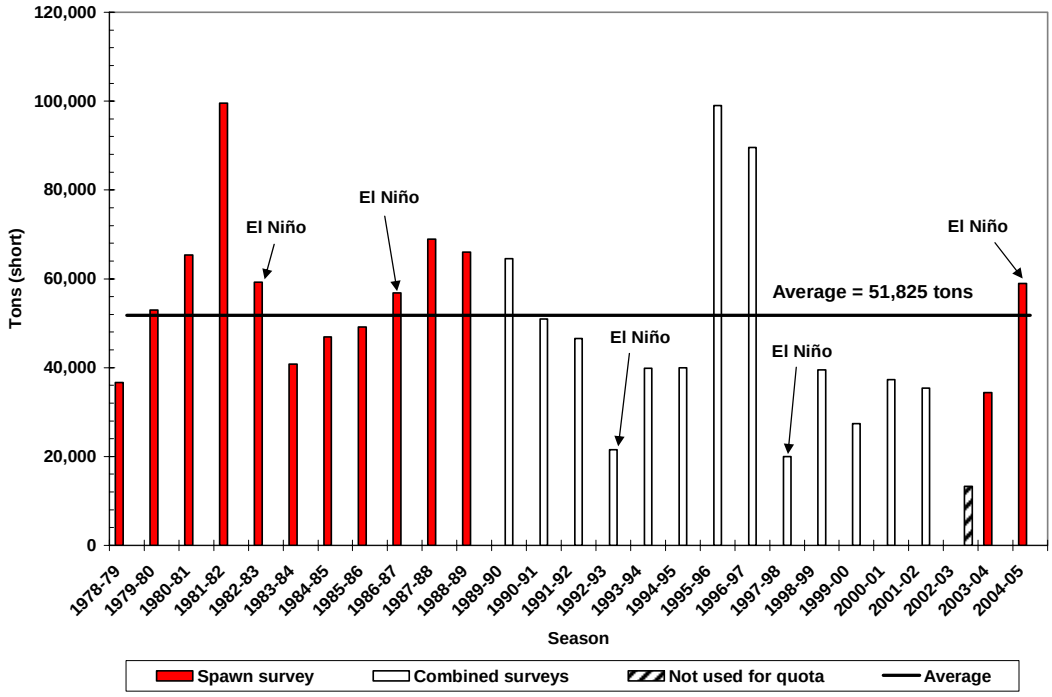
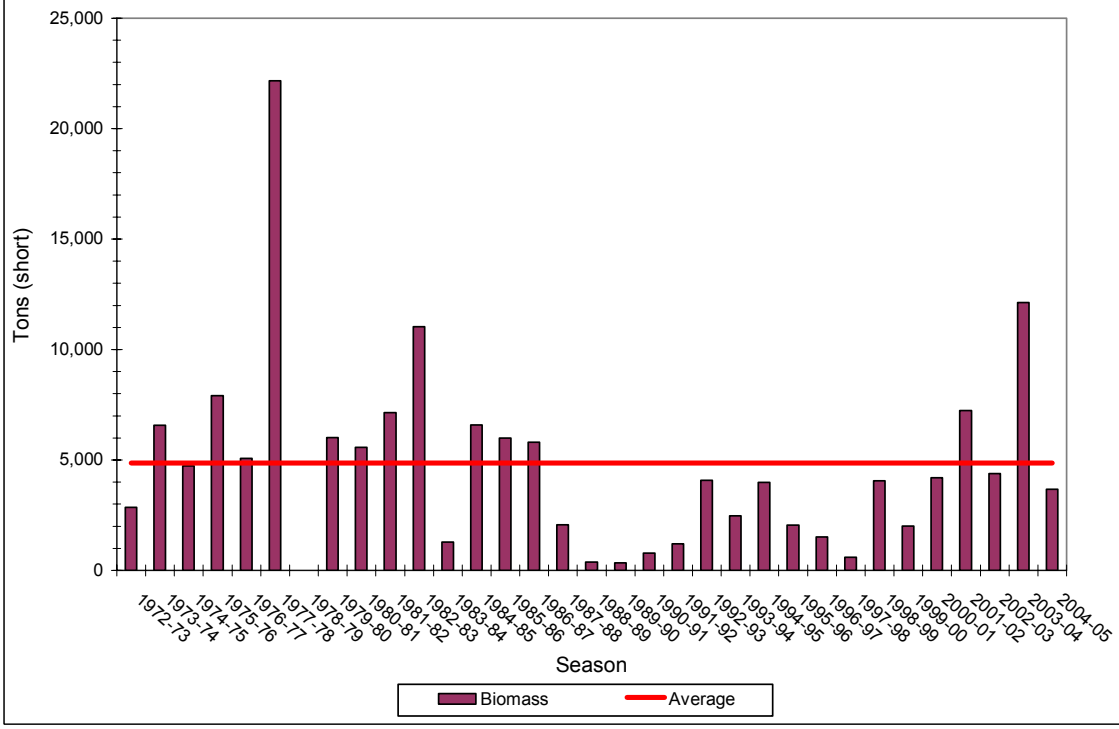
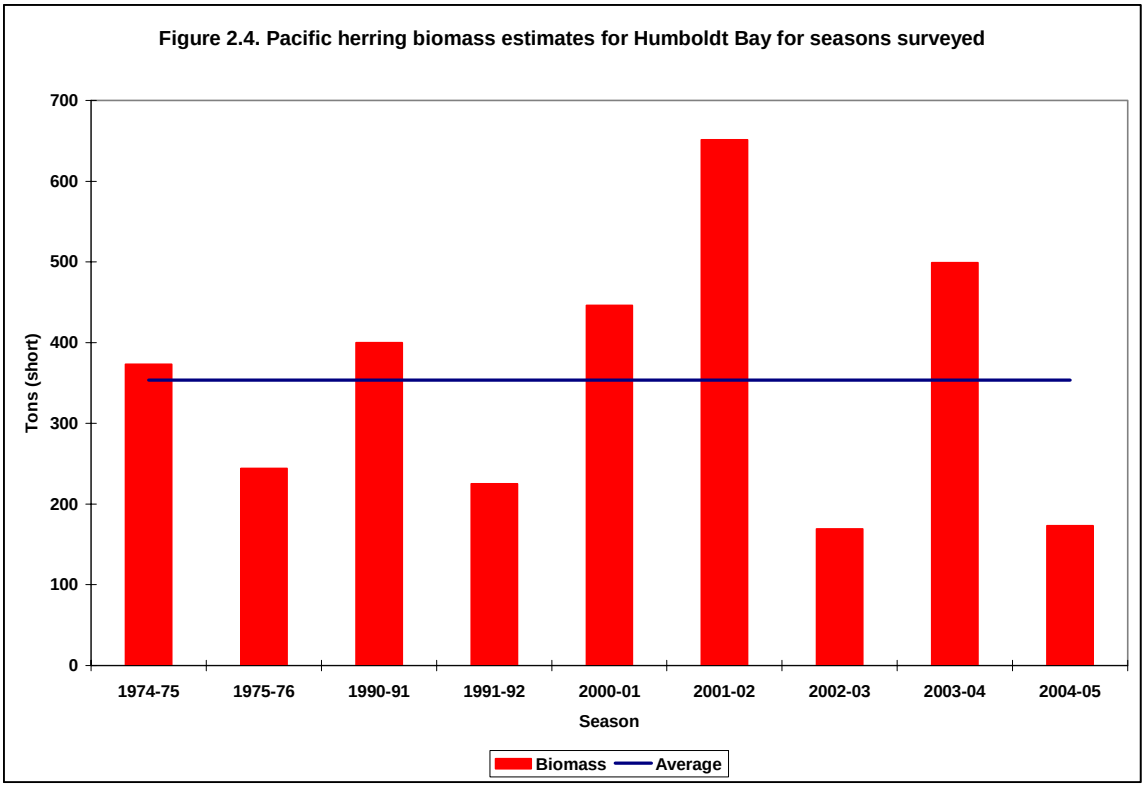


Figure 2.3. Pacific herring spawning biomass estimates for Tomales Bay



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 58,934 tons, which is above the 26-year average (2002-03 spawn deposition and hydroacoustic surveys were not used for quota calculation and omitted in this average) of 51,825 tons. Landings from the San Francisco Bay roe herring fishery totaled 145 tons, 3,024 tons less than the 3,169-ton quota. This harvest level is 0.02 percent of the season's spawning biomass estimate. In Tomales Bay, the 2004-05 spawning biomass estimate is 3,686 tons, which is a seventy percent decrease from the 2003-04 biomass estimate of 12,124 tons, and nine percent less than the thirteen season average of 4,031 tons (average based on seasons since the fishery re-opened in 1992). Tomales Bay roe herring landings totaled 30 tons, 370 tons less than the 400-ton season quota, and 0.8 percent of the season's estimated spawning biomass.

The spawn escapement estimate for the 2004-05 Humboldt Bay herring spawning season is 173 tons (Figure 2.4). This is close to a 66 percent decline from last season's estimate of 505 tons and only 53 percent of the 9-year average of 328 tons from seasons when spawn assessments were conducted in Humboldt Bay. The commercial Pacific herring landings were low for the 2004-05 season with 0.5 tons landed. This is slightly higher than the 2003-04 season which was the second lowest season recorded for the Humboldt Bay fishery. This harvest level is less than one percent of the season's spawning biomass estimate.

Spawning ground surveys and commercial fishery assessments were not conducted in the Crescent City area for the 2004-05 season. Although all the three permits are active in Crescent City, no fishing effort has taken place in Crescent City for the past three seasons. The Department does not plan to conduct spawning ground surveys and commercial fishery assessments in the Crescent City area for the 2005-06 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, 163.5 and 164, Title 14 CCR,

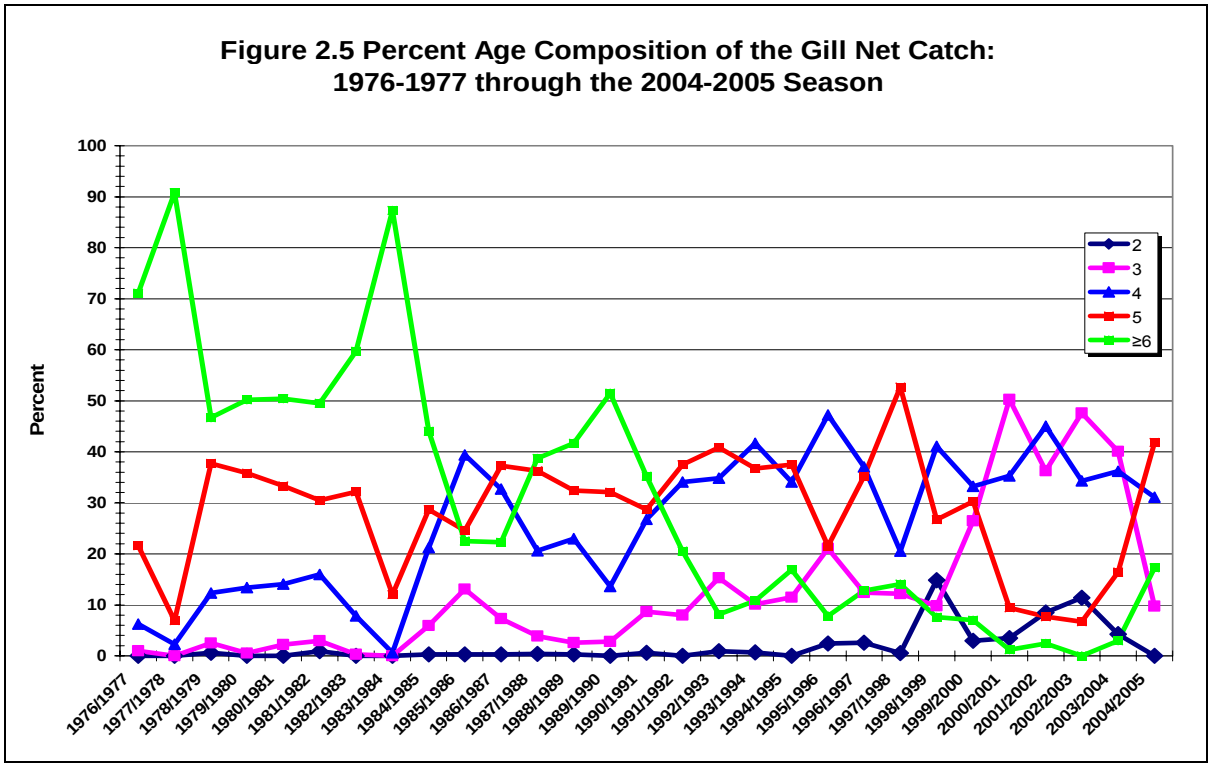
addressed by this DSED, reflect both Department and the public recommendations brought forward by the Department.

2.3.1 Roe Herring Fisheries

2.3.1.1 San Francisco Bay 2005-06 Quota

The 2004-05 spawning biomass estimate for San Francisco is 58,934 tons (including catch), which is above the 26-year average of 51,825 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 last season. The numbers of 3-year-olds declined in the catch and 4-year-olds and older herring increased (Figure 2.5).

Figure 2.5 Percent Age Composition of the Gill Net Catch: 1976-1977 through the 2004-2005 Season



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

The proposed quota for the 2005-06 San Francisco Bay herring fishery is 5,890 tons, representing approximately 10 percent of the 58,934-ton estimated spawning biomass (Option 1). A harvest rate of 10 percent will provide for a target 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 2004-05 El Niño.

Industry members from the San Francisco Bay herring fishery have proposed that the minimum mesh size for the San Francisco Bay fishery be reduced from 2 1/8-in. to 2-in. Due to concerns regarding the proposal by industry, a second option is considered should the reduction in mesh size be adopted. An additional option, Option 2, would set the quota at 4,502 tons which represents 7.6 percent of the 2004-05 spawning biomass estimate if minimum mesh was reduced to 2-in. The Department is concerned that a mesh size reduction would increase the take of age three and potentially age two fish in the commercial catch, and that an increase in the harvest of younger fish may have a long-term negative effect on the population. Since the 1997-98 El Niño, larger, older fish have been scarce or absent in both catch and population samples, declining well below long-term averages.

Setting the quota at less than 10 percent of the 2004-05 spawning biomass estimate would help offset the potential increase in the catch of younger fish. The quota for Option 2 represents a reduction based on the percentage of 2- and 3-year-old herring (11.3 and 12.2 percent by weight respectively) estimated to comprise the 2004-05 season landings. The estimated percentage of 2- and 3-year-old herring, based on average growth rate, is suggested as an approximation of what may be caught in the 2005-06 season. Growth rates were below average for the 2004-05 season. This results in a quota of 4,502 tons or 7.6 percent of the 2004-05 estimated spawning biomass. A more detailed discussion of the potential effects of reducing the mesh size to 2-in. is discussed in Section 2.3.1.5 of this FSED.

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 2005-06 Quota

The Tomales Bay 2004-05 spawning biomass estimate is 3,686 tons, which is 70 percent less than the 2003-04 biomass estimate of 12,124 tons. This season's spawning biomass estimate is nine percent less than the previous twelve-season average of 4,061 tons. During the 2004-05 season, the commercial gill net catch for the Tomales Bay herring fishery was below the initial season quota of 400 tons. The 30 tons landed during the 2004-05 season was the second lowest landing since the fishery was re-opened for the 1992-93 season.

For the 2005-06 season, the Department proposes to set the initial Tomales Bay catch quota at 400 tons, which is 11 percent of the 2004-05 estimated spawning biomass of 3,686 tons. The Department sets Tomales Bay initial quotas conservatively, taking into account recent trends in the spawning population and the best available data. The Department is in the midst of a mesh size study that allows permittees to use a gill net mesh size of 2-in., which is smaller than the 2 1/8-in. mesh allowed prior to the mesh size study. The current regulation specifies that the mesh size shall revert to no less than 2 1/8-in. or greater than 2 1/2-in. after the 2004-05 season, unless otherwise designated in regulation. A proposed quota based upon 11 percent of the 2004-05 spawning biomass is consistent with the Department's conservative management strategy. The proposed one-year continuation of the mesh size study, originally approved for the 2000-01, 2001-02, 2002-03, 2003-04, 2004-05 seasons only, will allow the Department to continue to evaluate the effect of reduced mesh length on the size and age composition of herring caught in 2-in. mesh gill nets.

Since the fishery re-opened, the exploitation rate averaged less than six percent. The exploitation rate during this period has exceeded 10 percent twice, in the 1995-96 and 1996-97 seasons, at 17 percent and 14.7 percent. Since the implementation of the "one net per permittee" restriction, the Tomales Bay commercial catch has only exceeded 300 tons twice, during the 1995-96 and 2001-

02 seasons. The quota has been set at an exploitation rate of 10 percent of the average spawning biomass since the fishery was re-opened for the 1992-93 season. The proposed initial quota of 400 tons provides a conservative starting point for next season, but recent trends in landings of the Tomales Bay fishery suggests that the fleet is unlikely to fill its initial quota.

Due to the relative small scale of the Tomales Bay fishery, the Department has provisions in the regulations that allow for in-season quota increases should the spawning biomass support such increases (refer to Section 2.2.2 of this FSED). The proposed regulations also contain provisions to increase the quota based on in-season estimates of spawning escapement. If the spawning escapement reaches or exceeds 4,000 tons prior to February 15, 2006, the quota shall be increased to a total take of herring, which shall not exceed 500 tons for the season.

2.3.1.3 Humboldt Bay and Crescent City 2005-06 Quota

The 2004-05 herring season marked the fifth 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. Spawn escapement for 2004-05 was estimated to be 173 tons, close to a 66 percent decrease from last season's estimate of 505 tons. The total spawning biomass estimate (spawn escapement plus commercial catch) was 174 tons, well below estimates from historic surveys conducted during the 1974-75, 1975-76, 1990-91, and 1991-92 seasons, which recorded a spawning biomass in Humboldt Bay of 372, 232, 400, and 225 tons, respectively.

The commercial Pacific herring landings were down again this season in Humboldt Bay with just over 0.6 tons landed. This is the third lowest season on record for Humboldt Bay, and just a fraction of the average total landings per year of 37 tons since 1983 when the current quota of 60 tons was set. 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.

For the last five seasons 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. Two of

the last three season's biomass estimates were far below average; however, the exploitation rate during this 3-year period remained below one percent. The average yearly biomass estimate from the last five spawn assessment surveys conducted since the 2000-01 season is 389 tons. A 60-ton quota based on this average would result in a 15 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 2005-06 season. The proposed quota for Humboldt Bay and Crescent City are 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 5, 2005, was to recommend that the dates of the roe herring fisheries in San Francisco Bay be set from 5 p.m. on Sunday, December 11, 2005 until 6:00 a.m. on Friday, December 23, 2005 and re-open at 5 p.m. on Monday, December 26, 2005 until 6:00 a.m. on Friday, December 30, 2005 ("DH" gill net platoon only). Recommended dates for the odd and even platoons are from 5:00 p.m. on Monday January 2, 2006 until noon on Friday, March 17, 2006. The consensus among Tomales Bay permittees was to recommend opening at 5:00 p.m. on Sunday, December 25, 2005 until noon on Friday, December 30, 2004, and from 5:00 p.m. on Sunday, January 1, 2006 to noon on Friday, February 24, 2006. The Department concurs with these recommendations. It should be noted that there is an industry proposal to allow weekend fishing in Tomales Bay.

2.3.1.4.1 Weekend Fishing in Tomales Bay

Existing regulations specify that herring fishing is not permitted from noon on Friday through 5:00 p.m. Sunday night in Tomales and San Francisco Bays. The

Tomales Bay herring fishermen and their herring buyer propose to change regulations to allow weekend fishing in Tomales Bay during the commercial sac roe herring season. Removal of the weekend restriction would allow Tomales Bay herring fishermen to operate 24 hours per day, seven days per week, during the season. Fishermen and the buyer have stated that there is an economic need to increase the profitability fishery.

Fishermen and the buyer cite numerous weekend spawning events in the past which in effect, reduced fishing opportunities and potential income. Due to the limited time that herring are available to the fishery, and the variability of spawning biomass composing schools, a weekend spawn could represent a significant portion of season's spawning biomass. It is the goal of the industry in opening fishing on the weekend to increase the profitability of the fishery and fish when spawning events occur, yet potentially limit their time on the water and decrease operating costs. Weekend spawning events that have occurred in the past have limited fishermen from potential catch.

Currently, only the Crescent City and Humboldt Bay herring fisheries are permitted to fish seven days per week. Both Tomales Bay and San Francisco Bay herring fisheries are restricted from fishing from noon on Fridays to 5:00 p.m. Sunday nights. The original intent of the weekend closure regulation was to prevent potential conflict with recreational user groups. The Tomales Bay fishermen feel that unlike San Francisco Bay, the potential for conflict is minimal due to the lack of recreational user groups during winter months on Tomales Bay.

Herring fishermen also believe that there are benefits stemming from the removal of the weekend fishing restriction. They feel that without the weekend closure restriction, fishermen would not be pressured to fish as hard in a limited time frame. Reducing fishing effort pre-spawning herring schools could be achieved by scanning the bay from Highway 1 (Marin County) for signs of spawning prior to fishing. Fishermen would be inclined to fish only during the spawning events which could reduce costs and disruption to the environment. This proposal may reduce harassing herring prior to spawning, allow herring to spawn in a more natural state, and increase profitability for the industry.

Weekend fishing in Tomales Bay would increase costs to the Department in the form of potential overtime of Department personnel. In other state fisheries, for example the HEOK fishery, a detailed invoice of the cost of operations by the Department for weekend harvest is provided to each individual permittee for payment. The Department proposes that should the Commission decide to allow weekend fishing in Tomales Bay, the Department shall be able to submit a detailed invoice to the appropriate party, or parties, for any increase in the cost of operations.

2.3.1.5 Reduction in the Minimum Mesh Size to 2-in. for Gill Nets Used in the San Francisco Bay Roe Herring Fishery

Industry representatives of the San Francisco Bay sac roe herring fishery proposed a change in the minimum mesh size of gill nets used in San Francisco Bay from 2 1/8-in. to 2-in. (Appendix A). One of the Department's fishery management strategies is to allow the harvest of age four and older herring and to avoid taking 2- and 3-year-old herring which could be caught by the fishery prior to spawning for the first time. Two key benefits to this strategy are: 1) the size of an age class can be assessed before it is vulnerable to being caught; and 2) the population's reproductive potential is increased. Because not all 2-year-olds spawn, the size of a year class is not known until the fish are 3-year-olds. A harvest strategy of age four or older allows the Department to assess a year class for two years before it enters or recruits to the fishery.

The reproductive potential of the population is increased when young fish have the opportunity to spawn. Egg production-per-recruit analysis (Appendix E) 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 to age four. In the early years of the fishery the population's age structure included older cohorts to sustain the fishery and the catch of 2- and 3-year-old herring was extremely low (Figure 2.5). The majority of the commercial catch was comprised of age six and older herring until the mid-1980's.

One of the principal reasons for converting the commercial fishery in San Francisco Bay to an all gillnet fishery and eliminating round haul gear (1994-98) was

to further the goal of harvesting age four and older herring (Appendix E). Since the 1997-98 El Niño, there has been a significant decline in the estimated number of age four and older herring in the population, and a corresponding increase in the number of 3-year-old herring caught by the commercial fishery. The proposed reduction in minimum mesh size to 2-in. is likely to further increase the catch of 3- and possibly 2-year-old herring, conflicting with the Department's management goal of not harvesting those ages.

The Department recognizes the need to review its management strategies and goals for the San Francisco Bay population (2004 FSED, section 3.5) , and to consider employing the use of management tools such as: a threshold for fishery closure and setting harvest percentages; using the stock's fishable biomass rather than total spawning biomass to set the fishery quota; shortening the fishing season to allow early season spawning to recover; and developing an age-structured model to utilize all of the data collected to set harvest levels. The most comprehensive way to consider these and other potential management changes will be through the development of a fishery management plan (FMP) for herring.

For a variety of reasons, the minimum mesh size in the San Francisco Bay herring fishery has varied over time (Appendix C). A reduction in the minimum gill net mesh size allowed for the San Francisco Bay herring fishery is proposed (Appendix A: Mr. Sam Liberati's July 7, 2004 letter). Under this proposal, existing minimum mesh size regulations would be changed from 2 1/8-in. to 2-in. for a trial period of two or more years. The San Francisco herring population and the gill net fishery would be monitored during this period to assess effectiveness of 2-in. mesh size in reducing fishery related mortality. In addition, lowering the harvest rate for the 2005-06 season would offer further protection of the younger age classes. Reducing the 5,890-ton proposed quota by the percentage of 2- and 3-year-old herring (11.3 and 12.2 percent by weight respectively) estimated to comprise the 2004-05 season landings as an approximation of what may be caught in the 2005-06 season, yields a quota of 4,502 tons or a harvest level of 7.6 percent of the 2004-05 estimated spawning biomass. Detrimental effects to the herring population or reduced product value would also be evaluated in determining minimum gill net

mesh size following the trial period. The trial period may be ended early if significant negative impacts are identified to the herring population or other resources, or to product value. At that point the minimum mesh size would revert to 2 1/8-in.

2.3.1.5.1 General Overview of Gill Nets and Department Use of Multi-Panel Research Gill Nets and Mesh Size Study in San Francisco Bay

Observed gill net selectivity is a function of mesh size and the size distribution of fish present at the time the nets are fished. The size distribution of fish landed using an identical net with the same sized mesh fished at various times and locations will be different. The selectivity of the net has not changed, only the size composition of herring encountering the net has changed. Consequently, comparison of gill nets being used in different locations or at different times is not necessarily indicative of the true selectivity of a net (Gregoire and Lefbvre 2003).

There are three ways that herring can be caught in gill nets: snagged by mouth parts, gills, or fins, wedged by head or body, and entangled in loose webbing. The primary method of entrapment in gill nets is wedging followed by snagging, and then entanglement (Potter and Pawson 1991).

There are two primary characteristics of gill nets that are affected by differences in mesh size. These are the “effectiveness” and “efficiency” of nets. Potter and Pawson (1991) define effectiveness as “the attribute of a fishing gear that enables a fisherman to catch fish of a desired species and size”, and landing efficiency as “that proportion of the fish killed as a result of fishing activity that is actually landed and can be recorded”.

As the size of landed herring changes in response to different mesh sizes, the value of the sac roe product will also change. For the herring sac roe fishery, roe technicians sample each landing to determine roe content for buyers. Buyers pay fishermen a premium above a base price for roe percentages exceeding 10 percent. Ovary size and the sex ratio of landings influences the value of the catch, with larger ovaries and fewer males increasing the roe percentage (and thus, the value) of the catch.

The Department and the San Francisco Bay herring fishing industry began what was intended to be a multi-season gill net mesh size study during the 1999-2000 season. The purpose of this study was to evaluate the catch differences between three mesh sizes: 2 1/16-in., 2 1/8 -in., and 2 3/32-in. (the industry-acknowledged mesh size used by many in the San Francisco gill net commercial fishery). The focus of the study was to compare the age composition of these catches relative to the Department's herring management objective of harvesting age four and older herring while allowing escapement of age two and age three herring. However, the study was incomplete for a variety of reasons including lack of funding and logistical problems encountered by the study participants.

The Department's Pacific herring research project has used variable mesh gill nets to sample herring schools in combination with other gears since 1981 in San Francisco Bay. The Department's research gill nets were constructed of an array of mesh sizes: 1 1/2-in., 1 3/4-in., 2-in., 2 1/4-in. and 2 1/2-in. These mesh sizes were selected to sample the entire range of herring sizes present in the San Francisco Bay population, not to evaluate the optimal mesh size for the commercial gill net fishery. Because of this, direct comparisons between the catches of research gill nets and commercial gill nets are difficult to make. Other factors that make comparisons difficult include: 1) differences in the construction material used in the Department research gill nets and commercial fishery, which likely result in differences in selectivity; 2) the Department's array of web sizes does not include the mesh size(s) existing in the current fishery; 3) the Department sampled in areas away from commercial fishing activity to avoid potential conflicts with gear; and 4) the Department did not attempt to sample on a consistent basis at night when the commercial fishery was most active.

Despite the difficulties described above, some general conclusions can be drawn from the Department's use of variable mesh gill nets relative to the proposed gill net mesh size reduction: 1) the lengths of fish caught declined with mesh size; 2) the ratio of males increased with declining mesh size; and 3) the ratio of females increased with increasing mesh size (Reilly and Moore, 1987).

2.3.1.5.2 Gill Net Mesh Range of Selectivity for Herring: Analysis of Other Studies

Fishery scientists have used several different length measurements for herring. The Department of Fish and Game's herring project measures body length, while Hay et al. (1986) measured herring standard length in British Columbia, and Gregoire and Lefebvre (2003) measured total length of Atlantic herring (*Clupea harengus*). The relationship between body, standard, and total length is predictable and can be easily converted, so for this analysis, all length measurements have been converted to total lengths (TL) (Table 2.1). Hay et al. (1986) found that herring measuring 280 mm TL were the optimal size for a 2 1/4-in. mesh gill net. Gregoire and Lefebvre (2003) show that the optimal herring length selected for changes by about 0.7-in. for each 1/8-in. change in mesh size, when comparing mesh sizes of 2 1/2-, 2 5/8-, and 2 3/4-in. Clarke and King (1986) examined smaller gill net mesh sizes of 2-, 2 1/4- and 2 1/2 -in. and found that optimal size selectivity changed from about 240 mm TL to 310 mm TL between the smallest and largest meshes. This is consistent with the work of Gregoire and Lefebvre (2003). Hay et al. (1986) used a 2 1/4-in. mesh net in their study and found that few fish smaller than 234 mm TL were caught while most fish larger than 255 mm TL were captured. In summary, these studies indicate that the optimal size selected for would drop by approximately 0.7-in. for a 1/8-in. reduction in mesh size (Table 2.2).

Table 2.1. Comparison of various length measurements (mm) from San Francisco Bay herring

Body Length	Standard Length	Fork Length	Total Length
118	115	126	140
118	114	126	140
122	118	129	145
126	121	133	149
126	122	133	150
125	121	134	150
125	120	134	150
126	123	134	151
132	128	141	155
133	127	142	158
137	131	143	163
138	134	147	163
143	138	150	168
147	143	155	174
146	141	158	174
151	145	157	177
152	146	160	181
155	149	164	181
152	148	161	182
155	150	165	183
156	152	166	186
157	152	166	187
159	155	170	188
162	157	170	190
161	154	170	191
164	158	172	191
165	156	171	192
162	157	173	194
164	159	174	195
166	160	180	196
165	161	175	197
168	162	177	197
166	160	176	198
173	169	185	208
177	172	188	209
176	171	186	210
178	171	187	212
181	173	190	213
183	177	193	216
184	178	196	219
179	174	188	221
187	180	198	224
190	184	203	224
191	184	202	224
182	176	195	225

Table 2.2. Optimal length selectivity by mesh size from four herring gill net mesh size studies. Hay et al. (1986) estimate based on a known number of fish and thus is a true estimate of optimal selectivity. The other studies are based on observed catches only.

Mesh Size		Hay et al. 1986	Gregoire & Lefebvre 2003	Clark & King 1986	Winters & Wheeler 1986	Winters & Wheeler 1987
mm	in					
50.8	2.00			248	255	291
57.2	2.25	280		284	287	327
63.5	2.50		380	314	318	363
66.8	2.63		399			
69.9	2.75		418		350	400

Winters and Wheeler (1990) used gill nets with mesh sizes from 2-in. to 3-in. for two seasons, 1986 and 1987, fishing for Atlantic herring. Their optimal length selectivity for 1986 was similar to Hay et al. (1986) and Clark and King (1986), but was considerably greater in 1987, perhaps as a result of following several large year classes through the fishery (Table 2.2). The difference may have been in the growth of these numerically dominant cohorts between years. In a Bering Sea herring gill net study, observed optimal selectivity for 2-in mesh gill nets ranged from 212 mm to 240 mm with a mean of 224 mm for eight different fisheries (Quang 2002).

2.3.1.5.3 Age Selectivity of 2 1/8-in. and 2-in. Mesh Gill Nets

Theoretically, a 2 1/8-in. mesh gill net has an optimum length selectivity of about 276 mm which is an 8-year-old herring or older (Table 2.3, Figure 2.6). At the 50% catch range, 2 1/8-in. mesh gill nets are able to catch larger 5-year-olds, and at the 25% range, about half the 5-year-olds are vulnerable. A 2-in. mesh gill net has an optimum length of capture around 260 mm (Table 2.3) which is about the mean length of 8-year-old fish (Figure 2.6). At the 75 percent selectivity range, most 6-year-olds and larger 5-year-olds would be vulnerable. At the 50 percent selectivity range, almost 50 percent of the 4-year-old fish and large 3-year-old fish would be vulnerable, and at the lower 25 percent retention rate most 4-year-olds and larger 3-year-olds are vulnerable (Figure 2.6).

Table 2.3. Estimated percent of herring captured by fish length (mm) by gill net mesh size for 2 ⅛-in. and 2-in. based on data from Hay et al. (1986) in British Columbia. Hay et al. (1986) used standard length as their measurement. Total lengths were calculated based on linear regression from San Francisco Bay herring length measurements.

	Hay et al. 1986		Estimated			
% Retained	2 ¼-in.		2 ⅛-in.		2-in.	
	TL	SL	TL	SL	TL	SL
25	252	200	233	181	214	162
50	265	210	246	191	227	172
70	277	220	258	201	239	182
80	295	235	276	216	257	197
70	314	250	295	231	276	212
50	326	260	307	241	288	222
25	338	270	319	251	300	232

Regression equation : Total Length = 0.776 + 1.223 * Standard Length

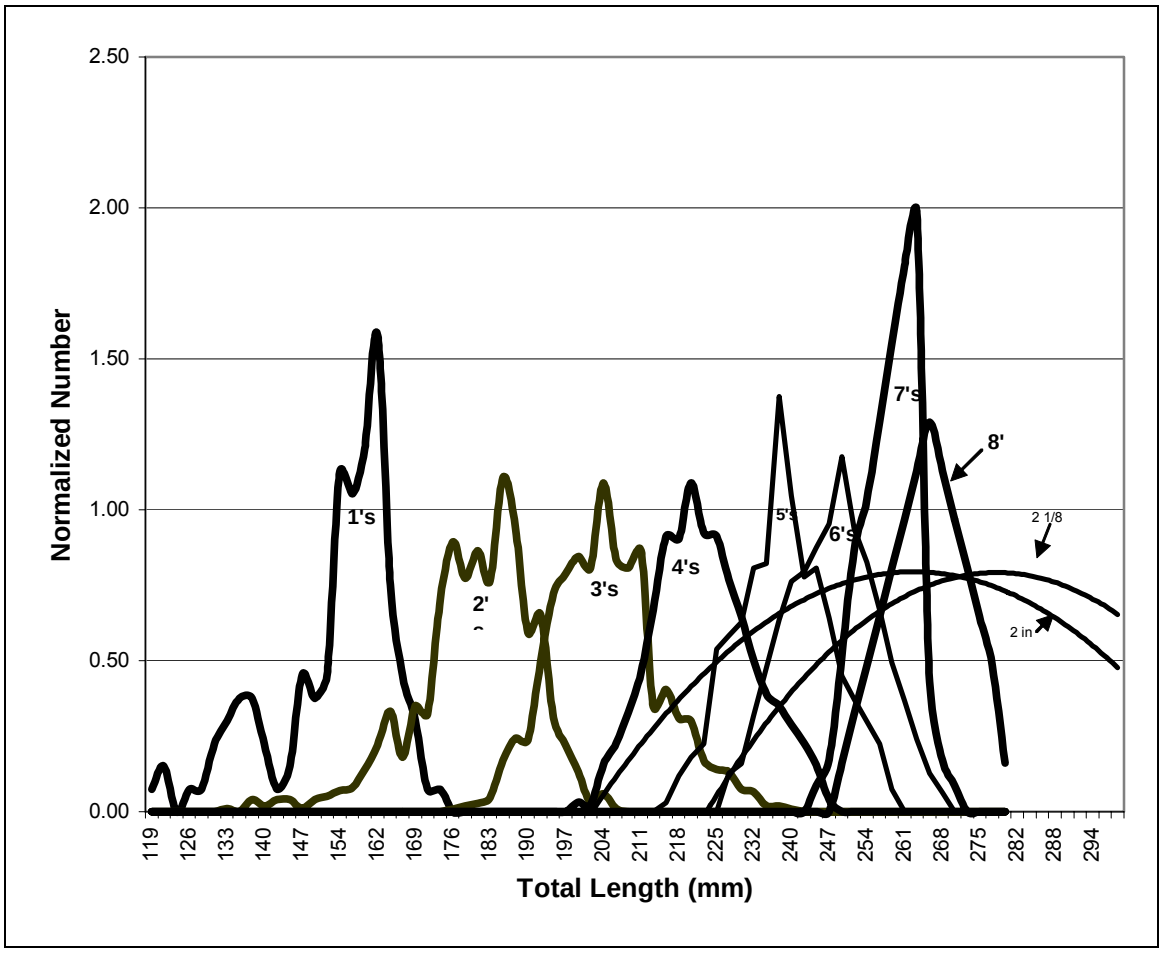


Figure 2.6. Normalized length (total length) distributions of San Francisco Bay herring ages 1 through 8 from research surveys in the 1988-89, 1989-90 and 1990-91 seasons. The two rounded arcs are the length selectivity percentages of herring for 2-in. mesh and 2 ⅛-in. mesh gill net. These years were selected because they contained ages from 1-year-old to 8-year-old. Tails of the age curves have been truncated. Age curves are normalized so that the curves enclose the same area and do not reflect the actual age distribution of fish in the population in these years.

Considering the current age composition of the San Francisco Bay herring population (Table 2.4), which lacks age 7 and older herring and has seen a decline in 6-year-old herring, neither 2 1/8-in. nor 2-in. mesh can be considered efficient mesh sizes. Less efficient mesh size has been chosen to reduce the catch of smaller fish for economic reasons and to protect smaller first-time spawning herring.

Table 2.4 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	2.9	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	0.2	117	0	0	0.0	587,349
84-85	[a]	N/A	184,695	38.7	190,998	40.0	46,613	9.8	22,153	4.6	25,914	5.4	6,652	1.4	688	0.1	0	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	1.5	717	0.1	182	0.0	501,049
86-87	[a]	N/A	168,962	29.2	194,365	33.6	134,528	23.2	64,598	11.2	9,182	1.6	6,175	1.1	1,065	0.2	246	0.0	579,121
87-88	[a]	N/A	233,193	30.6	292,508	38.3	136,604	17.9	66,494	8.7	25,337	3.3	5,027	0.7	3,939	0.5	0	0.0	763,102
88-89	[a]	N/A	146,525	25.8	222,058	39.0	139,906	24.6	44,435	7.8	12,310	2.2	3,030	0.5	534	0.1	0	0.0	568,798
89-90	[a]	N/A	294,631	37.6	237,377	30.3	136,248	17.4	84,361	10.8	23,970	3.1	6,572	0.8	0	0	0	0.0	783,159
91-92	1,356	0.3	13,666	3.0	126,016	28.0	206,930	45.2	82,870	18.1	23,764	5.2	3,490	0.8	0	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	0.0	238,723
93-94	11,485	2.6	22,403	5.1	134,870	31.0	160,335	36.9	63,331	14.6	25,926	6.0	4,808	1.1	355	0.1	0	0.0	423,513
94-95	2,276	0.5	39,363	9.0	236,783	54.1	94,833	21.7	42,850	9.8	18,223	4.2	3,196	0.7	0	0	0	0.0	437,524
95-96	3,142	0.3	483,164	38.9	359,357	29.0	282,069	22.7	81,768	6.6	28,904	2.3	1,687	0.1	0	0	0	0.0	1,240,091
96-97	1,184	0.1	290,497	29.1	359,459	36.0	183,370	18.4	120,029	12.0	33,098	3.3	8,935	0.9	270	0	0	0.0	996,842
97-98	42	0	45,092	17.2	129,411	49.3	65,637	25.0	18,724	7.1	2,259	0.9	1,430	0.5	0	0	0	0.0	262,595
98-99	1,931	0.4	256,816	52.0	54,306	11.0	114,835	23.2	56,915	11.5	9,729	2.0	558	0.1	978	0.2	[b]	0.0	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]	0.0	340,650
00-01	255,158	36.0	178,401	35.43	185,748	36.9	65,555	13.0	24,267	4.8	126	0.0	0	0	0	0	0	0.0	709,255
01-02	5,788	1.5	157,182	39.6	138,752	35.0	75,088	18.9	15,383	3.9	4,265	1.1	152	0	0	0	0	0.0	396,610
03-04[c]	2,473	0.5	328,257	65.5	122,072	24.3	26,641	5.3	14,848	3.0	7,225	1.4	0	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	0.0	867,628
Mean	22,021	3.3	184,076	30.7	187,129	31.3	122,141	22.0	54,623	9.9	15,970	2.8	3,705	0.6	839	0.1	68	0.0	577,626

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 were sampled in spawning condition

As stated previously, observed (i.e., actual) gill net selectivity is a function of mesh size and the size distribution of fish present at the time the nets are fished. The observed catch (i.e., actual catch) of Pacific herring in San Francisco Bay in 2 1/8-in. mesh differs considerably from the theoretical optimum selectivities reported above because the San Francisco Bay population lacks herring of optimum sizes for 2 1/8-in. mesh. It also lacks herring of the optimal size for 2-in. mesh. Therefore, 2-in. mesh, while slightly more efficient than 2 1/8-in. mesh, is still not an efficient mesh size, which means that many herring will still swim through it. In addition, 2-in. mesh will catch more 3-year-old herring.

A number of factors will affect the observed ages of fish caught by fishing gears, including gill nets. For example, all ages of fish are not usually present in equal numbers. Gregoire and Lefebvre (2003) found differences in the observed selectivity of the same nets between years and theorized that the differences were due to changes in herring age (and thus, size) composition between years. Winters and Wheeler (1990) had quite different results between the two years of their study using the same mesh size. Winters and Wheeler (1990) found that the 2-in. mesh net had the highest fishing power in 1987 while the 2.5-in. mesh net had the highest fishing power the previous year. Observed catch curves occur to the left of true net selectivity curves as a result of both natural and fishing mortality (Clark and King 1986).

2.3.1.5.4 Efficiency

As stated previously “efficiency” is that portion of fish which are killed as a result of fishing and can be recorded as landed. In the herring roe fishery we can further restrict this definition to those fish for which the roe can be processed and sold. Fish caught by medial to posterior wedging (i.e., belly caught) often have ovaries broken and eggs extruded limiting the value of such fish (Figure 2.7).

Figure 2.7. “Belly caught” commercial gill net herring from San Francisco Bay: 2004-05 Season.

Other fish are killed and lost during gill net retrieval when they fall from the net into the water (gill net dropout). An unknown proportion of dropout herring may survive, some may die due to causes of latent mortality (i.e., injuries sustained in the net or by disease), while others may be eaten by birds or marine mammals (Ken Oda, California Department of Fish and Game, personal communication). Dropout rates and resultant mortalities, which have been estimated at less than two percent, do not appear to change significantly with gill net mesh size (Hay et al.1982).

For the San Francisco Bay herring fishery, reducing the minimum gill net mesh size from 2 1/8-in. to 2-in. may reduce the medial wedging of large 3-year-old herring but may shift this problem to smaller 3-year-olds in the San Francisco herring fishery. However, if quotas can be achieved with less fishing effort then total mortality associated with fishing may be reduced.

2.3.1.5.5 Mortality of Herring Escaping Through Gill Nets

Small fish will escape through mesh that is too large for them with minimal damage. Herring swimming through the nets tend to lose more scales as size

approaches the net selectivity (Hay et al. 1986). Yet despite the increased scale loss with size, mortality rates were low even for fish with 75 percent scale loss (Hay et al.1986). These authors estimate a swim-through mortality of 2 percent or less. It should be noted that the authors did not subject fish to repeated net contact. If swim-through mortality were 2 percent for first-time net encounters, then mortality rates would likely increase with an increase in net encounters. At present there is no evidence that this is an issue. Nonetheless, reducing the number of times smaller herring pass through nets should lower fishing mortality on non-landed herring.

2.3.1.5.6 Reduced Value of Landed Fish

On average, a reduction in mesh size from 2 1/8-in. to 2-in.could result in a decline in the size of fish landed of about 0.7-in. This will shift exploitation rates down about two ages, from primarily targeting 5-year-olds and above to targeting 3-year-olds and older (Figure 2.5). Until the 2004-05 season, landings in recent years have been composed primarily of 3- and 4-year-old fish with declining numbers of 5-year-old and older fish, due to declines in abundance of these older herring in the population (Figure 2.5).

With a reduced mesh size, the average size of 3- and 4-year-old fish in the catch should decline because the 2 1/8-in. currently catches larger 3- and 4-year-olds. There may also be an increase in catch of males which have a lesser girth on average than females. The end result could be an increase in processing costs because processing time is similar for a fish regardless of size and larger fish produce larger roe sacs and generally higher roe counts. Fishermen may see a reduction in catch value due to lower roe counts; however, this reduction in catch value may be mitigated by higher landings and reduced overhead

2.3.1.5.7 Incidental Catch

There are two issues of concern associated with incidental catch. The first is that the species composition of incidental catch may change. The second is that mortality rates of incidental catch may change. Incidental catch in herring gill nets is quite low. The ratio of incidental catch to herring catch over a three year period was

0.0017-in. for research gill nets set to catch herring (FED, 1998). The change to a smaller minimum mesh net may have an effect in the average size of incidental catch, but the change will be small and have little effect on species composition of incidental catch. If there were a shift in species composition, overall effects would still be minimal because of low incidental catch. A portion of incidental catch is due to entanglement of larger fish and this will be affected very little by one eighth of an inch decrease in minimum mesh size. With the potential reduction of minimum mesh size to 2-in. in San Francisco Bay, there is, however, the possibility of a take of endangered and threatened salmonid species (See Section 3.6.2).

2.3.1.5.8 Sustainability of the Herring Population

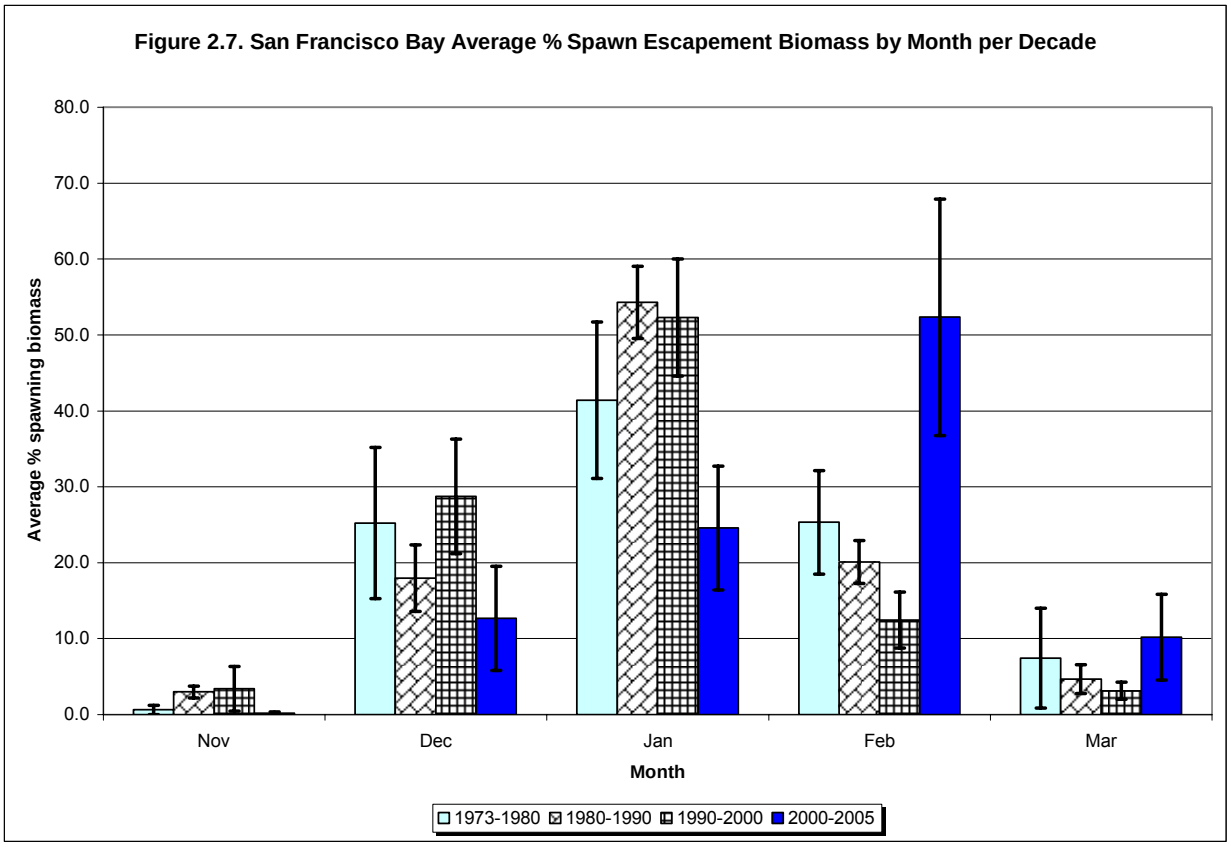
The herring population has not fully recovered from the 1997-98 El Niño. The fishery has failed to meet quotas in the last four seasons with the lowest catch-to-quota ratio in 2004-05 (Table 2.5). If the Commission continues to set conservative quotas, and fishery induced non-landed mortality can be kept at a minimum, then the fishery may have a minimal effect on rebuilding of the population and its age structure. However, there is a level of recruitment at which even a minimal fishery could delay the rebuilding period. If poor recruitment occurs over the next several years, then a fishery closure should be considered. These concerns tend to be independent of minimum mesh size regulations if quotas are adjusted accordingly to conservative harvest levels.

The age structure of the San Francisco herring population since the 1997-98 El Niño has been made up primarily of 2- to 4-year-old fish, with very few older fish (Table 2.4). Historically, earlier spawns have been composed of older

Table 2.5. San Francisco herring price, roe percent, ex-vessel price per ton quota, landings and total estimated value to fishermen

Season	Base Price	Ave Roe %	Ex-Vessel/ Ton	Quota	Landings	Value $1000
1985-1986	$1,100	12.2	$1,342	7,530	7,728	$10,371
1986-1987	$1,200	11.7	$1,404	7,470	8,098	$11,370
1987-1988	$1,300	13.5	$1,755	8,432	8,741	$15,340
1988-1989	$1,250	11.5	$1,438	9,238	9,736	$14,000
1989-1990	$1,200	13.0	$1,560	9,057	8,962	$13,981
1990-1991	$900	13.3	$1,197	8,858	7,741	$9,266
1991-1992	$1,200	13.9	$1,668	7,134	7,417	$12,372
1992-1993	$500	13.0	$650	5,175	5,151	$3,348
1993-1994	$600	11.7	$702	1,996	2,302	$1,616
1994-1995	$1,400	12.3	$1,722	4,408	4,574	$7,876
1995-1996	$2,300	13.8	$3,174	5,524	6,165	$19,568
1996-1997	$1,000	13.3	$1,330	13,543	11,496	$15,290
1997-1998	$400	11.3	$452	9,793	1,981	$895
1998-1999	$625	15.3	$923	2,739	2,817	$2,600
1999-2000	$800	14.2	$1,136	5,925	3,356	$3,812
2000-2001	$700	13.1	$917	2,499	2,991	$2,743
2001-2002	$600	15.9	$951	4,128	3,287	$3,126
2002-2003	$600	15.1	$906	3,262	2,097	$1,900
2003-2004	$500	13.6	$680	2,020	1,540	$1,047
2004-2005	$500	16.2	$810	3,169	143	$116
Mean	**$934**	**13.4**	**$1,236**	**6,095**	**5,316**	**$7,532**

fish with the youngest fish spawning later in the season. With the exception of the 2004-05 season, in recent years there have been few significant spawns in November and December (Figure 2.7).



Eggs of larger herring are larger than are eggs from younger herring and may make a higher contribution to recruit-per-egg (i.e. survival) than eggs from younger fish. Studies on the timing of spawning have indicated that recruitment events vary between years so that in a given year, conditions may be better for recruitment at different times during the spawning period (Berkeley et al. 2004). Consequently, it makes sense to maintain the age structure of the San Francisco herring population close to the virgin population structure so that spawning takes place throughout the historic spawning period and throughout the spawning areas in the Bay (Berkeley et al. 2004; Watters et al. 2004).

2.3.1.6 Gill Net Length Measurement

Subsection (f)(2)(B) of the roe fishery regulations specifies that no permittee shall possess or fish more than a total of 65 fathoms (1 shackle) of gill net in San Francisco

and Tomales Bays. Several members of the herring industry have expressed concern and some confusion as to where gill net length measurement is taken by Department enforcement. Both Department enforcement and industry agree that the length measurement should be taken along the cork line and that this should be specified in regulation. The Department is proposing to add the phrase “as measured at the cork line” to further specify and clarify gill net length measurement in the regulations.

2.3.1.7 Permit Changes

2.3.1.7.1 Transfer Fee Reduction

Under existing law (Fish and Game Code Sections 8550 and 8552), Pacific herring may be taken for commercial purposes only under the authority of a permit, and the permits are transferable under the provisions of Fish and Game Code Sections 8552.2, 8552.6, and 8552.7. Fish and Game Code Section 8552.7 currently sets the fee to transfer a herring permit at $5,000. Under existing law (Fish and Game Code Section 8552.1), the Fish and Game Commission (Commission) may adjust the herring permit transfer fee to a level that will not discourage the transfer of permits or limit entry into the fishery, and that will ensure sufficient funds to cover reasonable Department of Fish and Game (Department) costs associated with management of the fishery.

The proposed regulations would lower the herring permit transfer fee from $5,000 to $1,000. The current fee of $5,000 is inhibiting transfer of permits, and is creating an economic hardship for permit holders who want to leave the fishery and for fishermen who want to enter the fishery. Many permit holders consider the $5,000 fee excessive and inequitable during a period when the market value of the permits is relatively low. Lowering the permit fee to $1,000 would lower the economic barrier for permit transfers while still providing the Department with revenue for herring research and management.

The herring permit transfer fee was not established to cover the administrative costs of transferring a permit but rather as a means to help fund herring research and management. The commercial roe herring fishery has been regulated by fixed numbers of permits since 1973, and the permits were not

transferable (except to a working partner or family member upon death of the permit holder) until 1989. Thus, the Department did not initially issue an item of real monetary value, because the permits were not transferable and initial issuance of a permit was at no cost to the recipient except for the annual permit fee. The passage of AB4597 in 1989, with the provision for full transferability of herring permits, assigned a real monetary value to possession of a herring permit without accruable monetary benefit to the state. To rectify that, AB4597 required that a transfer fee be paid to the state.

Anecdotal information from fishermen as well as trends for the number of permit transfers, number of permits reverting to the state, and the number of partnerships indicate that the current transfer fee of $5,000 is a barrier to the sale and transfer of herring permits. The number of transfers per year dropped markedly after the transfer fee increased from $2,500 to $5,000 on April 1, 1997 (Attachment 1). The number of permits reverting to the state has increased dramatically in the last two seasons (Attachment 1); a permit reverts to the state when the permit was not sold and transferred after the death of a permit holder or when the permit holder choose not to renew the permit.

Herring permit transfer procedures are specified in statute (Fish and Game Code Sections 8552.2 and 8552.6). The administrative and fiscal impacts to the Department for completing a transfer are minor. The reduction in the fee will not impact the Department's ability to complete permit transfers.

Existing law (Fish and Game Code Section 8552.7) states that the transfer fees shall be used for research and management of herring. On average, the revenues from the transfer fee represent about 4 to 5 percent of the revenue that the Department receives directly from the herring fishery and about 7 percent of the revenue deposited in the Herring Dedicated Account for herring management and research. If the number of permit transfers per year stays the same as the average number per year since the transfer fee was increased to $5,000 on April 1, 1997 (*i.e*., about 4 per year), then the Department would lose revenues. However, if the number of permit transfers per year equals the average number of transfers when the fee was less than $5,000 (*i.e.,* 32 per year), then the Department would not lose

revenues. Any revenues lost due to the lower transfer fee would need to be absorbed by the Department within existing budgets and resources, or the Department would need to find ways to reduce the cost of managing the herring fisheries. The proposed regulation would lower the herring transfer fee from $5,000 to $1,000.

2.3.1.7.2 Other Measures to Facilitate Transfers

Members of the fishing industry argue that other socio-economic factors besides the transfer fee are inhibiting herring permit transfers. Existing law (Fish and Game Code Section 8552.3) authorizes the Commission to allow an individual to own a permit for each of the three gill net platoons (also called fishing groups and designated DH, Odd, and Even) in San Francisco Bay; to eliminate the point system for qualifying for a herring permit; and to allow a herring permit to be transferred from a parent to child or between spouses.

Regulations proposed that were described in the DSED (See Appendix F of this FSED) did not go forward to the Commission due to conflicts with existing Fish and Game Code sections regarding partnerships. A separate proposal by a herring permittee was submitted to the Fish and Game Commission at their August 19, 2005 meeting in Morro Bay. The Commission voted to go to public notice on the proposal for discussion and potential adoption at their November 4, 2005 meeting. This proposal, along with the previous recommendations received by a group of Director's Herring Advisory Committee members regarding point system elimination, the ownership of more than one permit in the San Francisco Bay fishery, and the transfer from husband to wife and parent to child, has gone to public notice for a 45-day comment period.

The proposal from the meeting is based on existing law (Fish and Game Code Section 8552.3). Regarding the ownership of multiple permits in the San Francisco Bay fishery, the proposed regulations would authorize gillnet permit holders in San Francisco Bay to own permits in more than one platoon (odd-numbered permits, even-numbered permits, and December herring ("DH") permits), but would prohibit anyone from holding more than one permit per platoon.

Individuals holding converted round haul ("CH") permits that are authorized to fish in two platoons would be allowed to own a permit for the platoon that is not authorized under his or her CH permit. An individual who is a partner of a permit held in partnership would not be allowed to hold another permit (either as sole owner or as a partner) for the same platoon as the permit held in partnership.

Elimination of the point system is based on legislative direction in Section 8552.3 (c) to only eliminate the point system, not to dispense with qualifying criteria altogether. In issuing limited entry permits, Commission Restricted Access Policy 4.1 encourages giving a preference to fishermen with a record of prior participation in the fishery. The point-system would be eliminated, and new eligibility criteria would be in place for permits that are not held in partnership. The proposed regulations would limit transfers to individuals who meet at least one of the following criteria: have fished in a herring roe fishery in California for at least one season and have held a California commercial fishing license for at least three years; or is a current San Francisco Bay permit holder who is purchasing another San Francisco Bay permit.

The proposed regulations would prescribe the documents needed to demonstrate eligibility. To reduce the burden on the permit holder, the proposed regulations would eliminate the requirements that a permit holder mail a notice of intention to transfer to everyone on the Department's list of individuals with experience points (commonly called the 20-point list). To facilitate administration of the proposed changes, the proposed regulations specify the requirement for requesting a permit transfer, specify that an application must be for each permit each season, and provide a process to appeal a Department denial of a transfer.

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 pallasi*, are found throughout the coastal zone from northern Baja California on the North American coast, around the rim of the North Pacific Basin and Korea on the Asian coast (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 product, *kazunoko*, from this fishery 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 existing 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

Annual estimates of spawning biomass are made by the Department in Tomales and Humboldt bays using spawn deposition surveys (refer to section 3.2.1). For San Francisco Bay, the Department estimated spawning biomass using the 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 (refer to section 3.2.2) for San Francisco Bay. Beginning with the 2003-04 season, the Department reverted to using the spawn deposition surveys alone for biomass estimation (refer to section 3.2.3). 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 from the commercial catch. All of the information collected by the Department, including ocean conditions, is used in annual population assessments.

3.2.1 Spawn Deposition Surveys

Pacific herring enter Crescent City Harbor, Humboldt, Tomales, and San Francisco Bays in schools (or waves) to spawn in the intertidal and shallow subtidal portions of the Bay from November through March each year. Females extrude adhesive eggs on a variety of 'clean' substrates (i.e., free from silt) including vegetation, rocks, shell fragments, pier pilings, boat bottoms, concrete riprap and seawalls. Embryos take about ten days to develop and hatch.

The spawn survey consists of: 1) a systematic search for herring spawning activity throughout the spawning season; 2) surveying spawns to estimate the biomass of adult spawners; and 3) adding landings to adult spawner biomass to estimate total biomass of each school. The basic methodology (Spratt, 1981) of the survey has remained the same since 1973, with some modifications over the years to increase the survey's accuracy. Watters et al. (2004) describes in more detail the field and laboratory methods used to conduct the survey.

The spawn survey was designed to estimate the total number of eggs spawned and to convert that estimate to the total tons of spawning adults, using a conversion factor based on fecundity (the number of eggs per unit body weight of females) and the ratio of males and females in the school. The area of the spawn is measured and samples are collected from which the density (number of eggs/m^2) of eggs is calculated. This is expanded to the total area of the spawn

to estimate the total number of eggs spawned. The total eggs spawned are then converted to tons of spawning adults. The sac roe fishery typically catches Pacific herring just prior to spawning, while the herring eggs-on-kelp fishermen harvest product post-spawning. Landings data are collected and tallied on a daily basis. The tons of sac roe herring landed are then added to the estimated tons of spawners. Herring eggs-on-kelp landings are also added after conversion to tons of whole fish to estimate the total size of a school (or wave) of herring.

3.2.2 San Francisco Bay Hydroacoustic Surveys

Hydroacoustic surveys determine the size and density of herring schools entering the Bay by transmitting sound waves through the water column using an echo sounder and quantifying the returning echoes or "marks". Hydroacoustic surveys were composed of quantitative and qualitative components. Qualitative surveys were conducted primarily with a video echo sounder to verify the location and distribution of herring schools. Sampling gear, primarily midwater trawl, was used to identify or differentiate the "marks" as herring from other schooling species commonly found in the Bay such as Northern anchovy (*Engraulis mordax*) and white croaker (*Genyonemus lineatus*). Qualitative surveys were carried out prior to quantitative surveys.

The Department used two quantitative survey methods to estimate biomass, "visual" integration and echo integration. The visual integration method was developed for herring biomass estimation in 1982 and continued to the present (Reilly and Moore 1983). Echo integration was used from 1986 through 1990 before being discontinued due to logistical issues (FED 1998). This method is fully described in Reilly and Moore 1987.

Quantitative surveys were conducted for each detected school that entered the Bay after it was determined by sampling and qualitative surveys that the school ripened, the school coalesced, and spawning, based on observed behavior, was imminent. Once school location and school boundaries were determined by qualitative surveys ("metering") using an echo sounder, the quantitative survey was initiated at the west end, or "upstream" end, of the

school.

Visual integration surveys employed a paper recording echo sounder and a GPS (global positioning system) device. An echogram, a paper recording produced by the echo sounder, provided a visual recording of the school density and area information. This was obtained by taking systematic diagonal “zig zag” transects from one end of the herring school to the other. Each transect was terminated when either the herring “marks” disappeared or when the course taken by the skipper conflicts with land or other obstacles (i.e., vessels and buoys). A turn by the vessel was made to initiate a new transect. Turn location data from positioning location equipment were recorded on the echogram. In the laboratory, transects were plotted on charts from the location information recorded on the echogram.

Densities of herring represented in each transect were determined based on comparisons to calibration standards (i.e., visual integration). Marks that were determined by sampling or appeared to be non-herring were deducted or omitted from analysis. The densities were averaged for each transect and multiplied by the school surface area to determine the number of tons contained within the area surveyed (Oda 1994).

3.2.3 Stock Assessment and Review of Survey Methods for San Francisco Bay

Following the 2002-03 herring season, Department biologists conducted a comprehensive review of the status of the San Francisco Bay herring population. The review included an analysis of several long-term data sets, some of which date back to the beginning of the roe fishery in 1973, including spawning biomass estimates, age composition of the population, age composition of the catch, length and weight at age, and environmental data. In addition, the Coleraine Model, a stock assessment model, was utilized to assess the status of the population. The Department’s use of the Coleraine Model and its results

were subjected to an independent peer review, administered through California Sea Grant (Appendix B: Peer Review).

The Department also conducted an analysis of the two survey methods used to estimate biomass in San Francisco Bay: the spawn deposition survey and the hydroacoustic survey (Sections 3.2.1 and 3.2.2). The two surveys were used in combination on a school-by-school basis to derive a biomass estimate from the 1989-90 through 2001-02 seasons. The two surveys were usually combined by choosing the higher of the two estimates. Sometimes this resulted in a total biomass estimate for the season that exceeded the total for either survey. Beginning with the 1993-94 season, the total biomass estimated by each survey began to diverge, with the hydroacoustic survey estimates consistently larger than spawn survey estimates. In addition, in later years the trends depicted by the two survey estimates began to differ, with the hydroacoustic survey estimates fluctuating up and down from year to year, and the spawn survey estimates remaining low.

Because the biomass estimate from one season is used to set the quota for the following season, a basic assumption in using a survey is that its biomass estimate from one year will be a reasonable estimator of biomass in the following year. The analysis found that the hydroacoustic survey was less consistent and a poor predictor of itself in the following year, while the spawn survey followed more consistent trends, predicting itself in the following year reasonably well. In addition, when compared with the modeled biomass estimates from the Coleraine model, hydroacoustic survey biomass estimates did not correlate, while the spawn survey biomass showed a high correlation with modeled biomass.

This analysis was also reviewed by the peer review panel. In reviewing the biomass estimates from the two survey methodologies, the peer review panel found that the spawn deposition survey on average tends to underestimate biomass by about 10 percent and the hydroacoustic survey tends to overestimate biomass by about 20 percent on average. The panel found that the Department's method of combining the two surveys, which often involved using

the higher of the two estimates on a school by school basis, has contributed to excessive quotas by overestimating biomass.

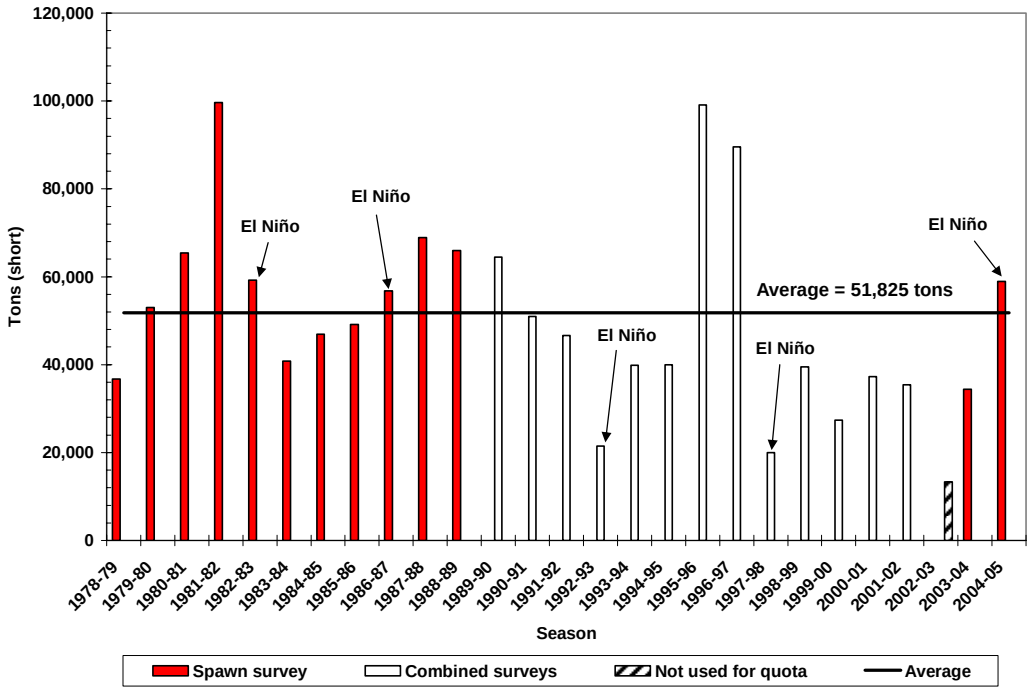
The panel recommended that the spawn survey be used as the primary index of abundance and as the biomass estimate for setting the fishery quota until an integrated catch-age model can be developed and verified for San Francisco Bay. They also recommended that hydroacoustic surveys be continued to support the location and timing of the spawn deposition survey in conjunction with sampling herring schools that are critical for collecting population age structure information.

Following the Department's own analysis of the two survey's biomass estimates and the peer review panel's analysis, in 2003-04 the Department reverted to using the spawn survey biomass estimate as a basis for quota recommendations for San Francisco Bay. This change was implemented to improve the consistency and accuracy of biomass estimation. Controversy surrounding that decision is discussed further in Section 3.6 of this DSED.

3.3 Status of the San Francisco Bay Spawning Population

The 2004-05 spawning biomass estimate is 58,934 tons (including catch), a 71 percent increase over last season's estimate of 34,400 tons (Figure 2.2). It is the first spawning biomass estimate to exceed the long-term average, 51,825 tons, used to set fishery quotas since the 1996-97 season, following seven consecutive seasons of below-average spawning biomass.

Figure 2.2. San Francisco Bay Pacific herring spawning biomass estimates 1978-79 to 2004-2005



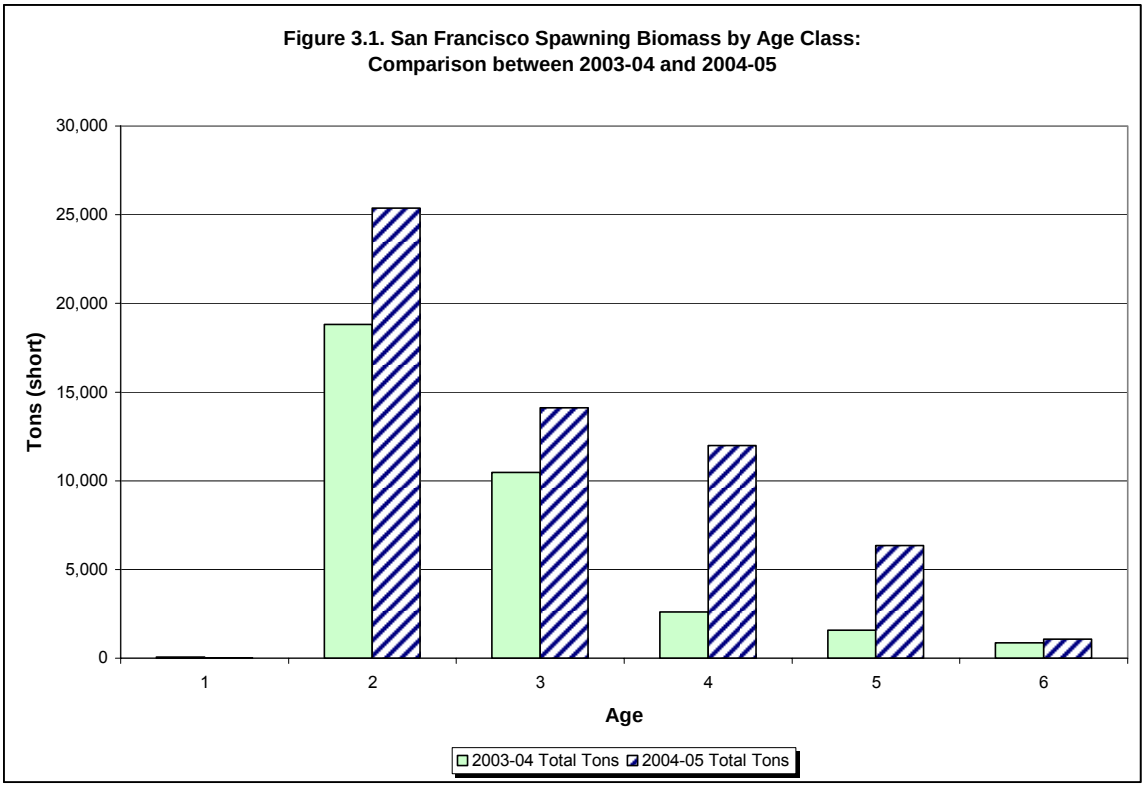
Length at age information from the 2003-04 season was applied to this season's length data to develop a preliminary population age structure. The more accurate method of reading otoliths, hard ear-bone structures, for obtaining age composition for the current season will be conducted this summer. The updated ages will then be incorporated into the FSED for 2005.

The preliminary age composition indicates strong recruitment of two-year-old herring, approximately 128 percent by number above the long-term mean and 33 percent higher than the 2003-04 season (Table 2.5). There were significant increases in the numbers of 3-, 4-, 5-, and 6-year-old sized herring (35, 358, 302, and 23 percent by number respectively from the 2003-04 season); however, the estimated numbers of 3-, 4-, and 5-year-olds were average and 6-year-olds were below the long-term averages. The greatest increase in spawning biomass by age group appears to be the four-year-old cohort (Figure 3.1).

Table 2.5. Estimated Numbers (x 1,000) of Herring-at-Age in the San Francisco Bay Spawning Population, 1982-83 to present

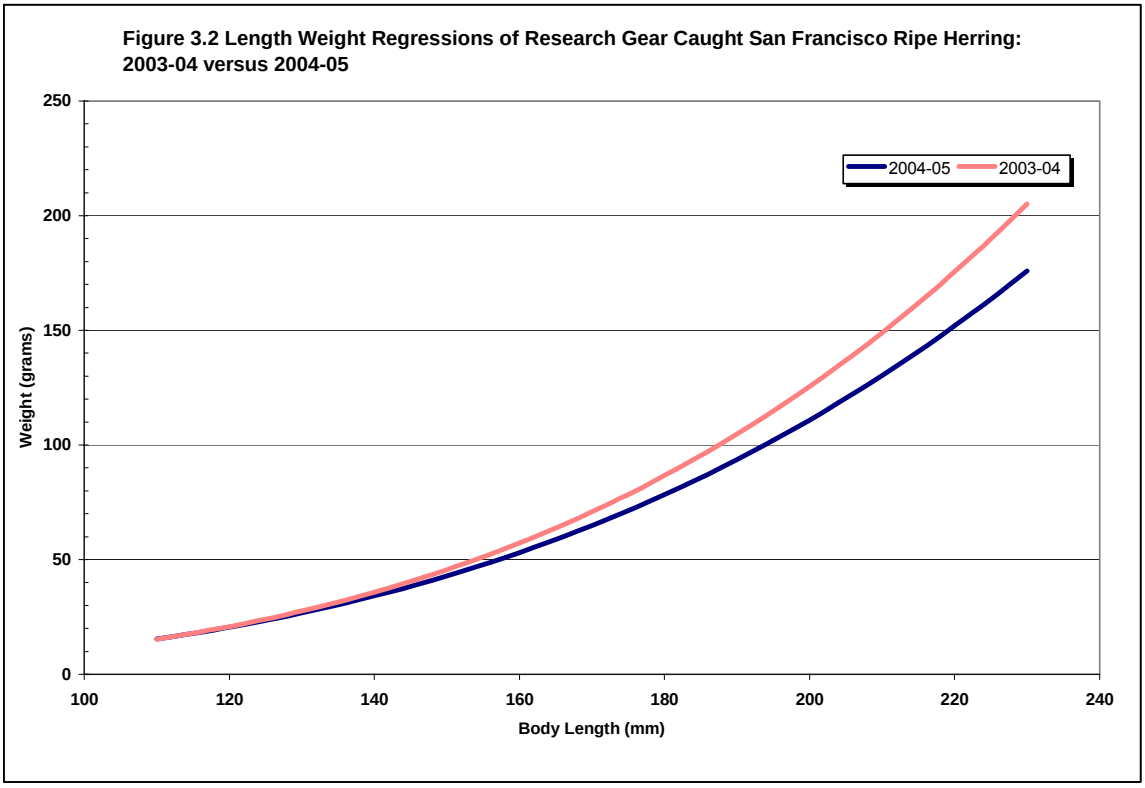
	Age and Percent Composition																		
Season	1	%	2	%	3	%	4	%	5	%	6	%	7	%	8	%	9	%	Total
82-83	[a]	N/A	87,908	14.8	149,971	0.3	182,936	30.7	118,040	19.8	30,478	5.1	17,177	2.9	8,121	1.4	797	0.1	595,428
83-84	[a]	N/A	332,699	56.6	69,654	0.1	92,565	15.8	73,840	12.6	17,306	2.9	1,168	0.2	117	0	0	0.0	587,349
84-85	[a]	N/A	184,695	38.7	190,998	40.0	46,613	9.8	22,153	4.6	25,914	5.4	6,652	1.4	688	0.1	0	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	1.5	717	0.1	182	0.0	501,049
86-87	[a]	N/A	168,962	29.2	194,365	33.6	134,528	23.2	64,598	11.2	9,182	1.6	6,175	1.1	1,065	0.2	246	0.0	579,121
87-88	[a]	N/A	233,193	30.6	292,508	38.3	136,604	17.9	66,494	8.7	25,337	3.3	5,027	0.7	3,939	0.5	0	0.0	763,102
88-89	[a]	N/A	146,525	25.8	222,058	39.0	139,906	24.6	44,435	7.8	12,310	2.2	3,030	0.5	534	0.1	0	0.0	568,798
89-90	[a]	N/A	294,631	37.6	237,377	30.3	136,248	17.4	84,361	10.8	23,970	3.1	6,572	0.8	0	0	0	0.0	783,159
91-92	1,356	0.3	13,666	3.0	126,016	28.0	206,930	45.2	82,870	18.1	23,764	5.2	3,490	0.8	0	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	0.0	238,723
93-94	11,485	2.6	22,403	5.1	134,870	31.0	160,335	36.9	63,331	14.6	25,926	6.0	4,808	1.1	355	0.1	0	0.0	423,513
94-95	2,276	0.5	39,363	9.0	236,783	54.1	94,833	21.7	42,850	9.8	18,223	4.2	3,196	0.7	0	0	0	0.0	437,524
95-96	3,142	0.3	483,164	38.9	359,357	29.0	282,069	22.7	81,768	6.6	28,904	2.3	1,687	0.1	0	0	0	0.0	1,240,091
96-97	1,184	0.1	290,497	29.1	359,459	36.0	183,370	18.4	120,029	12.0	33,098	3.3	8,935	0.9	270	0	0	0.0	996,842
97-98	42	0	45,092	17.2	129,411	49.3	65,637	25.0	18,724	7.1	2,259	0.9	1,430	0.5	0	0	0	0.0	262,595
98-99	1,931	0.4	256,816	52.0	54,306	11.0	114,835	23.2	56,915	11.5	9,729	2.0	558	0.1	978	0.2	[b]	0.0	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]	0.0	340,650
00-01	255,158	36.0	178,401	35.43	185,748	36.9	65,555	13.0	24,267	4.8	126	0.0	0	0	0	0	0	0.0	709,255
01-02	5,788	1.5	157,182	39.6	138,752	35.0	75,088	18.9	15,383	3.9	4,265	1.1	152	0	0	0	0	0.0	396,610
03-04[c]	2,473	0.5	328,257	65.5	122,072	24.3	26,641	5.3	14,848	3.0	7,225	1.4	0	0	0	0	0	0.0	501,516
04-05[d]	1,096	0.1	442,928	55.4	164,566	20.6	122,103	15.4	59,676	7.5	8,875	1.1	0	0	0	0	0	0.0	799,244
Mean	22,096	3.3	191,146	31.7	177,681	30.3	119,973	21.8	55,314	10.0	15,992	2.8	3,705	0.6	839	0.1	68	0.0	586,814

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 numbers of herring, [d] percentages are the average percentages for all years, not the percentage that the average number represents



Although the numbers of six-year-old herring increased from the 2003-04 estimate, it appears that the numbers of six-year-old herring remain below average while herring older than six years are nearly absent from the population.

Length weight regression analysis of data taken from ripe herring sampled this season with research gear (midwater trawl, gill net, and throw net) indicates that herring were lighter in weight for a given length than the 2003-04 season. Ripe herring, male and female samples combined, weighed as much as 12 percent lighter for a given length than herring sampled in the 2003-04 season (Figure 3.2).



Samples taken from the commercial gill net fishery indicate the same trend in weight loss. The mean length of commercial gill net samples for the 2003-04 season was 187 millimeters (mm) Body Length (BL) and weights averaged 101 grams (g). This season the average length of the commercial catch increased to 191 mm BL; however, average weights of sampled fish declined to 98 g.

Poor growth of herring in 2004 is attributed to the effects of the 2004-05 El Niño and is likely to be one the factors that led to record low landings by the gill net fishery this season. Although the annual estimated spawning biomass is 71 percent higher than the 2003-04 season, and 4-, 5-, and 6-year-old sized herring increased a total of 14,000 tons from the previous season (Figure 3.1), the fishery was dismal. Herring exhibiting reduced weight and girth due to effects of El Niño are more likely to pass through gill net webbing, whereas, well-conditioned herring with higher weight to length ratios are more likely to be caught (Winters and Wheeler 1990). Additionally, this season's spawning

population was dominated by younger fish; approximately 75 percent by number of the spawning biomass was composed by 2- and 3-year-old sized herring.

The earliest spawn occurred near November 2, 2004, and the latest spawn occurred on March 25, 2005. Spawns were recorded from the Marin Rod and Gun Club at Pt. San Quentin in the north to Coyote Pt. in the south. This season's vegetation survey revealed a substantial increase over recent years in density and area of eelgrass (*Zostera marina)* and *Gracilaria spp.* in Richardson Bay and Belvedere Cove. At some sites within Richardson Bay the increase was three-fold or greater over last year's densities. A substantial amount of *Gracilaria spp*. was also discovered for the first time in the subtidal area south of Candlestick Point.

The spawning season started off very slowly with only trace amounts of spawn found in Richardson Bay in November and at Crown Beach in Alameda in early December. The first measurable spawn of the season (2,876 short tons) occurred about December 12, 2004, in the Candlestick Pt. area, in the subtidal on *Gracilaria spp.* between Hunter's Point and Candlestick Pt., the intertidal around Candlestick Pt., and the subtidal south of Candlestick Pt., again on *Gracilaria spp.* This was the first time subtidal spawning was documented in this area in the 32-year history of the spawn survey, and the Department documented spawning here three more times during the 2004-05 spawning season (Table 3.1).

An unusually high amount of spawning occurred in the South Bay region (Candlestick Pt. south, including Sierra Pt., Oyster Pt., and Coyote Pt.) during 2004-05, with the majority occurring in the subtidal area around Candlestick Pt. Twenty-six percent of the total spawn escapement (not including catch) biomass estimate occurred in this area. Historically, the South Bay region has comprised only about 1 percent on average of the total spawn escapement biomass for San Francisco 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). Seventy-one percent of the 2004-05 season's total spawn escapement biomass occurred in North-Central Bay, with 58 percent of the season's total

Table 3.1. 2004-05 Pacific Herring Spawning Biomass Estimates for San Francisco Bay
All weights in short tons.

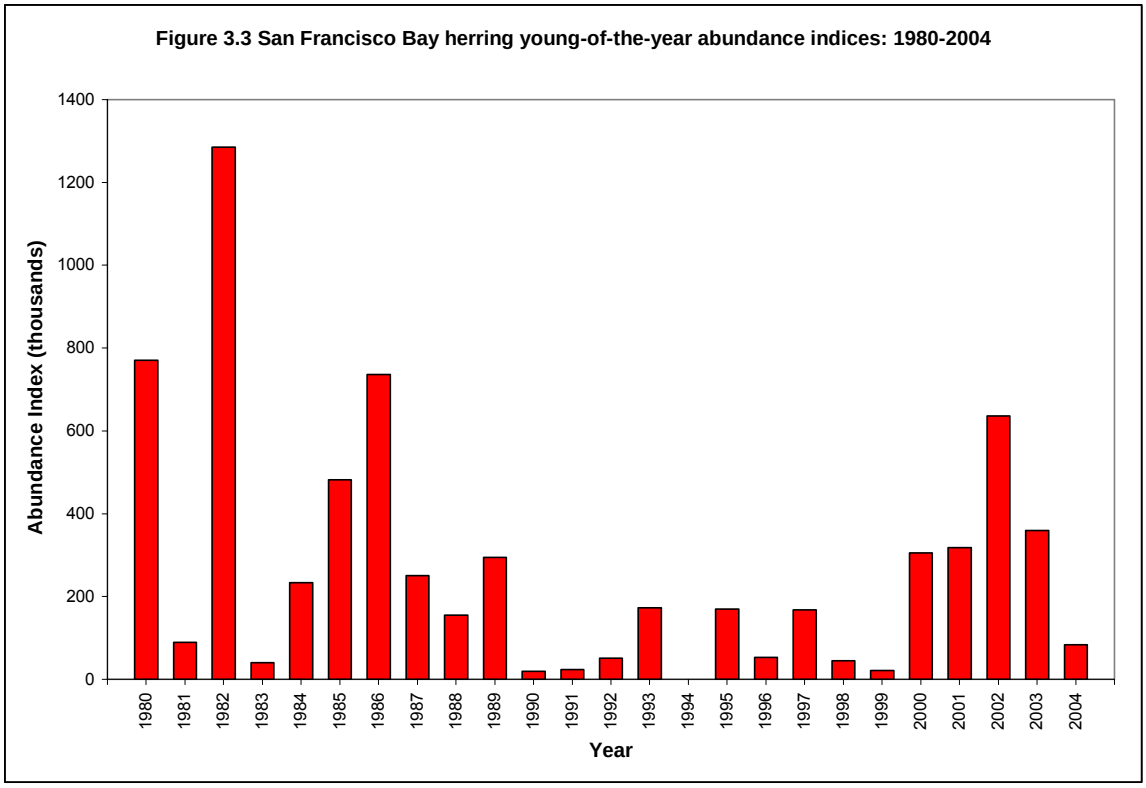
Wave Number	Approx. Spawn Date(s)	Location(s)	Spawn Escapement Estimate	Catch	Spawning Biomass Estimate
1	2-Nov-04	Richardson Bay subtidal	Trace	NA	NA
2	23-Nov-04	Richardson Bay subtidal	Trace	NA	NA
3	3-Dec-04	Crown Beach Alameda	Trace	NA	NA
4	12-Dec-04	Cove between Candlestick Pt. and Hunter's Pt., subtidal south of Candlestick, intertidal Candlestick	2,857	NA	2,857
4	15-Dec-04	Oyster Pt.	19	NA	19
5	16-Dec-04	Richardson Bay subtidal	1,630	NA	1,630
6	25 Dec 04 - 1 Jan 05	Cove between Candlestick Pt. and Hunter's Pt., intertidal Candlestick Pt., subtidal south of Candlestick Pt.	10,760	NA	10,760
6	30-Dec-05	Cove between Candlestick Pt. & Hunter's Pt., intertidal Candlestick Pt., subtidal between Candlestick & Sierra Pt., Sierra Pt., Oyster Cove marina, Coyote Pt.	3,587	NA	3,587
7	29-30 Dec 04	Richardson Bay subtidal	3,069	NA	3,069
8	4-10 Jan 05	Richardson Bay subtidal	3,029	NA	3,029
9	16-21 Jan 05	Fort Baker to Sausalito intertidal, most marinas in Sausalito, Richardson Bay subtidal	15,774	68	15,842
10	27-28 Jan 05	Peninsula Pt., Belvedere subtidal	164	NA	164
10	29 Jan-2 Feb 05	Richardson Bay subtidal, Belvedere Cove intertidal and seawall	7,255	NA	7,255
10	2-5 Feb 05	(continuation of above spawn) Sausalito marinas, intertidal Sausalito to past sewage treatment plant	709	NA	709
11	29-31 Jan 05	South of Candlestick Point, trace in Hunter's Pt. Cove	112	NA	112
11	4-Feb-05	Oyster Pt.	36	NA	36
12	5-8 Feb 05	Pt. San Quentin to Elephant Rock	3,392	77	3,469
13	20-Feb-05	Belvedere Cove	3	NA	3
13	22-25 Feb 05	Richardson Bay	3,761	NA	3,761
13	27-28 Feb 05	Sausalito Marina	226	NA	226
14	7-Mar-05	Belvedere Cove, Richardson Bay	1,611	NA	1,611
15	10-Mar-05	Sausalito, Stink Plant	Trace	NA	NA
16	25-Mar-05	Richardson Bay	795	NA	795
Totals			58,789	145	58,934

occurring within Richardson Bay, primarily in the subtidal beds of eelgrass and *Gracilaria spp*. A total of eight spawns occurred in Richardson Bay this season, and at times spawning almost seemed 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 marinas). North-Central Bay spawning activity also included a spawn at Pt. San Quentin (290 tons), which included spawn along the shoreline from northwest of the Marin Rod and Gun Club (MRGC), the pier at MRGC, to the west end of San Quentin Prison. This was the first spawn of measurable size documented at this location in the 32-year history of the spawn survey (a trace amount of spawn was noted here in February of 2003).

Increased overall spawning biomass with significant improvements in the numbers of fish from age 4 through 6 cohorts, from the 2003-04 season, and the apparent strong recruitment of two-year-olds are positive signs of improvement for the San Francisco Bay spawning population. However, as in the last several years, the apparent low numbers of six-year-old herring (45 percent below average), and absence of older herring continue to be a cause of concern. This continued collapsed age structure, apparent reduction in size at age and/or poor condition, and potential El Niño effects give 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 young-of-the-year (YOY) abundance index for 2004 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 2004 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 2006-07 and 2007-08 seasons as 2- and 3-year-olds. However, there is no strong predictive relationship 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 2004-05 spawning biomass estimate is 3,686 tons, a 70 percent decline from the 2003-04 biomass estimate of 12,124 tons. The spawning biomass estimate is nine percent less than the thirteen-season average of 4,061 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 3.2). Environmental conditions offshore and in Tomales Bay play a key role in the fluctuation of spawning biomass. A decline in spawning biomass was not unexpected this season, after the second highest biomass estimate in the history of the Tomales Bay roe herring fishery in the 2003-04 season, but the recent El Niño may have precipitated the decline. El Niño events often create unfavorable environmental conditions for herring due to changes in ocean dynamics; for example, decreased coastal upwelling. These changes may lead to temporal effects in the food web, increased competition, predation, and altered migration patterns.

The first fifteen seasons of the Tomales Bay-Bodega Bay roe herring fisheries, from 1972-1987, was a cool water period, dominated by La Niña events. Above average spawning biomass estimates were found in eleven out of the fifteen seasons. (In two of the fifteen seasons spawning biomass surveys were not conducted.) These periods of cool water are thought to be more beneficial for Pacific herring. The period after the fishery was re-opened for the 1992-93 season has been marked by frequent El Niño events of varying magnitude. For example, the weak-to-moderate 2002-03 El Niño did not appear to greatly impact herring in Tomales Bay in 2003-04. However, the strong 1997-98 El Niño had lasting effects including a low spawning biomass estimate of 586 tons (Table 3.2). The post 1997-98 El Niño herring spawning biomass in Tomales Bay has shown a general trend towards improvement, but the loss of older age classes remains a concern. Oceanic temperatures in recent seasons indicate a cooling trend, which is often favorable to herring, and is reflected in the spawning biomass estimates over this period. Despite the loss of older age classes, there are positive signs of improvement, as 2-, 3-, and 4-year-old herring

Table 3.2 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%	6,023
1980-81 [c]	5,128	448	8%	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[2]
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%	380
1989-90 [e]	345	0	0%	345
1990-91 [e]	779	0	0%	779
1991-92 [e]	1,214	0	0%	1,214
1992-93 [f]	3,850	222	5.5%	4,072
1993-94 [f]	2,245	219	8.9%	2,464
1994-95 [f]	3,705	275	6.9%	3,980
1995-96 [f]	1,730	355	17%	2,085
1996-97 [f]	1,288	222	14.7%	1,510
1997-98 [f]	586	0	0 %	586
1998-99 [f]	4,017	54	1.3%	4,071
1999-00 [f]	1,968	42	2.1%	2,010
2000-01 [g]	3,897	298	7.1%	4,195
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
AVERAGE	4,580	214	8.9%	4,938
'92-03 to '04-05 AVG	3,845	187	5.6%	4,031
Mesh Study Average	6,118	208	3.4%	6,326

[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.

Table 3.3 Estimated Numbers (x1,000) 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	0.0%	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	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%	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	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	0.0%	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	0.0%	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%	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	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	1.1%	0	0.0%	0	0.0%	0	0.0%	42,181
AVG	0	0	10,500	16.2%	16,989	31.5%	11,597	29.5%	4,499	14.2%	1,588	5.8%	530	1.8%	200	0.9%	21	0.1%	45,925

Note: 1997-98 season not included due insufficient data set for expansion

have shown up in unprecedented numbers in recent seasons (Table 3.3).

Herring cohorts in Tomales Bay typically do not track well. Improvements in spawning biomass since 1992-93 indicate recovery that can not be attributed entirely to recruitment of younger fish; older fish either returned or emigrated from other areas. Similarly, the spawning biomass of 2003-04 was not built entirely from Tomales Bay stock, as the numbers of older herring went well beyond simple recruitment. It is possible that increased mortality of herring due to El Niño conditions is responsible for some of the decline this season; however, displacement of herring may be a more major cause of the decline considering that this El Niño appears to be weaker than the 2002-03 El Niño. Sea surface temperature (SST) monitoring of Northern California waters has shown that temperature anomalies vary in time and space. Each El Niño event impacts the herring population differently depending on the magnitude, timing, and locations of the anomalous SST occurrences in California waters. The locality and timing of warm water masses associated with El Niño may have displaced herring, and temporarily prevented herring from returning to Tomales Bay. Conversely, favorable environmental conditions during the 2003-04 season may have led to an influx of herring from other areas, which may have returned to those areas this season.

Commercial and research catch data collected this season demonstrate the effects of an El Niño. Herring returned to Tomales Bay underweight which typically reflects poor oceanic conditions. Herring caught commercially this season were slightly shorter, and showed an 11 percent reduction in weight compared to herring caught in the 2003-04 season. Research samples are collected using gill nets with several mesh sizes, which are designed to sample a broader size range and provide a better estimate of the entire spawning population than commercial gill nets.

Research sampled fish were on average 3-mm longer, but 10 percent lighter than herring caught in 2003-04. Spawning population lengths and weights collected this season were similar to those collected during the 2002-03 El Niño. The reduced weight of herring this season may be linked to unfavorable oceanic conditions and may account for a small portion of the decline in spawning biomass. Commercial catch data indicate that herring in the selectivity range of commercial nets were

2-mm longer, but six percent lighter than those caught during the 2002-03 El Niño. The poor condition of herring this season helps to explain the poor commercial catch this season by fishermen.

Spawning biomass in Tomales Bay began to decline drastically in the late 1980's as a result of what would become a six-year drought. Drought conditions in Tomales Bay were thought to be the primary cause of the decline in spawning biomass. Without normal rainfall, bay salinities remain high and are not conducive for spawning. Poor spawning conditions may have led a large portion of herring to temporarily abandon Tomales Bay until conditions improved.

There were eight spawning events during the 2004-05 season totaling 3,656 tons of spawning escapement. Seventeen different spawning bed areas were utilized from November through February. The locality 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 first 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 the second highest since the 1992-93 season. Eelgrass (*Zostera marina)* and *Gracilaria spp.* resources in Tomales Bay remained healthy and provided plenty of suitable spawning substrate for herring. Environmental conditions in Tomales Bay (i.e., temperature and salinity) do not appear to be a factor in the decline in spawning biomass this season. It is more likely that offshore environmental conditions played a dominant role in the decrease in spawning biomass this season, although straying may also be a factor but not conclusive.

The Department is continuing a mesh size study for the Tomales Bay fishery. This study allows permittees to use a gill net mesh size of 2-in., which is smaller than the 2 ⅛-in. mesh required by regulation. The Department is evaluating the effects of using 2-in. mesh on the age classes caught by the commercial fleet to ensure that the younger fish (≤ 3-year-olds) are not significantly impacted, thus potentially causing the fishery to become unsustainable. There has been an

increase in the proportion of younger fish in the population since the 2000-01 season. It is not surprising, given the smaller mesh size, that commercial catch data show an increased take 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 was that the Tomales Bay age structure was primarily older fish (≥ 4-year-olds) based on population assessments prior to the use of 2-in. mesh beginning in the 2000-01 season.

From 1993-94 to1999-2000 (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 (Figure 3.4); below-average numbers of 5-year-old and older herring; and a shift in size selectivity to include smaller younger herring, due to the gill net mesh size reduction to 2-in. It is likely that the use of 2-in. mesh gill nets in Tomales Bay has not had a detrimental effect on the age structure of the spawning population due to the low harvest rate during the study period (average 3.4 percent). However, the trend of increased harvest of 3-year-old herring is cause for concern (Figure 3.5). If the Tomales Bay stock should continue rebuilding, the commercial catch composition may shift to older age classes if they persist in the population.

El Niño conditions may have been a factor in this season's decline in biomass for the Tomales Bay stock, and it is unclear whether the Tomales Bay stock will rebound in the 2005-06 season. Recognizing that biological and environmental conditions vary, the Department will continue to maintain a conservative fishery management strategy (closure of the outer Bodega Bay fishery, conservative quotas, and monitor the 2-in. mesh study) to help ensure the sustainability of the Pacific herring population in Tomales Bay. If the Tomales Bay stock should continue rebuilding, the commercial catch composition may shift to older age classes as they persist in the population.

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 spawn escapement estimate for the 2004-05 Humboldt Bay herring spawning season is 173 tons. This is a 66 percent decrease from last season's estimate of 505 tons and only 53 percent of the 9-year average of 328 tons 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 was in the North Bay on January 4th and was estimated at 29 tons. The next spawn took place close to one month later on February 3rd in the same location in North Bay and was estimated at approximately 20 tons. The last spawn detected this season occurred in the South Bay on February 4th and was estimated at 125 tons.

Due to the low numbers of herring landed during 2004-05 season the commercial catch was not sampled. The mean size for herring caught with the Department's variable-mesh gill net this season is 179 mm (range 148-225 mm), well below the mean lengths from the 2002-03, 2001-02 and 2000-01 seasons of 188 mm, 184 mm, and 188 mm, respectively.

Commercial Pacific herring landings were down again this season with just over 0.6 tons landed. This is the third season in a row that landings have been far below the 23-year Humboldt Bay average of 37 tons. The quota of 60 tons for Humboldt Bay has only been reached once since the 1997-98 El Niño and herring landings since that event averaging only 15 tons per year. A long-time Humboldt Bay herring permittee attributed these low landings to a disproportionate amount of small herring entering the bay, which were unavailable to commercial 2 ¼-in. mesh nets. Landing data from the Department's research nets appear to support this observation as approximately 91 percent (by number) of the herring caught during the 2004-05 season were captured in meshes 2-in. or less. Two of the last three season's biomass estimates were far below average; however, the exploitation rate during this 3-year period remained below one percent. The average yearly biomass estimate from the last five spawn assessment surveys, since the 2000-2001 season,

is 389 tons. A 60-ton quota based on this average would result in a 15 percent exploitation rate, which is considered a conservative rate of harvest.

The Department of Fish and Game continued to work with University of California Sea Grant, Humboldt State University, and Humboldt Bay Harbor District to monitor eelgrass biomass in Humboldt Bay. Agencies completed a full year of sampling with 10 sample sites in both the north, central and the south regions of Humboldt Bay. Above-ground eelgrass biomass (fresh weight) for winter 2004-2005 had a mean of 0.61 kg/m^2 (range 0.17-1.58 kg/m^2), which is a 21 percent increase from the winter 2003-2004 mean of 0.48 kg/m^2 (range 0.29-0.97 kg/m^2). This data is 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 2004-05 season. No commercial fishing effort was reported in Crescent City during the 2004-05 season. The 30-year average of 22 tons is far below the 30-ton quota for this fishery. The Department does not plan to conduct spawning ground surveys or commercial fishery assessments in the Crescent City area for the 2005-06 season.

3.6 Areas of Controversy

Several areas of controversy are outlined in Section S.6 of this DSED. In particular, item numbers 7 through 11 are relevant for the 2005-06 season and have been of concern to the Department and the commercial herring industry for the past several seasons. An update to item number 2 is also provided in this section.

Item number 2, the importance of herring as a forage species for sea birds, marine mammals, and other fishes was addressed in Chapter 4 (Section 4.2.6.2) of the 1998 FED. A literature review on recent abstracts regarding predator/prey interactions with herring (Baraff and Loughlin 2000, Beamish et al. 2000, Bishop and Green 2001, Furness 1999, Haegele 1993, Hunt et al. 1999, Jauguet et al. 2004, Lance et al. 2002, Okey et al. 2004, Rooper and Haldorson 2000, and Sullivan and Butler 2002) indicates that are no new significant issues requiring additional mitigation measures relative to the proposed project since the 1998 FED. Some

fish, birds and mammals may be affected by industrial fisheries but most of these animals are long-lived and generalist feeders that would find other food sources when herring (eggs, larvae, juvenile, and adult) are not available. The most important factor cited was setting conservative exploitation rates that recognize the importance of herring as a prey species for numerous marine animals.

Item number 7, status of the herring population in San Francisco Bay, is discussed in detail in Section 3.3 of this DSED. The Department is concerned about potential negative impacts on the San Francisco Bay population following the 2004-05 El Niño that may affect the 2005-06 season, and believes that the continuance of a conservative management strategy and measures to rebuild the stock are needed.

Item number 8, the independent peer review sought by the Department and the alleged violation of the Marine Life Management Act (MLMA), refers to the controversy based on the belief by some herring industry members that the Department violated the MLMA when a peer review on biomass assessment methodologies and preliminary use of a stock assessment model was done. The Department did not violate MLMA because the herring fishery is not subject to that Act until a fisheries management plan (FMP) is developed.

As mentioned in Section 3.2.3 of this DSED, and discussed in the 2004 FSED (Section 3.2.1), the Department sought the independent peer review in 2003 to evaluate the use of the Coleraine stock assessment model as an assessment tool and the two survey methodologies used to estimate the Pacific herring spawning biomass in San Francisco Bay (Appendix B). The model had not been previously used by the Department to assess the status of Pacific herring. California Sea Grant administered the peer review and assembled a panel of scientists with demonstrated expertise in modeling and assessing pelagic fish populations.

MLMA was passed in 1998 and became law on January 1, 1999, and is contained in Fish and Game Code Sections 7060-7090. MLMA provided a greater delegation of authority and responsibility to the Fish and Game Commission and the Department of Fish and Game for marine fisheries. It also mandates "…priority of long-term benefits and sustainability over short-term benefits in our use of marine resources, an ecosystem perspective that includes more than fisheries, and a strong

emphasis on science-based management developed with the help of those most knowledgeable and concerned about the health of the ocean and our fisheries." (Webber and Heneman 2000). The primary goals of MLMA are to ensure the conservation, restoration, and sustainable use of California's marine living resources. To achieve this goal, MLMA requires that FMPs be developed for managing the State's fisheries. A more detailed description of FMPs is located in Section 1.3 of this DSED. Due to the large number and variety of marine fisheries in California, the time and effort needed to prepare an FMP, and the significant costs associated with FMPs, procedural guidelines and priorities were developed. MLMA is also a collaborative process and requires ongoing communication and participation from all those involved in developing an FMP, including sport and commercial fishermen, environmental and conservation groups, academic and scientific communities, and other interested parties (Department of Fish and Game DRAFT Master Plan 2001). Once an FMP is developed for a fishery, it is implemented through regulations adopted by the Fish and Game Commission. The Pacific herring fishery is among five California fisheries referenced in the MLMA section of the Fish and Game Code (Section 7059 (b)(2)) as a model to follow for "…[developing] a process for the involvement of interested parties and for factfinding and dispute resolution processes appropriate to each element in the marine life and fishery management process."

The Pacific herring fishery currently does not have an FMP. However, it does have a CEQA functional equivalent document (Section 1.2) which takes the place of an FMP until such time as one can be developed and implemented. The peer review that the Department sought on the Coleraine model and its survey methodologies does not fall under MLMA given this difference. When an FMP is completed for the Pacific herring fishery, it will be subject to all aspects of MLMA as well as CEQA, and will be functionally equivalent to an Environmental Impact Report (EIR).

The peer review that the Department received confirmed that the Coleraine model was appropriate to use as a preliminary assessment tool for herring until a more robust model can be developed. In addition, the peer review evaluated the

scientific methods used to assess the Pacific herring fishery in San Francisco Bay, and made recommendations on the appropriate use of the survey methods for future population assessments. In effect, the Department is adhering to one of the mandates of MLMA which is to base decisions on sound science and best available information.

Item number 9, the use of the spawn deposition survey alone for biomass estimation, is referring to the concern of industry members with the Department's decision to stop utilizing the hydroacoustic survey as a method for estimating biomass in San Francisco Bay, and rely solely on the spawn deposition survey.

Hydroacoustic assessment is an accepted methodology for detecting presence, determining distribution, estimating biomass, and observing behavior for a variety of fish species. It is used to assess some herring stocks around the world either solely or in conjunction with another method. For example, the North Sea Herring Assessment is conducted using hydroacoustic methods along with a catch-at-age model. The hydroacoustic information is used in the model, and the model results are used to set the biomass estimate of the stock. The Alaska Department of Fish and Game assesses the Prince William Sound and Kodiak stocks using hydroacoustic and aerial surveys but does not use hydroacoustic surveys to assess the Southeast, Northeast Bering Sea, Togiak, or Cook Inlet stocks. They do identify some potential problems with duplication of schools and incomplete surveys due to the nature of the behavior of the fish in certain areas. The Washington Department of Fish and Wildlife utilize both spawn deposition surveys and hydroacoustic surveys while the Canadian Department of Fisheries and Oceans rely only on spawn surveys for their assessments. It is clear that hydroacoustic surveys work for some herring fisheries and not for others. Differences unique to those fisheries (i.e., open ocean versus bays and inlets) would be one factor.

While the hydroacoustic method is used in a variety of herring fisheries, the Department has determined that the spawn deposition survey is more accurate and precise, less variable and more predictable for San Francisco Bay than the hydroacoustic survey. This determination is based on: 1) the Department's own comparative analysis of the spawn deposition survey (Section 3.2.1) and the

hydroacoustic survey (3.2.2) used to assess the herring population in San Francisco Bay as discussed in Section 3.2.3 of this DSED; and 2) the results of an independent peer review of our methodologies and use of a stock assessment model (Coleraine) as a possible assessment tool (Appendix B). In addition, spawn deposition surveys are used to assess the Tomales Bay and Humboldt Bay populations.

Item number 10, minimum mesh size reduction in San Francisco Bay from 2 1/8-in. to 2-in, refers to the ongoing controversy with the reduction of the minimum mesh size in San Francisco Bay from 2 1/8-in. to 2-in., and is discussed in Section 2.3.1.5 of this DESD. The mesh size reduction in San Francisco Bay involves the long term opinion held by some members of the commercial herring industry that a smaller mesh size would enable the fishery to catch the quota more efficiently without catching a large proportion of younger age fish (age 3 and younger). The older age classes (age 5 older) are either not well represented in the population or are absent altogether. The Department is concerned that a reduction in the minimum mesh size in San Francisco Bay would result in an increased take of 2- and 3-year-old fish. If the 2-in mesh should be adopted, the Department recommends that the harvest rate be lowered by lowering the quota for the 2005-06 season and that the use of the gear be monitored for a period of two to three years.

Item number 11, comparison of the Tomales Bay and the San Francisco Bay herring population age structure from 1993 through 2004, refers to the fact that the perceived need for a reduction in the minimum gill net mesh size from the existing minimum 2 ⅛-in. mesh by herring fishermen in San Francisco Bay has led to comparisons with Tomales Bay. Herring fishermen in Tomales are using smaller 2-in. mesh gill nets as part of a mesh-study. Fishermen have pointed out a number of similarities between the two bays, particularly the apparent similarities in age structure prior to adoption of the smaller 2-in. mesh in Tomales Bay in the 2000-01 season. However, there are differences between the two bays which is discussed in Section 3.6.1 of this DSED.

3.6.1 Comparison of Tomales and San Francisco Age Structure

The purpose of this comparison is to analyze the results from the recent completion of a backlog of aging needed for Tomales Bay herring samples to thoroughly examine the age composition of both the spawning biomass and commercial catch in Tomales Bay. Prior to reading the otoliths from herring samples in the commercial and research catch, lengths were being used to determine preliminary ages.

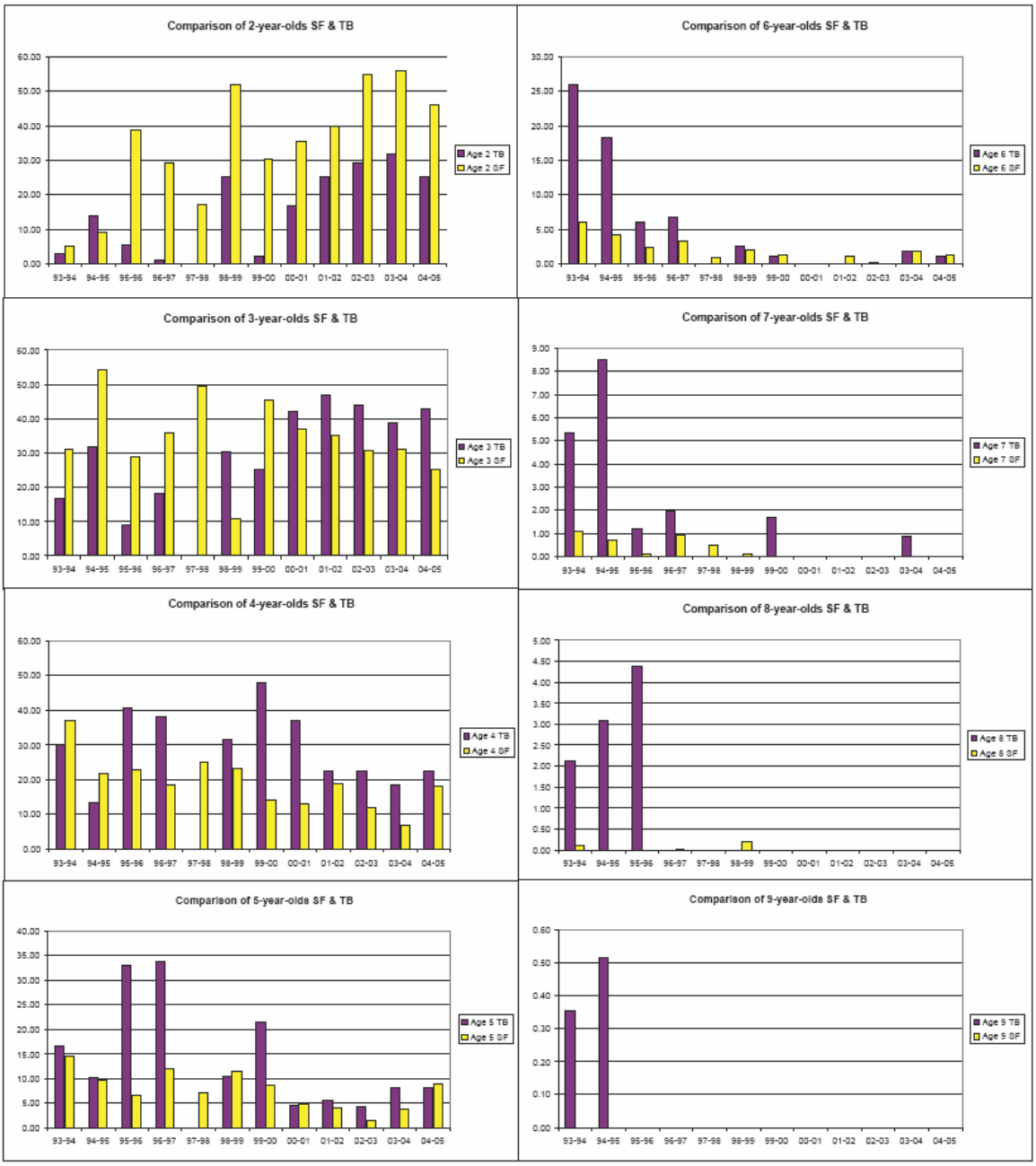
A more complete age data set exists for San Francisco Bay than for Tomales Bay. Prior to the 1992-93 spawning season, the Tomales Bay herring population was not sampled for age composition. Spawn sampling and commercial catch sampling was done by seasonal aids with supervision from a biologist from the Department's Monterey office. When the new full-time biologist in the Bodega Bay area took over management of the Tomales/Bodgea Bay herring fishery in 1992-93, sampling also began for age composition of the spawning population. However, age data from the commercial catch (i.e., samples taken from herring landings) does exist for Tomales Bay from 1972-73 to the present. Due to the lack of comparable catch and population age composition data for Tomales Bay prior to 1992-93, only age data from both research and commercial samples for the last 12 seasons were examined for both bays.

Significant differences exist between the two bays and this has had some effect on age data collection. The greatest differences are in the size and depth of these two bays and these two factors probably affect the behavior of pre-spawning herring the most. To adequately assess the age composition the herring biomass in each bay, all schools need to be sampled. The schools are larger and hold longer in the larger, deeper areas in San Francisco Bay and this makes research sampling easier than on the smaller schools in the smaller, shallower, Tomales Bay. Additionally, sampling of pre-spawning schools to needs to occur prior to commercial fishing since this greatly alters the age composition of the school. Given these factors, in Tomales Bay, in some seasons earlier schools were not adequately sampled and also sampling of some later schools was precluded by commercial fishing. What this means in regard to this comparison of the age composition of the Tomales Bay

spawning population, is that the numbers of larger, older herring which enter the bay in the earlier schools, may actually be slightly greater for some past seasons. Recognizing this fact, the Department has made a great effort since the 2002-03 season to adequately sample all schools throughout the spawning season in Tomales Bay.

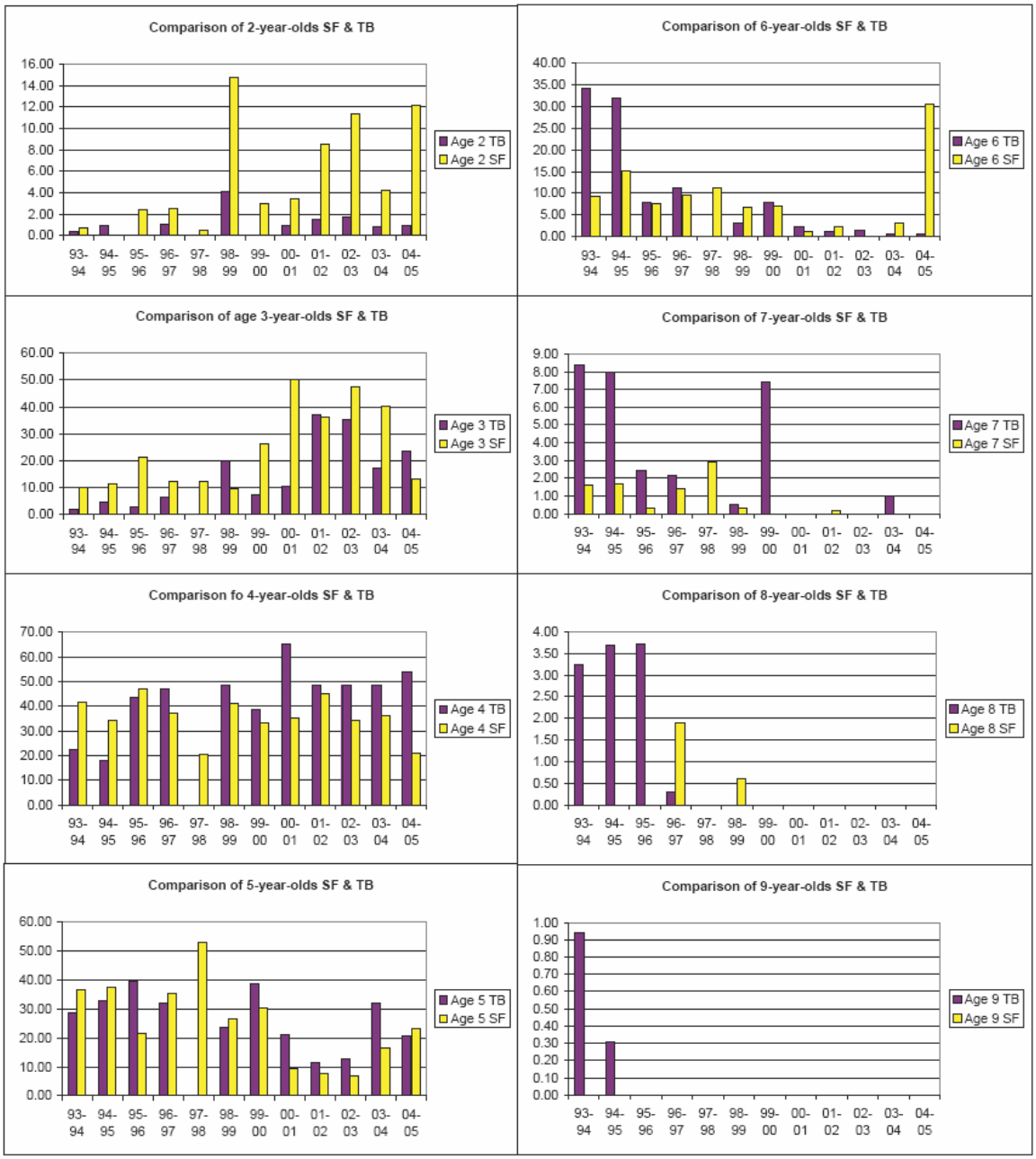
In recent years, Tomales Bay has been perceived as having a higher percentage of older herring than does San Francisco Bay. This was true in the early to mid 1990s when San Francisco Bay had higher percentages of 3-year-old herring while Tomales Bay had higher percentages of 4-year-old herring. The percentage of older herring changes with the three consecutive seasons starting in 2001-02 when Tomales Bay had slightly more 3-year-olds than San Francisco Bay and more 4-year-olds (Figure 3.4). This change is the result of a lack of 6-year and older fish and an increased proportion of 2-year-old fish in Tomales Bay.

Figure 3.4. Percent spawning biomass contribution for age 2 through 9 herring for San Francisco Bay and Tomales Bay for 1993-94 through 2004-05. There was no sampling for age composition in Tomales Bay in 1997-98, data were unavailable for comparison in those years.



It appears that the decline in abundance of larger, older fish is a problem for both Tomales Bay and San Francisco Bay from the mid-1990s through the present. This has occurred in Tomales Bay despite the low exploitation rate of the population in recent years (Figure 3.5).

Figure 3.5 Percent commercial gillnet catch contribution for age 2 through 9 herring for San Francisco Bay and Tomales Bay for 1993-94 through 2004-05. There was no sampling for age composition in Tomales Bay in 1997-98, data were unavailable for comparison in those years.

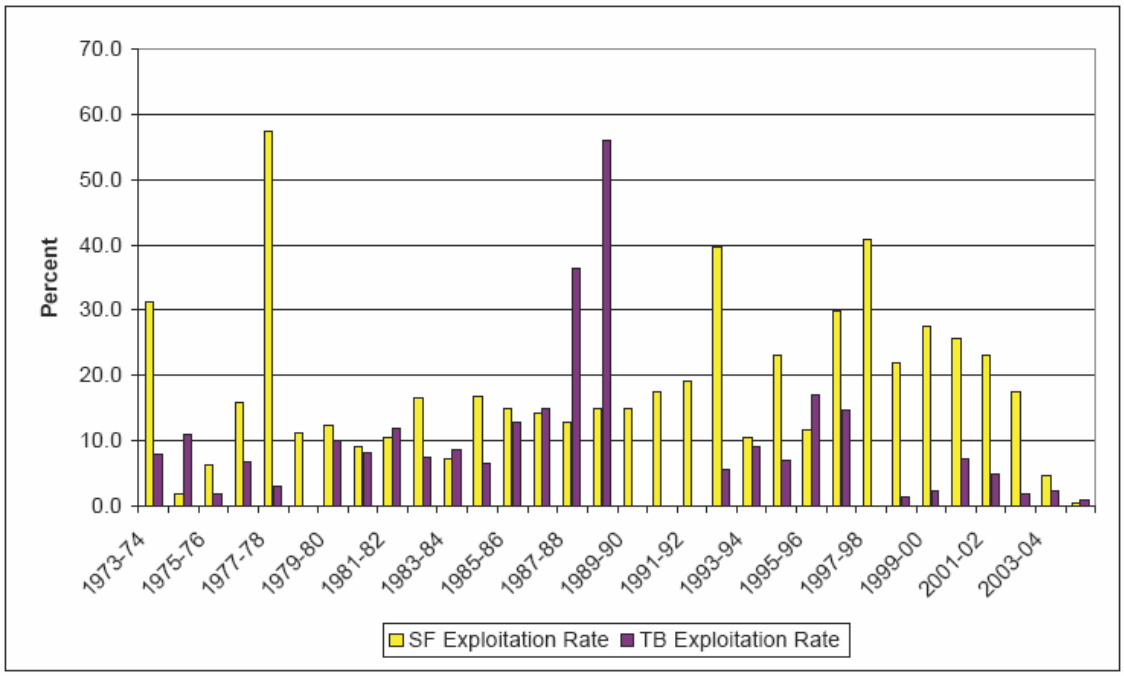


In addition to environmental effects associated with El Niño events (discussed in Section 3.3 and 3.4), one explanation could be that the two bays share the same fish to some unknown extent. This concept, however, has been examined by a number of techniques since the early 1980s. Spratt (1981) for example, noted that the growth rate of Tomales Bay herring was significantly different than that of San

Francisco Bay herring and that this may be evidence that the herring populations in the two bays are distinct. Reilly and Moore (1986) analyzed morphometric (i.e., measurement of body parts expressed as a ratio to standard length or some other measurement that is easily made) and meristic (count of body parts such as fin rays, vertebrate, spines, etc.) characteristics of California herring from Fort Bragg Harbor and San Francisco, Tomales, and Humboldt Bays, in an attempt to detect differences in herring from these locations. Analysis indicated that the northern populations (Humboldt Bay and Fort Bragg) could be separated from the southern populations (Tomales and San Francisco Bays) with an 85-87 percent success rate, but morphometric differences were not great enough to separate herring from Tomales and San Francisco Bays. Moser (1992) used parasites as biological tags in his study of juvenile herring off central California. His results suggested that Tomales and San Francisco Bay herring are separate spawning stocks and generally remain separate while at sea.

Beacham et al. (2002) used microsatellite variation to determine population structure of herring in British Columbia, with comparisons to California. The study determined a lack of genetic difference among herring stocks in British Columbia that was most likely caused by the high rate of straying between areas. For locations where genetically distinct populations occur, differences in timing of spawning are the main isolating mechanisms. Additionally, geographic isolation of the spawning population may also have some effect in maintaining genetic distinctiveness of the spawning population. The study found that herring spawning in California are distinct from those spawning in British Columbia.

Figure 3.6 Exploitation rates for Tomales and San Francisco Bays, 1974-75 through 2004-05.



The loss of older fish in a population may indicate an increase in mortality rates for those older age classes. This will happen whether the increased mortality arises from fishing or from natural causes. The low exploitation rates (i.e., small catches in relation to the spawning biomass) in Tomales Bay would indicate that the lack of older fish is not the result of fishing mortality (Figure 3.6). It is unlikely that the 2-in. minimum mesh size now allowed in Tomales Bay is solely responsible for these changes with an average exploitation rate over the last seven years of less than 5 percent.

Recently, the commercial catch of herring in Tomales Bay has consisted of fish from ages 3 to 7 years. Since the 2001-02 season, the catch of fish age 6 and older has been quite small, averaging 1.2 percent, by weight (2.2 tons), of the average 186-ton commercial catch for this period. For this same period, the Tomales Bay biomass averaged 6,859 tons, with age 6 and older fish comprising 69 tons of the total biomass. This represents an average 3.2 percent exploitation rate for fish 6 years and older and clearly can not account for the decline observed for

age 6 and older herring in Tomales Bay.

In San Francisco Bay, the decline in abundance of older fish may have been the result of high exploitation rates. From the 1992-93 season through the 2002-03 season, exploitation rates may have been over 20 percent in all but two seasons and near or above 40 percent in 1992-92 and 1997-98, when comparing landings with the more conservative spawn survey biomass estimates (refer to Section 3.2.3) (Figure 3.6). Exploitation rates at these levels could be a factor in a decline in the mean age of the San Francisco Bay herring population. If Tomales Bay and San Francisco Bay both share the same fish, then this would help explain the similar decline in the Tomales Bay age composition.

Recently, several fish diseases have been implicated as major constraints in limiting age structure and survival of Pacific herring populations in Washington State. Hersberger et al. (2003) identified *Icthyophonus hoferi* and viral hemorrhagic septicemia virus (VHSV) as endemic pathogens in the Puget Sound herring metapopulation. Icthyophonus is age dependent, increasing in incidence as the fish grows older. VHS is maintained in low prevalence, primarily in young herring. Laboratory studies indicate that nominal stressors to wild herring, such as high seawater temperatures associated with El Niño events, can elicit overt diseases. VHS has been found in Southern California stocks of Pacific sardines, a clupeoid fish like Pacific herring (Cox and Hedrick, 2001). Pacific herring from San Francisco Bay were tested for VHS in the early 1990s and the virus was not found (William Cox, California Department of Fish and Game, personal communication).

A comparison of the age structure of commercial landings in Tomales Bay and San Francisco Bay (Figure 3.5) showed age composition trends that are similar to the population age structures (Figure 3.4). The concept that the Tomales Bay fishery caught older fish was true in the 1990s but showed a similar trend to San Francisco Bay in the lack of older fish in the 2000s. In general, the populations in both bays have similar age composition and are exhibiting similar trends in abundance for most year classes.

3.6.2 Potential Impacts of Herring Fishery Regulation Changes to Salmonids

There are several listed species of salmon and steelhead present in San Francisco Bay that may be impacted by the proposed herring fishery regulation change to reduce the minimum gill net mesh size from 2 ⅛-in. to 2-in. Sacramento River winter-run Chinook salmon is listed as endangered under both the California Endangered Species Act (CESA) and the Federal Endangered Species Act (FESA), Central Valley spring-run Chinook salmon is listed as threatened under both acts, and the Central Coast California and Central Valley steelhead Evolutionarily Significant Units (ESUs) are listed as threatened by FESA. Pursuant to both endangered species acts, "take" includes any action that would kill or harm the fish, including capture, injury from passing through a gill net, changes in feeding or migration behavior due to fishing activities, and attraction of predators.

Although Sacramento River winter-run Chinook salmon smolts occur in Central San Francisco Bay during the late November to mid-March herring fishing season, increased take due to the proposed regulation change will probably be insignificant. The peak timing of winter-run smolt emigration (out-migration) past Chipps Island near Pittsburg (Contra Costa County) typically occurs in March. Therefore the majority of winter-run Chinook salmon juveniles are well upstream of the Bay during most of the herring fishing season. Also, most emigrating smolts remain in the main channels and move through the Bay relatively quickly and are therefore not likely to occur in the nearshore areas of Central Bay where gill nets are often set.

In 25 years of sampling, the California Department of Fish and Game's San Francisco Bay Study (Bay Study) collected winter-run smolts ranging from 52- to 218 mm [mean=129 mm FL (Fork Length), n=73] during the herring fishing season, with only 1 fish >200 mm FL. Due to their size, winter-run smolts are not likely to be captured by a 2-in. mesh gill net, but if the smolts encounter the nets, there is a small potential for increased take due to injury by passing through the gill net mesh. It has been well documented that juvenile Chinook salmon are very good swimmers and can avoid nets, even actively employed gear designed to sample them. Take due to disruption of migration and feeding patterns by fishing activity and the

increased predation risk associated with the concentration of predators near fishing locations is also possible, but not likely to increase with 2-in. mesh.

Impacts to Central Valley spring-run Chinook salmon smolts by the proposed regulation change would also likely be insignificant. Since peak emigration of spring-run salmon smolts probably occurs in April, most juveniles are upstream of the Bay during the herring fishing season. Also, most emigrating spring-run smolts are too small to be captured by the gill nets; the Bay Study collected spring-run Chinook salmon ranging from 46- to 82 mm FL (mean=68 mm FL, n=15) during the herring fishing season. However, if the smolts encounter the nets, there is a small potential for increased take due to injury by passing through the gill net mesh. The potential for take due to disruption of migration and feeding patterns and the increased predation risk associated with fishing activities will probably not increase with the proposed 2-in. mesh.

Steelhead from both the Central Coast California and Central Valley ESUs occur in San Francisco Bay during the herring fishing season and the 2-in. mesh gill nets will likely result in take. Juvenile steelhead live in freshwater for 1 to 4 years, but most Central Valley and Central Coast steelhead emigrate after 2 years in freshwater, with peak emigration between January and May (Barnhart 1986, McEwan 2001). The Bay Study collected steelhead ranging from 112- to 277 mm FL (mean=213 mm FL, n=36) during the herring fishing season, which is consistent with the size range of smolting steelhead (Katie Perry, California Department of Fish and Game, personal communication). Because of their size, emigrating steelhead could be captured or injured by the herring gill nets and the number of steelhead taken will likely increase with a mesh change from 2 ⅛-in. to 2-in.

While there is little data to support the take of steelhead by the herring fishery, these fish are the most vulnerable salmonid species due to their life history while in the bay. It is the Department's opinion that there is the potential for a relatively small number Central Valley ESU steelhead to be taken by the herring fishery although most of these fish remain in the main channels during emigration and move through the Bay relatively quickly. However, gill nets set near the mouth of steelhead-producing streams in South and Central bays have a much higher

likelihood of taking Central Coast California steelhead due to the orientation of the nets, which is parallel to shore. Steelhead occurs in several streams near herring fishing areas, such as Corte Madera Creek in Central Bay. National Marine Fisheries Service has prepared draft Critical Habitat maps for the Bay Bridges and South Bay hydrologic units (http://swr.nmfs.noaa.gov/salmon/maps.htm) that can be used to identify steelhead-producing streams.

Although the proposed 2-in. mesh gill nets could potentially result in an increased take of steelhead, the number of fish taken will depend on fishing practices. Central Coast California steelhead are probably most vulnerable to capture and injury by gill nets set near their natal streams, but take could be lessened by designating no-fishing zones near these streams. There also is a potential for take of steelhead due to disruption of migration and feeding patterns and an increased predation risk associated with fishing activities, but, as for Chinook salmon smolts, this will not likely increase with proposed 2-in. mesh.

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 and the option of reducing the minimum mesh size to 2-in. in the San Francisco Bay fishery is discussed in Section 2.3.1.5 of this DSED.

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.

Errors in stock assessments were identified as an area of controversy and addressed in within Chapter 3 of the FED. As presented in Section 3.2.3 in this FSED, and in Section 3.2.1 of the 2004 FSED, the Department requested that the peer review include an assessment of the methodology used in formulating the annual season spawning biomass and resulting harvest level for the San Francisco Bay fishery. The reviewers concluded that a potential for overestimating the population existed when the higher of the two estimates was assigned on a spawning wave by spawning wave basis and recommended that the Department use the spawning escapement surveys to base harvest levels. The Department followed the recommendation of the peer review panel consistent with its adaptive management strategy. The proposed quota for the 2005-06 San Francisco Bay fisheries is based solely on the results of the spawn escapement survey.

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. Potential impacts as a result of the possible reduction in the minimum mesh size in San Francisco Bay, were identified and discussed in Section 2.3.1.5 of this FSED. No other 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 2004, were for the 2004-05 Pacific herring commercial fishing season. These regulations reflect the amendments as adopted by the Commission in August 2004. Under alternative 2, the only changes to the 2005-06 regulations would be to revise the herring fishing seasons, by location, and adjust quotas to reflect the 2004-05 biomass estimates determined by the Department. In most regards, the environmental impacts of alternative 2 will be similar to those of the proposed project. However, alternative 2 does not address problems or conditions that are addressed by the proposed project. Some of the changes and amendments in the proposed project address gear measurement, weekend fishing in Tomales Bay, the reduction of minimum mesh size in San Francisco Bay to 2-in., changes in the permitting process, eligibility for a permit, reduction of the transfer fee, 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 are in contact with other agencies, professional biologists and researchers involved in herring management on a regular basis. The Department's Bay Delta Branch was consulted on the potential impacts to endangered and threatened salmonids should the minimum mesh size in San Francisco Bay be reduced to 2-in. (Section 3.6.2 of this FSED). 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 2005-06 season with the Director's Herring Advisory Committee (DHAC) on April 5, 2005.

Proposed changes to the regulations for the 2005-06 were modified, as necessary, based on comments from the DHAC, and those received at the public meetings on April 12, 2005. The public meetings also served as a scoping session for the content of the Draft Supplemental Environmental Document (DSED). These recommendations were presented to the Fish and Game Commission at their August 19, 2005 meeting, and will be potentially adopted at their September 30, 2005 meeting.

Prior to preparation of the DSED, the Department initiated a broader consultation by distributing an NOP that announced the intent to prepare the document dated March 21, 2005. 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 22, 2005, 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 19, 2005 meeting in San Luis Obispo.

7.1 Summary of Comments Received

Written comments regarding the DSED were received by the Commission office from Lawanna Chapman, K-C Fish Co. Inc., Blaine, Washington on August 17, 2005, from Sam Liberati of Concord, California on August 19, 2005, from Matt Ryan and Kevin Marilley of Bellingham, Washington on August 22, 2005, and by the Department's Marine Region office in Belmont, from Doug Karlberg of Bellingham, Washington on August 19, 2005.

7.2 Department Responses to Comments

Lawanna Chapman Letter dated August 17, 2005

Comment 1

This comment is in support of quota Option 2 for the San Francisco Bay 2005-06 roe herring fishery which would provide for a 4,502 ton quota if the minimum mesh size is changed to 2-inches. Comment noted.

Comment 2

This comment is in support of all regulatory amendments proposed for the Tomales Bay roe herring fishery. Comment noted.

Comment 3

This comment is in support of the proposed reduction of permit transfer fees from $5000 to $1000 per permit transfer. Comment noted.

Doug Karlberg Letter dated August 15, 2005

Comment 1

This comment refers to the April 5, 2005 DHAC meeting described in Section 2.3 of the DSED and this FSED. As described the DHAC is comprised of industry members who are appointed and serve at the pleasure of the Director. The proposals referred to by Mr. Karlberg were submitted by a DHAC member to the DHAC for consideration at the April 5, 2005 meeting. The submitted proposals were received via e-mail on April 4, 2005 and added to the DHAC meeting agenda. Given the length of the agenda for the April meeting and given the timeframe for the meeting, DHAC members, not Department staff, prioritized what was to be covered at that meeting. Copies of the proposals were provided to each of the DHAC members at the meeting but they were not discussed. The proposals were not considered as proposals for regulatory change at this time, and therefore were not addressed through the regulatory process.

Comment 2

Please refer to the Department's response to Comment 1.

Comment 3

This comment refers to the independent herring stock assessment and survey method peer review that was conducted by California Sea Grant in the summer of 2003 and is described in Section 3.2.3 of the DSED. The peer review findings can be found in Appendix B of the DSED and of this FSED. The Department considers the peer review process to be rigorous and the findings valid. The Department agrees that the findings that the herring population has been reduced to 20 percent of the unfished level are cause for concern. The Department does not agree that this is proof of failure of fisheries management. Fisheries management is not an exact science. The ability of the Department to recognize that the conflicting data available reflected a possibly depressed population, and the subsequent consultation with other Department biologists, biologists from outside agencies and institutions, and the request for an independent peer review of the data, are all signs of proactive, adaptive management of a population that was showing signs of decline.

Comment 4

This comment refers to the age composition of the herring population, and the continuing lack of older fish in the population since the peer review was completed in August of 2003. See Section 3.3 and Table 2.5 of this FSED for more information on the status of the San Francisco Bay population. The Department has provided the Commission options of fishery closure and/or conservative harvest percentages, at or less than ten percent, since the peer review. The Department has also utilized the spawn survey biomass estimate as the primary basis for setting the fishery quota, per the peer review recommendations. However, despite any conservative measures, two years may not be enough time to realize any efforts made to rebuild the population.

Comment 5

This comment refers to the causes of overfishing. The Department concurs; the setting of quotas at too high a level will lead to diminished fish stocks. Please refer to Section 3.2.3 of this FSED for further explanation.

Comment 6

This comment refers to the proposed fishing quota, Option 1, in San Francisco Bay as outlined in Section 2.3.1.1. Proposed fishing quotas are based on a harvest percentage of the biomass estimate of the preceding season. The Department has typically recommended a harvest percentage of 10 to 15 percent. The proposed quota of 5,890 tons represents approximately 10 percent of the 58,934-tons biomass estimate and is at the conservative end of the above range. Please see Appendix 3 of the FED (www.dfg.ca.gov/mrd/herring/ceqa) for more information on the harvest percentage range.

Comment 7

This comment refers to the amount of money that the Department spends on the herring research and management project. The Department is in the process of reviewing ways to reduce the amount of money and time spent on this fishery as a result of a loss of biological staff and the status of the state budget

Comment 8

This comment refers to the use of mathematical models and their use in fisheries management. The Department does not currently utilize a model, per se, to set the quota. The quota is simply based on a harvest percentage of the biomass estimate. Please see

Section 2.3.1.1 of this FSED and Appendix 3 of the FED (www.dfg.ca.gov/mrd/herring/ceqa).

Comment 9

This comment refers to the accuracy of field data collected as part of the herring spawn survey in San Francisco Bay. The spawn surveys conducted by the Department are based on data collected in the field not on theory. Collection of data for the San Francisco Bay spawn survey has been completed by Department biologists who have, collectively, over 25 years experience in the collection of herring spawn deposition data. In addition, the stock assessment and review of survey methodology peer review panel included a biologist from Canada with considerable expertise in herring spawn deposition data collection. The Canadian biologist has worked with Department herring biologists and is aware of their expertise and knowledge. Coordination with other herring biologists on the west coast has been a practice of the Department for many years

Comment 10

This comment recommends that biological measuring devices by placed directly on fishing vessels and used as a method for bioacoustic survey. The Department appreciates this recommendation and will forward it to the DHAC and to the Commission for consideration.

Comment 11

This comment refers to the data collection format and the accessibility of data. The Department has developed a standardized format for collecting and analyzing spawn deposition data. It is not the Department's policy to publish raw data, and many other state and federal agencies share the same policy. However, this data is available for review in the Department's Marine Region office in Belmont. In addition, the three biologists on the Peer Review panel (Appendix B of this FSED) did provide an independent review of the Department's data collection, and management strategies.

Comment 12

This comment refers to the review and auditing of data. The Department welcomes further opportunity for peer review of data.

Comment 13

This comment refers to the benefits of cooperative fisheries management. The Department agrees that the best fisheries management is realized when scientific and field knowledge of fishermen is combined to provide for the best management of the resource. The Department also acknowledges that its responsibility in managing the herring resource includes managing for conservation as well as consumption.

Comment 14

This comment is a recommendation of a 3,000-ton quota. Comment noted.

Sam Liberati Letter dated August 10, 2005

Comment 1

This comment is a request that the Commission add three proposals to the August 19, 2005 Commission meeting agenda in San Luis Obispo. The proposals, (1) allow an individual to own a single permit for each of the different herring gillnet platoons in San Francisco Bay, (2) eliminate the point system for qualifying for a herring permit, and (3) allow a herring permit to be passed from a parent to child, or between husband and wife, were added to the agenda and the Commission requested that staff prepare a public notice to add these proposals to regulatory amendments for Section 163.1, Title 14, CCR to consider for adoption at the November 4, 2005 Commission meeting.

Matt Ryan and Kevin Marilley Letter received August 22, 2005

Comment 1

This comment refers to the Section 3.6 of the DSED which itemizes identified areas of controversy, specifically item number 8, and specifically refers to the Department's Marine Region Belmont office response. It should be noted that this response was drafted in consultation with the Department's legal counsel, as was the response in the DSED, and is the opinion of the Department, not solely the Belmont office herring staff.

Comment 2

The Department agrees that the Fish and Game Commission has held the management authority for all herring fisheries in the state since 1976.

Comment 3

This comment refers to the assertion that herring management continues to ignore the Fish and Game Code pertaining to the MLMA. This comment also presumes that MLMA applies to the Peer Review referred to in Section 3.2.3. .As stated in the DSED and this FSED, herring does fall under MLMA when a FMP is developed. At that time, the MLMA will direct the FMP development. It should be noted however, that the MLMA does not specify that constituent involvement be mandated during an independent peer review of the FMP. Please review Section 3.6 of the DSED and this FSED along with Section 7062 of the Fish and Game Code.

7.3 Copy of Letters Received

K-C FISH CO. INC.
F.K.A. SEA K FISH CO. INC.
P.O. BOX 2040
BLAINE, WA. 98231-2040

PHONE 360-332-5121 *FAX 360-332-8785*

MARTIN KULJIS, PRESIDENT
GEORGE COSTELLO, V-PRESIDENT
STEVE KULJIS, SECRETARY

BILL EWING, SALES
MIKE ORDAL, PRODUCTION
LAWANA CHAPMAN, G.M.

AUGUST 17, 2005

STATE OF CALIFORNIA
FISH AND GAME COMMISSION
C/O ROBERT R. TREANOR, EXECUTIVE DIRECTOR
1416 NINTH STREET
BOX 944209
SACRAMENTO, CALIFORNIA 94244-2090

VIA FAX: 916-653-5040

RE: PROPOSED CHANGES IN COMMERCIAL HERRING FISHERY:

DEAR COMMISSIONERS:

WE ARE WRITING IN SUPPORT OF SAN FRANCISCO BAY HERRING FISHERY OPTION 2 AS PROPOSED IN THE FISH AND GAME NOTICE OF PROPOSED CHANGES IN REGULATIONS SECTIONS 163 AND 164 RELATING TO THE COMMERCIAL HERRING SEASON FOR 2005/2006. WE ALSO SUPPORT THE REGULATORY AMENDMENTS AS RELATING TO THE TOMALES BAY FISHERY. 1 2

REDUCING THE MESH SIZE IN SAN FRANCISCO BAY TO 2 INCHES WILL ALLOW THE FISHERS TO CATCH THE QUOTA IN A SHORTER TIME PERIOD, THUS REDUCING THE STRESS ON THE HERRING BIOMASS AND ON OTHER MARINE LIFE IN THE BAY. IT WILL ENHANCE THE ECONOMIC EFFECTS OF THE FISHERY BY INCREASING THE PERCENTAGE OF CATCHABLE BIOMASS. THIS CHANGE WILL ENCOURAGE PERMIT HOLDERS TO RENEW PERMITS AND PARTICIPATE IN THE FISHERY, MAINTAINING THE REVENUE TO FISH AND GAME PROVIDED BY THOSE FEES. WITHOUT THIS CHANGE, SOME PERMIT HOLDERS ARE ANTICIPATING NON-RENEWAL BECAUSE OF FINANCIAL HARDSHIP. CURRENTLY, CALIFORNIA RESIDENT PERMIT HOLDERS PAY A COMMERCIAL LICENSE RENEWAL FEE OF $95, A PERMIT FEE OF $265, AND AN ASSESSMENT OF $100, PLUS THE BOAT REGISTRATION RENEWAL EACH YEAR. NON-RESIDENTS PAY A COMMERCIAL LICENSE FEE OF $285, A PERMIT FEE OF $1,000, AN ASSESSMENT OF $100, PLUS A BOAT REGISTRATION RENEWAL OF $750. IF THE PERMIT IS HELD IN PARTNERSHIP, THE COMMERCIAL LICENSE FEE IS DOUBLED.

WE CONCUR WITH THE PROPOSAL TO ALLOW WEEKEND FISHING IN TOMALES BAY. IN RECENT YEARS, CONSISTENT WEEKEND SPAWNING HAS PREVENTED OPTIMUM HARVEST OF HERRING IN TOMALES, SINCE THE FISHERS HAVE HAD TO STOP FISHING ON FRIDAY.

FOR QUALITY SEAFOOD, HOOK UP WITH OUR LINE

Lawana Chapman letter, page 1 of 2

WEEKEND HERRING FISHING SHOULD HAVE NO ADVERSE AFFECTS FOR PLEASURE BOATERS IN THAT AREA, AND WILL GREATLY INCREASE THE ECONOMIC BENEFITS OF THE TOMALES FISHERY.

A DECEMBER 11 OPENING IN SAN FRANCISCO BAY FOR THE DH FISHERMEN, WITH A CLOSURE ON DECEMBER 23, AND A RE-OPENING ON DECEMBER 26 THROUGH THE 30TH WILL COINCIDE THE DECEMBER FISHERIES WITH SPAWNING TIMES IN RECENT YEARS ACCORDING TO FISH AND GAME DATA.

WE FULLY SUPPORT THE PROPOSED CHANGE IN PERMIT TRANSFER FEES AS OUTLINED IN SECTION 163.1. THE TRANSFER FEE OF $5,000 IS INEQUITABLE GIVEN THE CURRENT LOW VALUE OF PERMITS. BECAUSE OF THE RECENT INCREASE IN COMMERCIAL FISHING LICENSE AND COMMERCIAL BOATS REGISTRATION FEES, AND THE INABILITY TO ATTRACT NEW FISHERS BECAUSE OF THE TRANSFER FEE, MANY PERMIT HOLDERS ARE FACING NON-RENEWAL AND LOSS OF THEIR PERMITS. ONE CAN BALANCE THE LOSS OF REVENUE FROM A DECREASE IN TRANSFER FEES TO $1,000 WITH THE PROSPECT OF LOST PERMIT RENEWAL FEES. 3

WE FEEL THAT CALIFORNIA FISH AND GAME HAS DONE AN EXCELLENT JOB IN ADDRESSING ECOLOGICAL, ECONOMIC, AND MANAGEMENT CONCERNS IN THEIR PROPOSAL NUMBER TWO UNDER SECTIONS 163 AND 164, AND THE PROPOSAL FOR PERMIT TRANSFER FEE REDUCTION UNER SECTION 163.1.

SINCERELY,

Lawana Chapman

LAWANA CHAPMAN FOR MARTIN KULJIS
SIGNED IN HIS ABSENCE TO PREVENT DELAY

Lawana Chapman letter, page 2 of 2

15-Aug-05

Doug Karlberg
PO Box 4397
Bellingham, WA 98227

California Fish and Game Commission

Re: Public comments and proposal suggestions for the San Francisco Herring Fishery

Dear Commissioners,

Unfortunately I am not able to attend this Commission meeting, but I would appreciate you reading my comments. I first introduced these comments and proposals to the DHAC meeting in April. Unfortunately the DHAC Committee failed to take any action on my proposals, even though Becky Ota assured me that they would. The DHAC Committees failure has caused me to bring these comments and proposals directly to directly to the Commission. comment 1

I believe that the department staff did not like my proposals because some of them are critical of the Department, and so the proposals and their constructive criticism has effectively been eliminated from your purview. comment 2

Let my encapsulate the important criticism. First I have lost all confidence in the Herring Staff to manage this fishery biologically. I firmly believe that the problem with the San Francisco herring fishery is not the fishermen, but the herring staff. An incompetent biological staff can and will cause major problems in any fishery.

The department under went a hastily put together "peer" review. The department touts this review as to why you as commissioners should trust their opinions. Unfortunately the peer review noted that the herring stock in San Francisco has been diminished to less than 20% of the historical size. This is absolute proof of failure. Good management simply would not produce this result. Additionally the peer review noted that older age herring had been eliminated from the herring stocks and recommended rebuilding. comment 3

Two years have passed since this peer review and the department has not made any substantial progress towards increasing the older age class herring. comment 4

Commissions such as yours depend on the competence of the scientific departments recommendations. The popular view is that over fishing causes diminished fish stocks. This is absolutely not true today. Fishermen only harvest what the government allows. The government setting too high quotas is what causes diminished fish stocks today. comment 5

The California Department of Fish and Game herring staff have been charged with rebuilding the herring stocks. Specifically rebuilding the older age classes of herring. Last year the Department recommended a conservative harvest quota of 3500 tons, of which only 200 was actually catch-able. So their cure to this scientific error last year is to recommend a almost 6,000 ton quota this year. This is ludicrous. comment 6

Doug Karlberg letter, page 1 of 4

The herring staff is incompetent. Worse, I can find no fishery management team which spends more money to manage a fishery of this size. The herring team as an organization seems to be more interested in their organization, than the resource. | comment 7

If this fishery fails to increase, the blame can be squarely placed upon the shoulders of the paid experts, and unfortunately upon you shoulders for trusting them.

The Department has placed in front of you a perfect 150 page document that is designed to provide a basis for your trust not being misplaced. The sad fact is that in all fishery management, it is not office work that effectively manages a fishery. All fishery management pivots upon the fishery data that is collected in the field. If the field data is of poor quality, not amount of paper and fancy mathematical models will ever fix the management.

Copious fisheries have declined into total crisis following the newest "model". Mathematical models are utilized today, but their failures are not publicized with the same zeal as their intial rollout.

Currently the Department uses a mathematical model that is only used in one other fishery in the world. The other fishery is not even a herring fishery. | comment 8

Here are my suggestions for improving the San Francisco fishery. Hire a biologist that has a demonstrated competence in accurately measuring spawn deposition of herring. Not in theory, but actually in the field. If you are not able to hire such a person, then this spawn deposition should at least be field audited by an audit team from Canada, so that you can trust the departments work. | comment 9

I view the departments biologists as the only experts sitting at the table when quota decisions are made. This is risky. I view these biological decisions more like choosing a heart surgeon, rather than an auto mechanic. I want to know what a surgeons real life experience is, and what his mortality rate is.

A spawn deposition surveys should be checked against a bioacoustics survey, but not the acoustical method the department is now utilizing. Fisheries management has long eclipsed the method currently utilized. Biological measuring devices should be placed directly upon fishing vessels. Simply put this method is cheaper and the results are more accurate. | comment 10

All biological data should be developed in a format that is standardized so that other biologists that manage herring can provide an independent review easily and annually until the Department has a history of successfully rebuilding both the size of the resource and the older age classes of herring. Today the department does not have a history of this performance. Biological data should be published in its raw form immediately. Sitting on raw biological data can entice managers to massage the data once they get a sense of the political winds. This is horrible and fraudulent science. | comment 11

Last, when a herring population is clearly at a low level. Doubl : checking and auditing the quality of the data and opinions from you Department staff needs to be a priority. The risk to the resource demands that even the department is not ab ve scrutiny. comment 12

Modern fisheries management is now discovering the importar ce to the resource of joint work between government agencies and the fishermen. The ac omplishments in this area are substantial. When the fishing industry does not have confic ence in the government's managers this cooperation becomes impossible. When the Dep artment becomes entrenched and defensive this is a sure sign that the managers : re not open to this type of cooperation. The real field knowledge of fishermen coupled w th the scientific knowledge of managers is an unbeatable combo, both on a cos basis and a scientific basis. It needs real cooperation and careful management of the conflicts of interest obvious in the harvesting sector, but the results are pretty ama ing when current government "experts" realize that the resource benefits from k nowledge, even if it is not their own. comment 13

I would recommend a quota level of 3,000 tons, not the aggre: sive 5,800 ton quota. My opinion is not necessarily the correct opinion, but if I am wror g, the result will be a larger quota next year. If the Department is wrong (like last year), th : consequences to the fishery may be catastrophic. When a fisherman recommends a smaller quota, this is not conflict of interest, although some of my peers may take me o f their Christmas card list. comment 14

Thank's for your time reading this material.

Warmest regards,

Doug Karlberg

Doug Karlberg

Doug Karlberg letter, page 3 of 4

BRITISH COLUMBIA ANNUAL COST OF MANAGEMENT OF ROE HERRING FISHERIES

Management Area	Fishery Officer Costs		On Grounds Managers Costs		Vessels Used for Fishery Management and spawn surveys		Science salary costs	
		DFO funded		Industry funded	DFO Funded	Industry Funded	DFO funded	Industry funded
West Coast Vancouver Island	Overtime, Salary, Travel, etc	$21,000	Overtime, Salary	$10,000		$279,600		
SE of Georgia	Overtime, Salary, Travel, etc	$17,000	Overtime, Salary, Travel, etc	$17,500		$495,600		
Central Coast	Overtime, Salary, Travel, etc	$43,000	Overtime, Salary, Travel, etc	$10,000		$273,600		
North Coast	Estimated	$10,000	Overtime, Salary, Travel, etc	$10,000	$63,000	$201,600		
Fraser River	Estimated	$10,000						$215,000
Science work applies to all areas								
TOTALS		$101,000		$47,500	$63,000	$1,250,400		$215,000

COMPARISON COST BRITISH COLUMBIA VERSUS SAN FRANCISCO HERRING

		Tons Herring Harvested	Costs per ton Management	Percentage difference Canada vs. California
		30,000		
		3,000		
British Columbia				
Totals	$1,762,900 CDN	$1,427,949.00 USD	$47.60	
Enforcement	$101,000 CDN	$81,810.00	$2.73	
			3000	
California DFG total		$ 650,000	$ 216.67	455%
		$ 350,000	$ 116.67	4278%

Doug Karlberg letter, page 4 of 4

August 10, 2005

Mr. Robert Treanor:
Executive Director
California Fish and Game Commission

Would you please add to the agenda for the California Gill Net Herring Fishery, the following three proposals.

comment 1

1-Allow an individual to own a single permit for each of the different Herring gillnet Platoons in San Francisco Bay.

2-Eliminate the Point System for Qualifying for a Herring Permit.

3-Allow a Herring Permit to be passed from a parent to child, or between husband and wife.

These three proposals have already been debated and passed and entered in the fish and game code by the California Legislature, (8552.3) and should be entered in the Herring Regulations. They will remove severe hardships on widows and family members of deceased fishermen.

Thank You

Sam Liberati
Herring Fisherman

Sam Liberati letter

08-30-05;02:09PM; # 2/ 3

RECEIVED
CALIFORNIA
FISH AND GAME
COMMISSION
2005 AUG 22 PM 11:47

Mr. Robert R. Treanor

comment 1

In the CEQA document the Belmont office has finally given an answer as to why they have continued to violate the fish and game codes pertaining to the MLMA. The Directors Herring Advisory Committee has asked for the answer for years. Belmont's answer has always been no response. Below is Belmont's reasoning.

In the CEQA (SCH No. 98052052) chapter 3-26 item number 8.

Item number 8, the independent peer review sought by the Department and the alleged violation of the Marine Life Management Act (MLMA), refers to the controversy based on the belief by some herring industry members that the Department violated the MLMA when a peer review on biomass assessment methodologies and preliminary use of a stock assessment model was done. **The Department did not violate MLMA because the herring fishery is not subject to that Act until a fisheries management plan (FMP) is developed.**

comment 2

We strongly disagree with Belmont. "The California Fish and Game Commission has held the management authority for all herring fisheries in the state since 1976". (ENV DOC, 1998)

The MLMA addresses its relationship to the herring fisheries in the following.

According to the MLMA - scope

The fishery management system established by the MLMA applies to four groups of fisheries.

1. The nearshore finfish fishery and the white seabass fishery.
2. Emerging fisheries - new and growing fisheries that are not currently subject to specific regulation.
3. **Those fisheries for which the Fish and Game Commission held some management authority before January 1, 1999. Future regulations affecting these fisheries will need to conform to the MLMA.**
4. Those commercial fisheries for which there is no statutory delegation of authority to the Commission and Department. (In the case of these fisheries, the Department may prepare, and the Commission may adopt, a fishery management plan, but that plan cannot be implemented without a further delegation of authority through the legislative process.)

RECEIVED
AUG 30 2005
CA DEPT FISH & GAME
BELMONT OFFICE

According to the online Guide to California's Marine Life Management Act:

The fishery management system established by the MLMA applies to four groups of fisheries [7051(b) and 7071(a), (b), and(c)].

The first group includes those fisheries for which the Commission held some management authority before January 1, 1999. This group includes all sport fisheries and commercial fishing for the species listed in the Introduction. Future new regulations affecting these fisheries will need to conform to the MLMA.

Matt Ryan-Kevin Marilley letter, page 1 of 2

08-30-05;02:09PM;

Species listed in the Introduction

Unless mentioned by name in the regulations, any species may be take n without restriction for commercial purposes. If a species is mentioned in regulations, it may b e taken only under the conditions described in those regulations. Species groups listed in the c ode of regulations include abalone, anchovy, bait fish, barracuda, several basses, broadbill swordi ish, California halibut, clams, corbina, several crabs, several croakers, goby, grunion, hagfish, **herrir g**, Kellet's whelk, killifsh, limpets, lingcod, spiny lobster, marlin, mussels, octopus, oysters, Pacifi : bonito, plainfin midshipman, prawns, queenfish, rays, rockfish, sablefish, salmon, sard nes, sea cucumber, sea urchin, shad, several sharks, shiner perch, shrimp, skates, smelt, squid . sculpin, sturgeon, sunfish, surfperch, several tunas, and yellowtail. The Fish and Game Code prohi bits commercial fishing for several dozen other species, including some invertebrates such as scall ops and krill, and some fish, such as white sharks, garibaldi, and marlin

We believe the MLMA establishes a set of ground rules, and we question why the herring management continues to ignore the fish and game codes pertai ning to the MLMA. . | comment 3

This letter is a request for an answer in writing on whether the MLMA applies to the herring fisheries.

DHAC Members:

Matt Ryan 360-961-5390
5145 Graveline Rd
Bellingham Wa. 98226

Kevin Marilley 360-961-8856

Matt Ryan-Kevin Marilley letter, page 2 of 2

LITERATURE CITED

Barnhart, R. A. 1986. Species profiles: life histories and environmental requirements of coastal fishes and invertebrates (Pacific Southwest) - Steelhead. U.S. Fish and Wildlife Service Biological Report 82(11.60). U.S. Army Corps of Engineers, TR EL-82-4. 21 pp.

Baraff, L. S., T. R. Loughlin. 2000. Trends and Potential Interactions Between Pinnipeds and Fisheries of New England and the U.S. West Coast. *Marine Fisheries Review* 62, no. 4: 1-39. Database on-line. Available from CSA, ASFA: Aquatic Sciences and Fisheries Abstracts, 5515838.

Beamish, RJ, GA McFarlane, J. Schweigert, and Alaska Sea Grant Coll. Program, Fairbanks, AK (USA). 2001. *Is the production of coho salmon in the strait of georgia linked to the production of pacific herring?* P.O. Box 755040 205 O'Neill Bldg. Fairbanks AK 99775-5040 USA, URL:http://www.uaf.edu/seagrant/]: University of Alaska Sea Grant. Database on-line. Available from CSA, ASFA: Aquatic Sciences and Fisheries Abstracts, 5361185.

Berkeley, S.A. et al. 2004. Fisheries Sustainability via Protection of Age Structure and Spatial Distribution of Fish Populations. Fisheries. Fisheries Management Section. August 2004.

Bishop, M. A., S. P. Green. 2001. Predation on Pacific herring (Clupea pallasi) spawn by birds in Prince William Sound, Alaska. *Fisheries Oceanography* 10, no. suppl.1 (Dec) : 149-158. Database on-line. Available from CSA, ASFA: Aquatic Sciences and Fisheries Abstracts, 5325226.

Clarke, D.R. and P.F. King. 1986. The estimation of gillnet selection curves for Atlantic herring (Clupea harengus L.) using length/girth relations. Journal du Conseil. 43(1): 77-82.

Cox and Hedrick. 2001. VHS virus in Pacific sardines and mackerel. American Fisheries Society Fish Health Section (FHS) Newsletter 29 (3), July 2001.

Department of Fish and Game. 2004. Final Supplemental Environmental Document, Pacific Herring Commercial Fishing Regulations (Sections 163, 163.5, and 164, Title 14, California Code of Regulations). State of California. The Resources Agency.

Department of Fish and Game. 2004. Draft Supplemental Environmental Document, Pacific Herring Commercial Fishing Regulations (Sections 163, 163.5, and 164, Title 14, California Code of Regulations). State of California. The Resources Agency.

Department of Fish and Game. 2002. Final Supplemental Environmental Document, Pacific Herring Commercial Fishing Regulations (Sections 163,

163.5, and 164, Title 14, California Code of Regulations). State of California. The Resources Agency.

Department of Fish and Game. 2002. Draft Supplemental Environmental Document, Pacific Herring Commercial Fishing Regulations (Sections 163, 163.5, and 164, Title 14, California Code of Regulations). State of California. The Resources Agency.

Department of Fish and Game. 2001. Final Supplemental Environmental Document, Pacific Herring Commercial Fishing Regulations (Sections 163, 163.5, and 164, Title 14, California Code of Regulations). State of California. The Resources Agency.

Department of Fish and Game. 2001. Draft Supplemental Environmental Document, Pacific Herring Commercial Fishing Regulations (Sections 163, 163.5, and 164, Title 14, California Code of Regulations). State of California. The Resources Agency.

Department of Fish and Game. 2001. Draft The Master Plan: A Guide for the Development of Fishery Management Plans as directed by the Marine Life Management Act of 1998. State of California. The Resources Agency.

Department of Fish and Game. 2000. Final Supplemental Environmental Document, Pacific Herring Commercial Fishing Regulations (Sections 163, 163.5, and 164, Title 14, California Code of Regulations). State of California. The Resources Agency.

Department of Fish and Game. 2000. Draft Supplemental Environmental Document, Pacific Herring Commercial Fishing Regulations (Sections 163, 163.5, and 164, Title 14, California Code of Regulations). State of California. The Resources Agency.

Department of Fish and Game. 1999. Final Supplemental Environmental Document, Pacific Herring Commercial Fishing Regulations (Sections 163, 163.5, and 164, Title 14, California Code of Regulations). State of California. The Resources Agency.

Department of Fish and Game. 1999. Draft Supplemental Environmental Document, Pacific Herring Commercial Fishing Regulations (Sections 163, 163.5, and 164, Title 14, California Code of Regulations). State of California. The Resources Agency.

Department of Fish and Game. 1998. Final Environmental Document, Pacific Herring Commercial Fishing Regulations (Sections 163, 163.5, and 164, Title 14, California Code of Regulations). State of California. The Resources Agency.

Fish and Game Code 2005. California Edition. LawTech Publishing Company Ltd., San Clemente, California.

Furness, RW. 1999. *Does harvesting a million metric tons of sand lance per year from the north sea threaten seabird populations?* P.O. Box 755040 205 O'Neill Bldg. Fairbanks AK 99775-5040 USA, [URL:http://www.uaf.edu/seagrant/]: University of Alaska Sea Grant. Database on-line. Available from CSA, ASFA: Aquatic Sciences and Fisheries Abstracts, 5375451.

Gregoire, F. and L. Lefebvre. 2003. Estimation of gillnet selectivity for Atlantic herring (Clupea harengus harengus) from the west coast of Newfoundland, 1997-2001. Canadian Industry Report of Fisheries and Aquatic Sciences. 272.

Haegele, C. W. 1993. Seabird predation of Pacific herring, Clupea pallasi, spawn in British Columbia. Canadian field-naturalist. Ottawa *ON* 107, no. 1: 73-82. Database on-line. Available from CSA, ASFA: Aquatic Sciences and Fisheries Abstracts, 3550584.

Hart, J.L. 1973. Pacific fishes of Canada. Fish. Res. Board Can. Bull. 180, Ottawa. 740 pp.

Hay, D.E. et al. 1986. Experimental studies of Pacific herring gillnets. Fisheries Research. 4(3-4): 191-212.

Hunt, S.L, T.J. Mulligan and K. Komori. 1999. Oceanic Feeding Habits of Chinook Salmon, Oncorhynchus tshawytscha, off northern California. Fish. Bull. 97:717-721.

Jauquet, J.M., and Puget Sound Action Team, Olympia, WA (USA). 2004. *The occurrence of diet items in coastal cutthroat trout collected in south Puget Sound, 1999-2002.* PO Box 40900 Olympia WA 98504 USA: Puget Sound Action Team. Database on-line. Available from CSA, ASFA: Aquatic Sciences and Fisheries Abstracts, 5870788.

Lance, M.M., S.J. Jeffries, J.M. London, and Puget Sound Action Team, Olympia, WA (USA). 2002. *Diet of harbor seals in hood canal during 1998 and 1999.* PO Box 40900 Olympia WA 98504 USA: Puget Sound Action Team. Database on-line. Available from CSA, ASFA: Aquatic Sciences and Fisheries Abstracts, 5779491.

Miller, D.J. and J. Schmidtke. 1956. Report on the distribution and abundance of Pacific herring (*Clupea pallasi*) along the coast of central and southern California. Calif. Fish Game Bulletin 42:163-187

McEwan, D.R. 2001. Central Valley Steelhead. *In*: R. Brown, ed., Contributions to the biology of Central Valley salmonids, Volume I, pages 1-44. California Department of Fish and Game Fish and Game Bulletin. No 179.

Moser, M. and J. Hsieh. 1992. Biological tags for stock separation in Pacific herring CLUPEA HARENGUS PALLASI in California. Journal of Parasitology. 78(1):54-60.

Oda, K.T. 1994. Pacific herring, *Clupea pallasi*, studies in San Francisco Bay, April 1990 to March 1992. CDFG Mar. Res. Div., Admin. Rpt. 94-2:1-38.

Okey, T.A., B.A. Wright. 2004. Toward Ecosystem-Based Extraction Policies for Prince William Sound, Alaska: Integrating Conflicting Objectives and Rebuilding Pinnipeds. *Bulletin of Marine Science* 74, no. 3: 727-747. Database on-line. Available from CSA, ASFA: Aquatic Sciences and Fisheries Abstracts, 6048448.

Orsi, J., ed. 1999. Report on the 1980-1995 Fish, Shrimp, and Crab Sampling in the San Francisco Estuary, California. California Department of Fish and Game Interagency Ecological Program, Tech. Rep. 63.

Outram, D.N. and R.D. Humphreys. 1974. The Pacific herring in British Columbia waters. Fish. Mar. Serv., Pac. Biol. Stn. Circ., 100:1-26.

Potter, E.C.E. and M.G. Pawson. 1991. Gill Netting. Ministry of Agriculture, Fisheries and Food. Directorate of Fisheries Research. Laboratory Leaflet No. 69.

Quang, P.X. 2002. An Analysis of Net Selectivity for Bering Sea Herring. Technical Fishery Report. February 2002.

Reilly, P.N. and T.O. Moore. 1983. Pacific herring, Clupea harengus pallasi, studies in San Francisco Bay, Monterey Bay, and the Gulf of the Farallones, July 1982 to March 1983. CDFG Mar. Res. Div., Admin. Rpt. 84-3:1-67.

Reilly, P.N. and T.O. Moore. 1986. Pacific herring, Clupea harengus pallasii, studies in San Francisco Bay, central and northern California, and Washington, March 1985 to May 1986. CDFG Mar. Res. Div., Admin. Rpt. 86-6:1-88.

Reilly, P.N. and T.O. Moore. 1987. Pacific herring, Clupea harengus pallasi, studies in San Francisco Bay, April 1986 to March 1987. CDFG Mar. Res. Div., Admin. Rpt. 87-15:1-74.

Rooper, C.N. and L.J. Haldorson. 2000. Consumption of Pacific herring (Clupea pallasi) eggs by greenling (Hexagrammidae) in Prince William Sound, Alaska. *Fishery Bulletin* 98, no. 3 (Jul) : 655-659. Database on-line. Available from CSA, ASFA: Aquatic Sciences and Fisheries Abstracts, 4751524.

Sullivan, T.M., and R.W. Butler, and W.S. Boyd. 2002. Seasonal distribution of waterbirds in relation to spawning Pacific herring, Clupea pallasi, in the Strait of Georgia, British Columbia. Canadian Field-Naturalist 116, no. 3:366-370. Database on-line. Available from CSA, ASFA: Aquatic Sciences and Fisheries Abstracts, 5722866.

Spratt, J.D. 1981. Status of the Pacific herring Clupea harengus pallasi resource in California, 1972 to 1980. California Department Fish and Game Fish and Game Fish Bulletin. 171:1-107.

Webber, M.L. and B. Heneman. 2000. Guide to California's Marine Life Management Act. The California Marine Life Management Project and Commonwealth. Common Knowledge Press, Bolinas, California.

Watters, D.L., H.M. Brown, F.J. Griffin, E.J. Larson, and G.N. Cherr. 2004. Pacific Herring Spawning Grounds in San Francisco Bay: 1973-2000. Am. Fish. Soc. Symposium 39:3-1.

Winters, G.H. and J.P. Wheeler. 1990. Direct and Indirect Estimation of Gillnet Selectivity Curves of Atlantic Herring (Clupea harengus harengus). Canadian Journal of Fisheries and Aquatic Sciences. 47:460-471.

Appendix A

Industry Proposal to Reduce the Minimum Mesh Size

July 7, 2004

Mr. Robert Treanor
Executive Secretary
California Fish and Game Commission

Dear Mr. Treanor

Please add to the agenda for Title 14 CCR Pacific Herring regulations now under consideration by the Commission, the following proposal for the San Francisco Bay Gillnet Herring Fishery.

Herring Gill nets for the 2004/2005 and 2006/2007 may have a minimum mesh size of 2 inches and a maximum size of 2 ½ inches measured as follows. 10 meshes are to be suspended vertically in a straight line down from a peg not larger than 1/16 of an inch and measured by a standard tape measure. The 10 meshes must measure from the inside of the first knot to the outside of the last knot and shall not be less than 20 inches hanging with a 1 pound weight hanging on the 11th mesh. Nets will be measured wet while fishing.
Measurements shall be taken vertically from the middle of the web hanging vertically between the cork line to the lead line.

Reasons for the mesh size change are as follows.

1-At the present time we are using 2 1/8 inch mesh and the mesh is too large to catch our quota in San Francisco Bay, along with environmental damage to our fishery.
2-The fish are caught by the bellies instead of by the gills. Because of this, a large percentage of fish are falling off nets as the nets are coming out of the water. Scales are missing from the herring and we feel that we are needlessly killing a lot of fish from the drop offs. This has got to stop and the only way that it can is to harvest the fish with the proper size nets.
3-We are also almost always coming up with herring eggs deposited on our nets. The reason for this is that the fish are depositing their eggs as they squeeze through the mesh or because our nets are in the water much too long trying to catch fish with too large a mesh and the herring are spawning on the nets.

A few years back, we had the very same problem and the biologists were quick to lower the mesh size from 2 1/4 to 2 1/8 With the stretching of the mesh, we were able to fish with 2 1/16 inch nets. Our problems went away. We became a model fishery in the state and it was determined that Gill Netting was the best environmentally safe way to harvest Herring in San Francisco Bay. This was the main reason that the Round Haul fishery was phased out.
The Biologist decided a few years later to up the mesh size by 1/6 of an inch and our prior problems came back.
The mesh size was changed by measuring nets a different way.

It should be known that approximately 5 years ago that this proposal we are asking for was adopted in Tamales Bay. The fishery had major problems, even worst than ours. The Biologist and fishermen got together and came up with the 2-inch mesh size. That fishery has improved every year since they went from 2 1/8 inch to 2-inch mesh. The run is building every year and the age class being caught hasn't changed at all. In fact, they are even starting to get older fish.

What we will accomplish by adopting this changing of mesh size.

1-We will eliminate the drop-offs from our nets.
2-We will eliminate most, if not all the mass of eggs coming up on our nets.
3-We will catch our quota in days or hours rather than weeks or months.
4-After our quota is caught, fish can come into the bay and schools can spawn without being disturbed.
5-Our cost of operating will go down. Our profits up, creating more jobs for crewmen.
6-The state will save money by managing the fishery in a much shorter time.
7-Enforcement can spend less time on the water measuring nets.
8-Coast Guard can spend less time monitoring herring boats.
9-Ferries will be happy to have us out of their way sooner.

Anyway that you look at it, it is a win, win, situation for everyone including the fish.

If this proposal produces unforeseen impact, the commission can readily address this regulation for the following season.

This proposal is submitted by the following San Francisco Herring Permitees.
Sam Liberati, Kathryn Liberati, Vito Liberati, Jack Liberati, My Van Do, Sam Papetti Sr., Sam Papetti Jr.,William Schoening, Bud Janniro, Lois Janniro, Harry Vogel, Tom Ohara, Gene McGregor, Anthony Russo, Emil Marcelli, Victor Galli, Dan Colchio,Salvatore Papetti, Savior Papetti, Sam Mercurio, Antoine Mercurio, Tommy Noto, Andy Russo, Vince Giamanco, Rich Ailello, Joe Fernandez, Joe Lagrande, Joe Costa, John Scardina, Harlan Bailey, Louie Grossi, Rico Grossi, Frank Akers, Joe Bonanno, Mitzie Grillo, Frank Grillo, Joe Catalano, Peter Mineo, Paul Aliotti, Violuri Manigoera, Salvatore Scaduto, Dominic Papetti, Bill Huntsinger, Chris Clement, Troy Johnson, Tom Johnson, Matt Lafada, Carlo San Filippo, John Tarentino, Philip Batalia, Mike Mitchel, Ione Johnson, Benny Lagrande, Philip Lafada, Pete Manaboni, Denise Papetti, Nancy Papetti, Mattely Crevello, Jessica Crevello, Mario Ballesteri, Pete Ballesteri

Appendix B

Peer Review

Peer Review of the California Department of Fish and Game's Commercial Pacific Herring Fishery Management and Use of the Coleraine Fishery Model

Completed: August 20, 2003

Administered by:

Dr. Chris Dewees
California Sea Grant Extension Program,
University of California, Davis

Bill Leet
California Sea Grant Extension Program
University of California, Davis

Peer Review Panel Members:

Alec MacCall, NOAA Fisheries, Santa Cruz, CA
Mark Maunder, Inter American Tropical Tuna Commission, La Jolla, CA
Jake Schweigert, Pacific Biological Station, Nanaimo, B.C.

Problem Statement

The California Department of Fish and Game (DFG) has traditionally used spawn surveys and hydroacoustic surveys to assess the stock size of Pacific herring in San Francisco Bay. These surveys have demonstrated a steady downward trend in the stock size over the past 25 years. Beyond the downward trend, during the past several years there was disagreement between the population estimates derived by using these two survey techniques. This year (2003) DFG decided to use currently available statistical modeling techniques to further assess the status of the population and the results that might be expected from different management strategies. The selected model, the Coleraine model, had not previously been used by DFG, and this general purpose model was not specifically designed for assessing San Francisco Bay Pacific herring. DFG requested that California Sea Grant assemble a panel of peer reviewers to determine if it was appropriate to use the Coleraine model, to instruct them in its use, to help its staff in interpreting the results, and possibly to suggest appropriate changes in management strategy. Sea Grant assembled a team of scientists with demonstrated expertise in modeling and assessing fish populations: Alec MacCall; Mark Maunder, and Jake Schweigert. They assembled together with DFG staff for a two-day workshop (August 19 and 20, 2003) designed to accomplish the above stated goals. Following are their findings, conclusions, and recommendations.

Findings

Estimates of stock abundance and trajectory over the available time series by an equilibrium surplus production model, the Coleraine catch-age model, and the Canadian herring catch-age model all result in similar estimates of stock status. The indication is that the San Francisco Bay herring population has been reduced to a level of roughly 20% of the unfished level and is presently at or near the lowest abundance observed since the early 1970s. All data (survey, CPUE, and catch-at-age) are generally consistent with these findings.

The exploitation rate defined as catch divided by spawning biomass has been over 20% for most of the period since 1990. The fishery tends to catch a very high proportion of the individuals that are vulnerable to the gear.

The age composition of the catch has changed towards younger individuals. At present there are essentially no individuals aged 6 years or older in the catch, while in earlier years these ages made up over 50% of the catch. Due to higher exploitation rates it is expected that the average age in the catch should have reduced. However, there is substantial evidence that the fishery has increasingly targeted younger individuals. The present mesh size limit in the fishery represents a lower limit for the exploitation of this population allowing a proportion of the age 3 and most of the age 2 fish an opportunity to spawn. Any further reduction in the mesh size or increase in the hanging ratio would negatively impact the population.

The spawn survey tends to underestimate spawning biomass by about 10% and the hydroacoustic survey tends to overestimate the spawning biomass by about 20%. The errors (coefficients of variation) in the annual spawning biomass indices are about 40% for the spawn survey and about 75% for the hydroacoustic survey. This indicates that the spawn survey is a better estimate of spawning biomass than the hydroacoustic survey.

The practice (or tendency) of using the higher value of the spawn survey or the acoustic survey as the basis for setting quotas has contributed to overfishing. The target exploitation rate (catch per spawning biomass) of 20% may be higher than optimal, and also has been exceeded frequently over the past decade. Maximum sustainable yields are obtained using an exploitation rate (catch divided by spawning biomass) of about 16%. Simulation analysis suggests that under the current age-specific selectivity pattern of the gear, this may involve harvesting nearly all the vulnerable individuals depending on the shape of the stock-recruitment relationship (which is not well estimated at the present time).

Recommendations

The San Francisco Bay herring population has been reduced to a level of roughly 20% of the unfished level and is presently at or near the lowest abundance observed since the early 1970s. A rebuilding policy should be implemented.

The current harvest strategy for this stock should be re-evaluated and explicitly documented. The current harvest rate policy of 20% appears to be too aggressive under current levels of

stock production. A harvest rate in the range of 10-15% appears to be sustainable with the lower level providing a desirable target for stock rebuilding. The CDFG should investigate the suitability of a fishing threshold or cutoff level similar to that in place in British Columbia and Alaska to conserve spawning biomass and during periods of reduced productivity.

The Department should develop a specialized herring stock assessment model using an approach similar to that in Coleraine. This will make the best use of the variety of data that exists for herring and would better reflect unique biological properties of the San Francisco Bay stock. While this could be done by contract, the Department would benefit greatly by developing this model in-house. This would assure that DFG has staff who understand the techniques and assumptions in such a model, who would be capable of maintaining and updating the model, and who would be capable of applying the technology to other resource management problems.

Spawn surveys provide a sound empirical estimate of current stock size and should be continued on an annual basis as the primary index of abundance and as the biomass estimate for use in setting the fishery quota for the upcoming season until an integrated catch-age model can be developed and verfied. Hydroacoustic surveys should be continued on a developmental basis as resources allow to support the location and timing of spawn assessment surveys and to better understand possible changes in pre-spawning herring behaviour within the bay. Such surveys can be conducted in conjunction with the trawl surveys that are critical for the collection of information on the age structure of the spawning population. The results of this year's Coleraine model runs may provide useful guidance for decision-making, with the understanding that the future specialized model may produce results that differ in unanticipated respects and the two models are unlikely to be exactly equivalent.

The biological sampling program currently in place for estimating the age-structure of the population is not providing an unbiased estimate of the true population age composition. The present system of obtaining age compositions by means of age-length keys should be replaced by direct (random) sampling of ages from the fishery and survey catches. The allocation of age samples would be approximately equal between surveys and fishery catches, and should be based on an approximately constant rate of samples per ton. The DFG may also want to consider the use of scales rather than otoliths to maximize the use of available ageing resources.

We recommend that the Department adopt a stronger policy of documentation. Details of each year's surveys and monitoring should be recorded and archived at least in timely internal reports.

Acknowledgement

We commend the professionalism of the DFG staff in supporting this review. Their dedication to herring research over the past 25 years has made it possible to do the statistical analyses required for sound management.

Appendix C

Gill Net Mesh Size in the California Herring Fisheries: Historical Background

Gill net Mesh Size in the California Herring FisherieHistorical Background Notes – Summary Table

Season	Regulation/Change/Why? (if no reference at 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 1/4 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).

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 form 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 February1 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 1/4 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 1/4 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 al 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 ½ 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 ½ 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 ¼ 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 ¼ 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 ¼ 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 hear, 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 on-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 form 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 form 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-wideTomales 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.

Appendix D

Historical Events in the Tomales-Bodega Bay 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 an 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 E

Synopsis of Herring Round Haul Conversion Issue

Synopsis of Herring Round Haul Conversion Issue - Its Developmental History, Analysis of the Round Haul Association's 1995 Proposal, And Pertinent Management Issues

I. Developmental History of the Conversion

The conversion of round haul permits to gill net permits in the San Francisco Bay Pacific herring fishery was adopted by the California Fish and Game Commission (Commission) in August 1994 and implemented by the Office of Administrative Law in September 1994, following a rather lengthy developmental history. The regulation provides for voluntary transfer to gill net gear with a multi-year series of decreasing incentives, followed by a mandatory conversion of remaining round haul permits in 1998 (five fishing seasons after regulation implementation). Voluntary conversion to a special gill net permit authorizes the permittee to fish for two gill net quotas for as long as the permit is held by the current permittee. The following synopsis explains the State's actions on this issue and demonstrates that ample opportunity was provided for public input and joint development of this regulation.

The California State Legislature gave the California Fish and Game Commission management authority for the Pacific herring fishery in 1973 (Fish and Game Code Section 8550). Five round haul permittees were the first participants at the inception of the roe herring fishery in San Francisco Bay in 1972, with fleet size peaking at 66 round haul permits in 1976-77. Gill nets were subsequently authorized for use in the herring fishery in 1974, and both gear types have been active participants since then. Beginning in 1977, the Commission has authorized the exchange of round haul permits for gill net permits.

The Commission began the phase-out of round haul permits in the 1979-80 season, by deciding that no new round haul permits would be issued in the future for San Francisco Bay. (The Commission had already prohibited the use of round haul gear in Tomales Bay in the 1977-78 season, largely due to public sentiment). The planned gradual reduction of the round haul fleet by attrition was hindered by the 1989 action by the California State Legislature to allow the transfer (sale) of herring permits to qualified applicants. Previously, herring permits could only be transferred to partners, heirs, or siblings. Consequently, the round haul fleet stabilized at 42 permittees (of which, ten are presently fishing, instead, in the herring eggs-on-kelp fishery). Currently, 374 gill net, 39 round haul, and 3 "CH", or converted round haul, permits are issued for San Francisco Bay roe herring.

As cited above, the Commission had expressed its intent to create a gill net-only roe herring fishery in 1979. Fishing industry and scientists' concerns about long-term improvements to

the fishery and resource status, and the lack of round haul permit attrition because of permit transferability prompted the Department in 1992 to initiate a public dialogue on this subject.

Department managers have a long notable history of "partnership" with the herring industry, seeking input through the Director's Herring Advisory Committee (DHAC), formal public hearings, and informal town hall meetings. The Department continued this policy, requesting guidance from herring fishery members at the very earliest stages of development of a round haul conversion proposal. Unfortunately, members of the herring round haul industry only provided few general comments. In the ensuing months leading to regulation adoption in August 1994, Department staff received **no** response other than several phone calls by permittees voicing general opposition to any actions. The following chronology lists the public meetings at which this subject was discussed, and individuals could provide input.

March 17, 1992 - Director's Herring Advisory Committee Meeting, Belmont.

March 16, 1993 - Director's Herring Advisory Committee Meeting, Belmont.

April 5, 1993 - Public Meeting on Pacific Herring Fishery, San Rafael.

April 16, 1993 - Round Haul Fishermen's Meeting, Youth Center, Dennis the Menace Park, Monterey.

August 23, 1993 - Fish and Game Commission Public Meeting, Sacramento.

March 21, 1994 - Director's Herring Advisory Committee Meeting, San Francisco.

April 11, 1994 - Public Meeting on Pacific Herring Fishery, San Rafael.

June 1994. The informative digest (listing proposed regulation changes, including the round haul conversion) of the STATEMENT OF PURPOSE FOR REGULATORY ACTION was mailed to all herring permittees by the Commission.

August 5, 1994 - Fish and Game Commission Public Meeting, San Luis Obispo.

August 26, 1994 - Fish and Game Commission Public Meeting, South Lake Tahoe.

The adopted herring regulations implementing the round haul permit conversion represent the culmination of a carefully

considered process of analyses on the biological, social and economic effects of the transition to an all-gill net herring fishery in San Francisco Bay and a concerted effort to work with the herring industry. The phase-in of such a conversion over a five-year period is intended to provide a planning horizon to permittees and to reduce the short-term economic dislocation that some individuals may suffer during this transition.

II. Department Comments on 1995 Proposal of San Francisco Round Haul Association

The Department has reviewed the Round Haul Association's proposal and finds the proposed regulatory measures to have minimal benefits regarding the management concerns previously identified by the Commission and the Department. This proposal ignores several of the principal reasons for the conversion, including longstanding Commission policy and fishery yield analyses, and offers critiques of four of the Department's original concerns regarding round haul fishing for herring. The Department has the following brief comments to the four issues identified in the Round Haul Association proposal.

1) Wrap-and-Release Mortality The Department agrees that immediate or latent mortality to herring concentrated in a round haul net and subsequently released has not been quantified. However, anecdotal comparisons of the Monterey sardine fishery, and its daily capture and release of thousands of tons of sardines, and the San Francisco herring fishery are not appropriate. Pacific herring do not have swim bladders, thus will generally sink when dead, except for spawned-out herring which will float. It seems unlikely that dead herring would wash ashore and accumulate due to strong tidal currents in the Bay or that complaints would be registered. The Department is unaware of any studies on wrap-and-release mortality, for other Pacific herring round haul fisheries on the west coast are very brief with little opportunity for "test" net sets.

2) Differing Age Composition of Round Haul vs. Gill Net Catches As outlined in the original conversion analysis, the size and age compositions of round haul and gill net catches have always been very different (See below and Figures 1,2, and 3). The comment that 2- and 3-year-old herring composed less than 2% of the round haul catch recently is spurious. In the three herring seasons since the Department's analysis, the differential harvesting characteristics of the gears remain. Additionally, fishing has negligible or little influence on the recent increase in numbers of 2-year-olds in the population which is generally attributed to favorable environmental conditions.

3) Round Haul Gear Effects on Herring Behavior This issue was originally raised by the Department as a minor aspect of round haul fishing. The Department has never alleged that round haul nets "dam or impede tidal influences". The alleged disruption of herring schooling behavior was merely cited as an often-repeated claim by gill net fishermen which has not been substantiated by Department staff.

4) Vessel Traffic Disruptions The Department agrees that potential obstruction of vessel traffic by round haul vessels while fishing has historically not been an area of concern.

Round Haul Association Management Proposal The Association's proposal appears to be a return to pre-conversion regulations, with two modifications. First, shortening the herring season by ten days will not buffer fluctuations in year class strength, as alleged, nor will it have a demonstrable effect on fishery practices. Round haul permittees are primarily regulated by individual catch quotas, and little herring spawning (and corresponding fishing effort) has taken place in the last ten days of a season (early March). For example, during seven of the last ten years **no** round haul landings occurred at all in the last ten days of a season, and in the remaining three seasons, landings in a season's last ten days only ranged from 1 to 21 tons (<1 to 1% of total landings).

Second, it is unclear to the Department what incidental gear conflicts are to be eliminated, as stated in the industry proposal, by the proposed 8% reduction in the length of an individual net from 240 to 220 fathoms. The proposed reduction in fishing power may reduce individual catch volumes, but it is the non-selective nature of a round haul net itself that is responsible in large part for the size and age composition of herring catches.

III. Management Issues Identified in Original Department Conversion Proposal

The size and age composition of herring catches by round haul and 2 1/8-inch gill nets in the San Francisco Bay fishery are very different (Figure 1). Ages two, three and four herring are only partially vulnerable to gill nets in San Francisco Bay and are completely vulnerable (recruited) to the fishery at age five (Figure 2). In contrast, herring are completely vulnerable (recruited) to round haul nets at age two; and two-, three- and four-year-old herring dominate round haul catches (Figure 3). The two gear types are thus differentially harvesting the various age classes in the population.

1) Wrap-and-Release Mortality. An additional and unquantifiable mortality of herring has occurred in the fishery

1) Wrap-and-Release Mortality. An additional and unquantifiable mortality of herring has occurred in the fishery due to the practice of wrap-and-release of inferior-quality roe herring by round haul vessels. The discard of less desirable fish, whether from small size, low roe count, poor condition, in order to retain higher-valued fish is a practice called "high-grading". Regulatory efforts to halt this practice have had mixed success. The prohibition on this activity is largely unenforceable at night and is extremely hard to enforce at other times, unless an enforcement officer can observe and subsequently document that the discarded, or released, fish were in fact herring. This has proven to be extremely difficult in practice. Wildlife Protection staff have been told by prosecutors that an observer is needed on board each vessel to determine intent to discard herring and to sample fish within the net in order to successfully enforce this regulation. As a result, the fleet itself must voluntarily terminate this practice; but as long as a price differential exists for higher roe-count herring, wrapping-and releasing of inferior-grade herring will probably occur. Conversion to gill net-only fishing would greatly reduce this "high-grading" practice.

2) Egg Production-per-Recruit Analysis. Egg production-per-recruit analysis indicated a substantial increase in population egg production as a result of a shift in recruitment from age two, the entry age into the round haul fishery, to ages three and four - the ages of first entry into the gill net fishery. (Age-three herring are only partially catchable with the present 2 1/8 inch gill net mesh size). At the target harvest rate of 15% of the stock, a 16% gain in egg production would result from a shift in recruitment to age three and a 31% gain by deferring recruitment to age four (Figure 4). Although the relationship between the parent population size and the size of an eventual recruiting year class of fish is unknown for herring, the calculated increase in the population's egg production (due to the increased biomass of older, more fecund herring) would provide an additional measure of safety to buffer oscillations in year class strength.

3) Round Haul Gear Effects on Herring Behavior. Herring fishermen have alleged that the elimination of the use of round haul gear would reduce the disruptive effects of the gear on the pre-spawning, schooling behavior of herring in the Bay. Department staff have not attempted to substantiate this claim of a behavioral effect; it was included here because of repeated contentions by the gill net fleet of such an impact. The veracity of their concerns and the impact of disrupted pre-spawning behavior are unknown.

4) Weight Yield Per Recruit. A standard analysis of yield in weight of herring per recruit to the population predicted lower yields by a shift in the age of recruitment to the fishery from

age two to ages three and four. In other words, an overall lower catch quota could result from a switch to an all-gill net roe fishery. At the target harvest rate of 15%, calculated weight yields would decline by 5 to 23% (Figure 5); but, given that only one-third of any annual quota is taken with round haul gear presently, this catch reduction would apply to only that part of the overall quota.

5) Roe Yield Per Recruit. Yield in terms of total weight of roe from the fishery would increase slightly by shifting recruitment to age three and decrease by as much as 13% by delaying recruitment to age four (Figure 6). An overall decrease in the tonnage of roe landed would probably be the expected outcome from conversion to an all-gill net fleet. The overall weight of roe may be less, according to this analysis, but actual roe counts (per ton, or per landing) would be higher. The quality of the resulting catch would be improved.

Social and Economic Aspects of the Proposal

1) Gear Conflicts. Gear conflicts between gill netters and round haulers would be eliminated. Historically, set gill nets and round haul gear have conflicted, particularly when spawning is underway or when herring are concentrated in small areas of the Bay.

2) Test Boat Program. The test boat program for the round haul fishery has reduced the prevalence of testing and releasing of low roe count fish, but the practice continues, according to Wildlife Protection staff. The inability to effectively enforce this regulation has diminished respect for other herring regulations, in particular, the gill net mesh regulation.

3) Individual Boat Quotas. Beginning with the 1981-82 season the total round haul quota was divided equally among the permittees and became individual allocations or quotas. These quotas ease competition among round haul vessels and increase the economic value of the catch, as permittees become more selective in their retained catch. But this selectivity encourages "high grading" of herring through wrap-and-release with resultant discard mortality of inferior fish. The fishing power of a seine or lampara net is considerable, and the mortality of many tons of herring at a time may occur due to wrap-and-release practices. Individual boat quotas are not routinely employed with the gill net fleet except occasionally to slow the pace of the fishery.

4) Fishing Power of Round Haul Nets. The catching power or capability of a herring seine or lampara net can greatly exceed a vessel quota at low quota levels. This may encourage the discard of surplus catch to ensure the attainment of an individual quota or may encourage the capture and landing of herring in excess of an individual quota. Anecdotal evidence suggests that such

practices are commonplace, but documenting and citing permittees for such offenses is very difficult. The under-reporting of landings is also a problem with the gill net fleet, but the harvesting capacity of a gill net is considerably less than that of a round haul net.

5) Economic Value of Round Haul versus Gill Net Catches. The ex-vessel prices of round haul-caught herring are typically 33 to 60% less than an equivalent amount of gill net-caught herring (five-year averages were $631 and $1450 per ton for round haul and gill net catches), because gill net-caught herring typically are larger, with larger roe sacs and higher roe yields.

APPENDIX F

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

- 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 2004-05.
- Table 2.4 was updated with the final age data from otolith readings.

Chapter 3. Environmental Setting

- Figure 3.1 was updated with final age data.
- Figures 3.4 and 3.5 were updated with current age data.
- Section 3.3 - The following text was deleted and replaced with updated information: Length at age information from the 2003-04 season was applied to this season's length data to develop a preliminary population age structure. The more accurate method of reading otoliths, hard ear-bone structures, for obtaining age composition for the current season

will be conducted this summer. The updated ages will then be incorporated into the FSED for 2005. The preliminary age composition indicates strong recruitment of two-year-old herring, approximately 128 percent by number above the long-term mean and 33 percent higher than the 2003-04 season (Table 2.5). There were significant increases in the numbers of 3-, 4-, 5-, and 6-year-old sized herring (35, 358, 302, and 23 percent by number respectively from the 2003-04 season); however, the estimated numbers of 3-, 4-, and 5-year-olds were average and 6-year-olds were below the long-term averages. The greatest increase in spawning biomass by age group appears to be the four-year-old cohort (Figure 3.1).

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