Tejas Pet Products Marketing, LLC
PO Box 67224
Lincoln NE 68506-7224

March 14, 2008

Mr. Donald K. Hansen
Chairman
Pacific Fishery Management Council
7700 NE Ambassador Place, Suite 101
Portland, Oregon 97220-1384
Fax 503-820-2299

Dear Chairman Hansen:

As purchasers West Coast seafood products, we have a great interest in protecting and promoting a vibrant and sustainable fishing and seafood processing industry. This industry represents thousands of jobs and a huge sales market for West Coast fish and seafood related products.

Along the West Coast, we are blessed with some of the freshest and best seafood products found anywhere. Getting these products from the Pacific Ocean to consumers requires a healthy fishing industry, a healthy and innovative processing sector and an efficient distribution and transportation network. All are critical to the entire industry's success.

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We are proud of our relationship with the processors who help us deliver seafood related products to our customers. I support new rules that will make this industry stronger and urge you to consider the impact new rules will have on every aspect of this seafood industry sectors.

Sincerely,

Brian Seth

1-888-546-0636 Tel. 402-475-7663 Fax. 402-475-7665

7 Seas
FISH CO. LTD.
PREFERRED SUPPLIER OF QUALITY SEAFOOD

March 20, 2008

Mr. Donald K. Hansen
Chairman
Pacific Fishery Management Council
7700 NE Ambassador Place, Suite 101
Portland, Oregon 97220-1384
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Sincerely,

Michael Heras, Vice President

4857 Chisholm Street, Delta, B.C. V4K 2K6
Phone: (604) 946-1266 Fax: (604) 946-4986

SAVE MART SUPERMARKETS
P.O. Box 4278, Modesto, California 95352-4278
1800 Standiford Avenue, Modesto, California 95350
Corporate Office (209) 577-1600
Merchandising (209) 574-6277

March 20, 2008

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7700 NE Ambassador Place, Suite 101
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Sincerely,

Marty Stephanic
Director Meat/Seafood
Save Mart Supermarkets Inc.
A California owned and operated company

Fairview Mills, LP
P.O. Box 170
Seneca, Kansas 66538
785-336-2148
800-222-1619
785-336-6720 FAX

FROM THE LAND OF KANSAS

Contract Manufacturer Of Quality Pet Food

Quality Products From Kansas, "The Breadbasket of the World"
Making Your Product Your Way

Dear Chairman Hansen:

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Sincerely,

Robert A Kramer

March 20, 2008

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Chairman
Pacific Fishery Management Council
7700 NE Ambassador Place, Suite 101
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Fax 503-820-2299

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Sincerely,

Brian Fenstermaker
Executive Chef
Eddie V's Oregon Prime Grille
Scottsdale, AZ

American Nutrition

P. O. BOX 1405, OGDEN, UTAH 84402 • 801-394-3477 • FAX#'s: CUSTOMER SERVICE, 801-394-3571 – ACCOUNTING, 801-394-3674 – SALES, 801-399-1709

March 13, 2008

Mr. Donald K. Hansen
Chairman
Pacific Fishery Management Council
7700 NE Ambassador Place, Suite 101
Portland, Oregon 97220-1384

Fax 503-820-2299

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Sincerely, Gene Moyes

Sea Merchants Inc.
55 Vansco Road • Toronto • Ontario • M8Z 5Z8 • Tel: 416-255-2700 • Fax: 416-255-6968

March 20, 2008

Mr. Donald K. Hansen
Chairman
Pacific Fishery Management Council
7700 NE Ambassador Place, Suite 101
Portland, Oregon 97220-1384
Fax 503-820-2299

RECEIVED
MAR 17 2008
PFMC

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Sincerely,

Andre Chabot
General Manager

ALBION "Good things from the sea!"

March 20, 2008

Mr. Donald K. Hansen
Chairman
Pacific Fishery Management Council
7700 NE Ambassador Place, Suite 101
Portland, Oregon 97220-1384
Fax 503-820-2299

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Sincerely,

ALBION FISHERIES LTD.
"Helping our Customers to Succeed with Seafood"
1077 Great Northern Way, Vancouver, BC V5T 1E1 Tel: 604 875-9411 Fax. 604 874 8534

PacificSeafood

PACIFIC COAST SEAFOOD

450 NW SKIPANON DRIVE • P.O. BOX 70 • WARRENTON, OR 97146

(503) 861-2201 • FAX (503) 861-0000

March 20, 2008

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Chairman
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7700 NE Ambassador Place, Suite 101
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Sincerely,

Boisvert
Jerry Boisvert, Fresh Sales

www.pacseafood.com

Mr Donald Hansen – Chairman
Pacific Fishery Management Council
7700 NE Ambassador Place, Suite 101
Portland, OR 97220-1384

March 18, 2008

Dear Mr. Chairman,

As purchasers and sellers of West Coast seafood products, we have a great interest in protecting and promoting a vibrant and sustainable fishing and seafood processing industry. Combined, Oregon restaurants and grocers represent thousands of jobs and a huge sales market for West Coast fish and seafood products.

Along the West Coast, we are blessed with some of the highest quality seafood products on the planet. Getting these products from the Pacific Ocean to grocery carts and restaurant plates requires a healthy fishing industry, a healthy and innovative processing sector and an efficient distribution and transportation network. Each segment is critical to the success of the entire industry.

As you consider adopting new rules that govern how fish are caught and processed along the West Coast, we urge you to adopt rules that are fair to both fishermen and seafood processors. As we understand it, the initial quota allocations will be made according to historical industry contributions and there can be no doubt of the equally important historic roles played by both the fishing and the processing sectors in creating a sustainable industry. A quota program that fails to recognize the critical role of processors in creating markets for seafood products will have an adverse impact on the entire industry, including consumers. In short, fishermen need processors to be healthy, processors need fishermen to be healthy, and consumers need them both healthy to insure that only the finest and freshest products reach the market place.

We are proud of our relationships with fishermen, processors and everyone in between who help us deliver fine seafood products to our customers. I support new rules that will make the industry stronger and urge you to consider the impact new rules will have on the entire business sector.

Sincerely,

(Bonnie)

Bonnie Axelson
President
The Seafood Merchants, Ltd.

March 20, 2008

Mr. Donald K. Hansen
Chairman
Pacific Fishery Management Council
7700 NE Ambassador Place, Suite 101
Portland, Oregon 97220-1384
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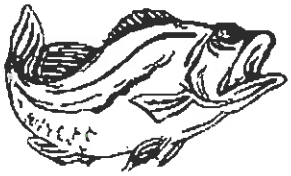
Sincerely,

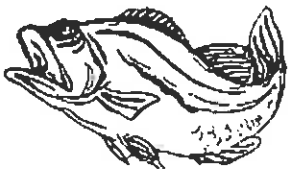
Blair Calkins
Calkins & Burke LTD
Vancouver



NAFCO

Wholesale Fish

MARYLAND WHOLESALE SEAFOOD MARKET



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Sincerely,

Mark Emmons

Stanley Pearlman Enterprises, Inc. • T/A Nafco • 7901 Oceano Ave. 54/60, Jessup, MD 20794
410-799-7655 • Fax 410-799-1394

SAVE MART SUPERMARKETS
P.O. Box 4278, Modesto, California 95352-4278
1800 Standiford Avenue, Modesto, California 95350
Corporate Office (209) 577-1600
Merchandising (209) 574-6277

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Sincerely,
David C Benson
Dave Benson
Category Manager Meat/Seafood
Save Mart Supermarkets

March 20, 2008

Barnacle Bill's Seafood
2174 N E Hwy 101
Lincoln City, OR. 97367

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Chairman
Pacific Fishery Management Council
7700 NE Ambassador Place, Suite 101
Portland, Oregon 97220-1384
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Sincerely,

HALLMARK INNS & RESORTS, INC

Luis Anduiza
Executive Chef

744 S.W. Elizabeth St.
Newport, OR 97365
(541) 265-9800
Fax (541) 265-9449
Email: georgies@actionnet.net

Home of

March 20, 2008

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Chairman
Pacific Fishery Management Council
7700 NE Ambassador Place, Suite 101
Portland, Oregon 97220-1384
Fax 503-820-2299

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Sincerely,

Luis Anduiza

March 20, 2008

Tidal Raves
SEAFOOD GRILL
casual sophisticated dining on the edge of the Pacific Ocean

279 NW Hwy 101
PO Box 929
Depoe Bay, OR
97341

phone 541-765-2995

Mr. Donald K. Hansen
Chairman
Pacific Fishery Management Council
7700 NE Ambassador Place, Suite 101
Portland, Oregon 97220-1384
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Sincerely,

FWS COLUMBIA RIVER 2008 CHINOOK MASS MARKING

1/15/2008

Species: Chinook
Area: Columbia River
Brood: 2007
Release Year: 2008 and 2009
Program Levels: Actual releases and marking levels may be somewhat higher or lower depending on actual rearing cycle.

			Number of fish to be released with a CWT		Number of fish to be released without a CWT			Proposed to be marked this year	Marked in previous year	
Agency	Hatchery	Stock	Ad Clipped	Unclipped	Ad Clipped	Unclipped	Total Production	(Y/N)	(Y/N)	Comments
FWS	Spring Creek NFH	Spring Creek - Tule Falls	450,000	450,000	14,200,000	0	15,100,000	Y	Y	
FWS	Little White Salmon NFH	Little White Salmon - URB Falls	200,000	200,000	1,600,000	0	2,000,000	Y	Y	
FWS	Little White Salmon NFH	Little White Salmon - URB Falls	200,000	0	0	650,000	850,000	N	N	YN-Prosser release, broodstock shortfall, ~1/2 of normal 1.7M program
WDFW	Priest Rapids	Priest Rapids - URB Falls	0	0	0	0	0	N	N	Broodstock shortfall, no fish for program in 2008
		Total Fall Chinook	**850,000**	**650,000**	**15,800,000**	**650,000**	**17,950,000**			
FWS	Carson NFH	Carson - Springs 1+	75,000	0	1,095,000	0	1,170,000	Y	Y	
FWS	Willard NFH	Little White Salmon - Springs 1+	50,000	0	400,000	0	450,000	Y	Y	Drano Lake release
FWS	Little White Salmon NFH	Little White Salmon - Springs 1+	75,000	0	475,000	0	550,000	Y	Y	
FWS	Little White Salmon NFH	White River - Wenatchee Springs 1+	0	150,000	0	0	150,000	N	N	White River restoration program
FWS	Carson NFH	Little White Salmon - Springs 1+	50,000	0	200,000	0	250,000	Y	Y	Walla Walla R. release
FWS	Warm Spings NFH	Warm Springs - Springs 1+	750,000	0	0	0	750,000	Y	Y	Fish loss, production will be lower
FWS	Leavenworth NFH	Leavenworth - Springs 1+	200,000	0	1,425,000	0	1,625,000	Y	Y	
FWS	Entiat NFH	Entiat - Springs 1+	0	0	0	0	0	N	Y	Spring Chinook program discontinued
FWS	Winthrop NFH	Methow - Springs 1+	0	600,000	0	0	600,000	N	N	Restoration program
FWS	Kooskia NFH	Kooskia NFH - Springs 1+	125,000	0	475,000	0	600,000	Y	Y	
FWS	Dworshak NFH	Dworshak - Springs 1+	120,000	0	930,000	0	1,050,000	Y	Y	
		Total Spring Chinook	**1,445,000**	**750,000**	**5,000,000**	**0**	**7,195,000**			
		Total Chinook	**2,295,000**	**1,400,000**	**20,800,000**	**650,000**	**25,145,000**			

Total Chinook Production **25,145,000**
Total Percent Marked **92%**

FWS NORTH COAST AND PUGET SOUND 2008 CHINOOK MASS MARKING

1/15/2008

Species: Chinook
Area: North Coast and Puget Sound
Brood: 2007
Release Year: 2008
Program Levels: Actual releases and marking levels may be somewhat higher or lower depending on actual rearing cycle.

Agency	Hatchery	Stock	Number of fish to be released with a CWT		Number of fish to be released without a CWT			Proposed to be marked this year (Y/N)	Marked in previous year (Y/N)	Comments
			Ad Clipped	Unclipped	Ad Clipped	Unclipped	Total Production			
FWS	Makah NFH	Sooes River Falls	260,000	0	1,940,000	0	2,200,000	Y	Y	
FWS	Quinault NFH	Cook Creek/Quinault Falls	200,000	0	400,000	0	600,000	Y	Y	
		Total Chinook	**460,000**	**0**	**2,340,000**	**0**	**2,800,000**			

Total Chinook Production **2,800,000**
Total Percent Marked **100%**

FWS COLUMBIA RIVER 2008 COHO MASS MARKING

1/15/2008

Species: Coho
Area: Columbia River
Brood: 2007
Release Year: 2009
Program Levels: Actual releases and marking levels may be somewhat higher or lower depending on actual rearing cycle.

Agency	Hatchery	Stock	Number of fish to be released with a CWT		Number of fish to be released without a CWT		Total Production	Proposed to be marked this year (Y/N)	Marked in previous year (Y/N)	Comments
			Ad Clipped	Unclipped	Ad Clipped	Unclipped				
FWS	Eagle Creek NFH	Eagle Creek - 1+	25,000	25,000	350,000	0	400,000	Y	Y	
FWS	Eagle Creek NFH	Eagle Creek - 1+	30,000	30,000	0	215,000	275,000	N	N	Potlatch R. Release - NPT restoration
FWS	Eagle Creek NFH	Eagle Creek - 1+	30,000	30,000	0	215,000	275,000	N	N	Lapwai Cr. Release - NPT restoration
FWS	Eagle Creek NFH	Eagle Creek - 1+	0	0	450,000	0	450,000	Y	Y	Yakima R. Release - YN
FWS	Willard NFH	Wenatchee - 1+	0	1,000,000	0	0	1,000,000	N	N	Wenatchee R. Release - YN restoration
ODFW	Cascade Hatchery	Wenatchee - 1+	0	950,000	0	0	950,000	N	N	Wen. R. Rel. - (Tagged by FWS) YN restoration
FWS	Entiat NFH	Wenatchee - 1+	0	200,000	50,000	0	250,000	N	N	YN restoration program
FWS	Winthrop NFH	Wenatchee - 1+	0	500,000	0	0	500,000	N	N	YN restoration program
FWS	Kooskia NFH	Dworshak - 1+	0	120,000	0	160,000	280,000	N	N	NPT restoration program
		Total Coho	**85,000**	**2,855,000**	**850,000**	**590,000**	**4,380,000**			

Total Coho Production **4,380,000**
Total Percent Marked **21%**

FWS NORTH COAST AND PUGET SOUND 2008 COHO MASS MARKING

1/15/2008

Species: Coho
Area: North Coast and Puget Sound
Brood: 2007
Release Year: 2009
Program Levels: Actual releases and marking levels may be somewhat higher or lower depending on actual rearing cycle.

Agency	Hatchery	Stock	Number of fish to be released with a CWT		Number of fish to be released without a CWT			Proposed to be marked this year (Y/N)	Marked in previous year (Y/N)	Comments
			Ad Clipped	Unclipped	Ad Clipped	Unclipped	Total Production			
FWS	Makah NFH	Sooes River	40,000	40,000	160,000	0	240,000	Y	Y	
FWS	Quinault NFH	Cook Creek	80,000	80,000	500,000	0	660,000	Y	Y	
FWS	Quicene NFH	Big Quilcene River	40,000	40,000	320,000	0	400,000	Y	Y	
		Total Coho	**160,000**	**160,000**	**980,000**	**0**	**1,300,000**			

Total Coho Production **1,300,000**
Total Percent Marked **88%**

COUNCIL COORDINATION COMMITTEE MEETING
MARRIOTT FRENCHMAN'S REEF HOTEL
ST. THOMAS, U.S. VIRGIN ISLANDS
MAY 6-9, 2008

TENTATIVE AGENDA

TUESDAY, MAY 6, 2008

8:30 a.m. - 9:30 a.m. Opening Remarks

- U.S.V.I. Government Officials
- CFMC – Eugenio Piñeiro
- NOAA Fisheries -VADM Conrad C. Lautenbacher, Jr.

9:30 a.m. - 12:00 noon Separate Sessions NMFS and Councils

12:00 noon - 1:30 p.m. **Lunch**

1:30 p.m. - 5:00 p.m. MSRA Implementation Issues

A. ◦ Discuss agency progress on NS1 Guidelines concerning ACLs/AMs.

B. ◦ Discuss agency progress on NEPA compliance procedures.

C. ◦ Discuss agency progress on NMFS guidance regarding implementation of LAPPs.

D. ◦ Discuss and review progress regarding incorporation of SSC into council specification setting processes, and is role as peer review body, as well as those of other advisory roles.

E. ◦ Discuss progress on developing 5-year research programs with SSC.

F. ◦ Discuss Councils efforts to end overfishing and status of rebuilding stocks that are overfished. (Each council will address this item.)

WEDNESDAY, MAY 7, 2008

8:30 a.m. - 10:45 a.m.	Other MSRA Implementation/Legislative Issues	
	G.	◦ Progress report on MRIP.
	H.	◦ Coastal States Organization (CSO) perspective on HR 21.
	I.	◦ Receive/discuss status of: HR 4087; HR 5425; or any other bill relevant to councils or NMFS.
10:45 a.m. - 11:00 a.m.	**Coffee Break**	
11:00 a.m. - 11:30 a.m.	U.S. Coast Guard Report	
11:45 a.m. - 5:30 p.m.	**FIELD TRIP TO ST. JOHN**	

THURSDAY, MAY 8, 2008

8:30 a.m. – 12:00 noon	Council Administrative Matters
J.	◦ Discuss FY 09 Appropriation Bill and how to address its impact on councils.
K.	◦ Discuss FY 09 stipends for SSC and need for a nationally consistent payment level.
L.	◦ Discuss FY 09 stipends for Industry Advisors.
M.	◦ Discuss FY 10 budget formulation activity.
N.	◦ Discuss status of SOPPs in terms of agency approval and need to have a national "template."
O.	◦ Discuss upcoming 5-year grant award process (FY 2010 - 2014) and related procedures.
12:00 p.m. to 1:30 p.m.	**Lunch**
1:30 p.m. - 3:00 p.m.	Continue Council Administrative Matters
3:00 p.m. - 3:15 p.m.	**Coffee Break**
3:15 p.m. - 5:30 p.m.	Issues Joint Concern/Interest NOAA/NMFS
P.	◦ Marine Sanctuary Program.
Q.	◦ MPAs and FAC Report
R.	◦ Use of performance metrics for budget allocation purposes, e.g., Councils' FSSI scoring system.
S.	◦ Discuss FY 2008 budget needs/relief for councils.

FRIDAY, MAY 9, 2008

8:30 a.m. - 12:00 noon:	Councils Only Session (If needed.)

Northwest Survey of Pacific Sardine

Pacific sardine industry representatives are sponsoring a new aerial survey of Pacific Sardine abundance off the coasts of Washington and Oregon. A workshop was held in Portland, Oregon on March 18, 2008 to review and comment on the initial survey proposal. The following materials are included in this report for your information.

NORTHWEST SARDINE SURVEY

Introduction

Sardine industry representatives from the Northwest and from California are funding a Northwest Sardine Survey. The planning for this cooperative research project is well underway. An initial survey design proposal (see "survey proposal") was presented at a workshop held at the PFMC offices in Portland on March 18th. The day long discussion was attended by scientists from NOAA and the states of Washington, Oregon and California. The workshop resulted in producing several refinements and clarifications to the survey proposal (see "workshop notes").

At present, the planning and design refinements are ongoing. The workshop participants pledged to continue providing valuable inputs to aid in the success of the project. It was felt that the workshop provided the necessary ground work for cooperation between the Sardine industry and the scientific community.

Project Objectives

To document that in one location, approximately 70 nautical miles north and 70 nautical miles south of the Columbia River mouth there is a population of Sardines that is several multiples of the quantity of Sardines predicted by the present model for the entire West Coast between Mexico and Alaska.

To collect data during the 2008 fishing season from July 1 to Mid-September that can be accepted as statistically valid by the SSC and be utilized and included in the existing SS2 model to better reflect actual conditions.

Methods

A broad random aerial survey will be conducted off the Washington and Oregon coastline using calibrated aerial photography to document relative sardine abundance.

In addition, another survey, using the same calibrated aerial photography will be performed to determine the population of abundance for a specific area near the mouth of the Columbia River.

These surveys will be conducted with the help of industry pilots and fishermen. The pilots will be using special imaging equipment mounted in their aircraft to record schools of fish that are visible from the air. The fishermen will then catch the actual fish that was recorded photographically by the aerial camera. The sardines caught by the fishermen will then be delivered to processors and weighed dockside for calibration purposes. The data collected will produce a measurable index:

SQUARE METERS OF VISIBLE SARDINE = X (METRIC TONS of SARDINES)

The indexed measurement produced will be applied to each photographic record observation to arrive at a total observed quantity.

All of the data collected will be provided to all areas of interest and importantly the NOAA scientists involved with the sardine stock assessment. A presentation of this project will be made available during the June Council meeting.

Regards,

Jerry Thon - Sardine Industry Representative

Proposal for a study of the feasibility of using an aerial survey to determine sardine abundance off the Washington-Oregon coast in conjunction with fishing vessel observation of spotted schools.

Prepared by Vidar G. Wespestad and Tom Jagielo

Background

Fishermen and processors report large concentrations of sardine off the Oregon and Washington coasts, particularly in the Columbia River area. NMFS vessel surveys have not located large concentrations in these areas, nor have they found any indication of spawning in the area. There are questions of stock structure and migration patterns that will require research to answer, but a first step is to explore and develop an abundance estimation protocol for the area north of California. The industry would like to evaluate the feasibility of using aerial based surveys with fishing vessel observations of underwater density and distribution to produce estimates of absolute abundance, or at a minimum the framework for a relative abundance estimate.

The basic plan is to use a spotter aircraft to fly track lines in a manner that will encompass the expected range of sardines off Washington-Oregon. A preliminary design and placement of track lines has been discussed with spotter pilots and fishermen. The research plan is designed to collect all observation digitally for subsequent analysis, review, and validation.

Central to the program will be an aerial-photogrammetric digital camera mounting system equipped with a data acquisition system capable recording altitude, position, and spotter observations (Appendix A). Comments can be entered (typed) into the log at any time by clicking on the "Comment" button in the program. The records are time, position, altitude, and speed stamped. Every record in the file begins with a "type" identifier, which allows for specific record type sorting. The log can be viewed from within the program, at any time. These data will be directly linked to the time stamped quantitative digital imagery. This is a critical item, as it is the primary tool for analysis of surface area of sardine schools. We have consulted with NMFS scientists experienced with quantitative aerial survey applications (Wayne Perryman, SWFSC and Lowell Fritz, AFSC) and have contacted the same vendor they have used (Don LeRoi, Aerial Imaging Solutions) to enquire about procuring such a system.

A second important element of the program is to collect at-sea data on the bathymetric distribution of sardine schools via echo sounder, sonar and possibly sidescan sonar that are aboard the purse seine vessels fishing sardine in the area. The vessels to be are sardine seine vessels in the length range of 58-90 ft. The catcher vessels for the survey will utilize sounders and sonars that have recording capabilities. For vessels that have no recoding capabilities the project will purchase a Simrad ES 60 with a 36-11 transducer. The transducer will be pole mounted and transferable between vessels. Prior to use the systems will be "calibrated" using a calibration sphere to test the transducer for on axis TS measurement and swung thru the transducer quadrants to insure all quadrants are

working properly (NMFS/AFSC/MACE ES-60 operation manual). The transducer will also be run in passive mode to evaluate noise characteristics.

Survey Methodology

At present, our concept for the survey design is preliminary, pending collaboration with other interested parties whom we expect to participate in a workshop to be held in Portland on March 18th. The goal of the workshop will be to develop a scientifically valid consensus plan to test the feasibility of deriving aerial based estimates of sardine abundance off Washington-Oregon.

We propose a three phase feasibility study approach as follows:

Phase I: Methodology Validation and Fishery Coordination.

The objectives of this initial phase will be to 1) conduct a small-scale aerial survey in conjunction with the purse-seine sardine fishery operating off the Columbia River area, and 2) validate aerial transect photogrammetric and at-sea sampling methodologies for a subsequent broad scale survey. Work will be focused on quantifying school distribution within a small area, monitoring daily and diurnal school variability, collecting biological data, and documenting ocean conditions.

An aircraft equipped with the aerial-photogrammetric camera and data acquisition system (described above and in Appendix A) will record schools that are set on, and the seine vessels equipped with proper electronics and recording equipment will provide school height data and possibly school shape. For fully captured schools the total weight of the school will be recorded and numbers per unit weight also determined. Purse seine vessels will be directed to schools by spotter pilots to scan schools to determine the height and shape of the school. Purse seine vessels will also be directed to fish on schools of varying dimensions to determine the volume of the captured school.

In this phase, it may also be possible to coordinate aerial surveys and possibly test sets in conjunction with planned SWFSC summer acoustic and egg surveys of the area. The spotter plane could join the NOAA research vessel on one or more days to record the distribution of schools on the research trackline and in adjacent areas to evaluate our ability to estimate the quantity of sardines subject to hydroacoustic sampling.

The project will require a student intern/scientific technician to work on the seine vessels to collect age structures, length and weight of sardines, and to observe and collect maturity data. This could also be a NMFS-Industry cooperative activity that could be expanded if desired.

Phase II: Broad-Scale Survey

The second phase will employ the methods developed and refined during Phase I to determine the feasibility of conducting a quantitative aerial survey of a much broader

area, extending from about 46º N. to the U.S.-Canadian border. The objective of this survey will be to estimate sardine biomass in the broad survey area using a scientifically reproducible methodology.

There are several methods of establishing tracklines and how they are surveyed. In this instance we propose two different levels of coverage and methods for discussion purposes. We hope to develop a better understanding of sardine distribution and general abundance off the north coast during the first phase of this project during June and July. With that information it may be possible to focus the survey on the primary areas of distribution and concentrate effort in these areas. However, if that isn't possible a survey will be run with the following specification. The distribution of tracklines dependent on aircraft type and funds.

Parallel survey transect lines will be oriented in an east-west direction and nominally 50 nm in length. The origination point for the initial westbound transect will be randomly selected, with the position of subsequent transects adjusted to the starting point. The transect will follow a set, straight-line course offshore for 50 nm, with the plane flying at an elevation of 1,000 to 2000 feet depending on overcast and sighting conditions. At an average flight speed of 80 knots, and with spacing between parallel transects of 50 nm, the survey area could potentially be covered with 6 east-west transects and a total flight distance of 450 nm (Figure x). Flight time for this plan would take approximately 6 hours. Alternatively, at a flight speed of 200 knots (e.g. with a twin engine Cessna 337 airplane), 16 east-west transects spaced 10 m apart could cover the survey area in approximately 5 hours. These preliminary suggestions are for planning purposes only, and will be modified as needed to achieve the objectives determined at the Survey Planning Workshop, and from the experience gleaned in Phase I. For example, it may be desirable to employ adaptive sampling to run finer scale transects in areas of large numbers of sardine schools. Adaptive sampling, however, requires prior knowledge of the underlying probability distribution, which we would need to obtain from preliminary sampling in Phase I.

Fishermen and pilots are proposing a north-south axis of transect lines between Pt. Lookout Oregon and Cape Elizabeth, Washington flying at an elevation of 1,000 to 5,000 feet, depending on overcast and sighting conditions, at an average flight speed of 80 to 180 knots. The proposal is to begin transects near-shore and fly north from Pt. Lookout 2 miles parallel at the 124ºW longitude, then move offshore 2 miles and proceed south. The survey would continue to work off-shore at 2 nm intervals until 124º 30' W longitude from where transects will proceed at 10 nm intervals until 125ºW longitude.

It is believed that this is the most efficient way of covering the area and the search area will include the majority of the Washington and Oregon sardine distribution. This survey pattern also provides greater safety for survey pilots. The sardine workshop will explore these and other potential survey designs to generate a design that will provide the best means of getting a statistical reliable estimate of the amount of sardines in the area while maximizing flying safety and minimizing costs.

A minimum of three full surveys will be flown through the range of sardines off Oregon and Washington to derive enough abundance estimates to calculate a survey variance. Surveys will be attempted from late July to early September when conditions are

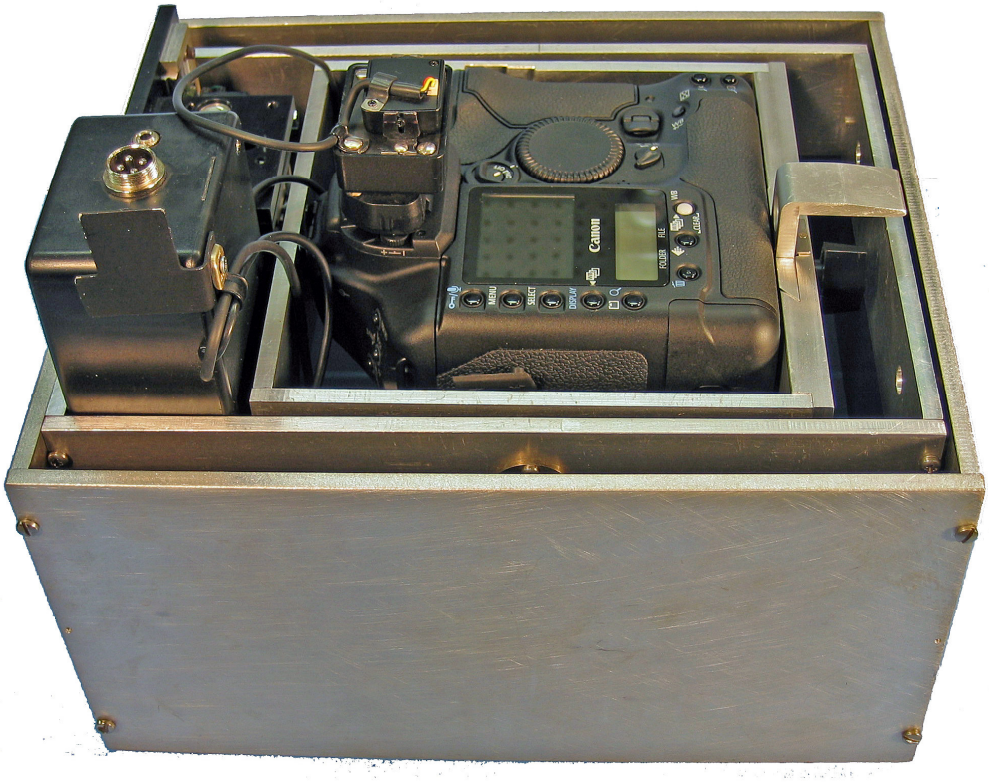
optimum for school detection. Purse seine vessels will sample schools on the transect lines using the stratified random sampling methods refined in Phase I.

Phase 3: Analysis and Estimation

The final phase of the project will be to analyze the aerial survey data and to estimate sardine biomass. A digital imagery data editing program will be used to process the photogrammetric images. Initial screening will be used to reduce the imagery data to total surface area of sardine observed. Acoustic data from the at-sea sampling will be reduced to characterize the vertical dimension of the sampled schools. A variety of statistical methods have been applied previously to analyze spatial sampling data of the type we will be collecting. They include stochastic geometry, kernel estimation (ref), simple random sampling, adaptive sampling, and cluster analysis. The final method or set of methods chosen will be driven by our success in achieving the sampling assumptions required for executing Phase I and Phase II of the project.

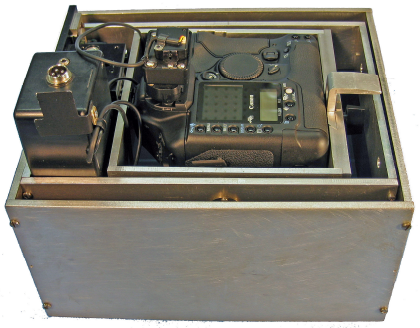
In its simplest form, estimation of biomass is obtained by taking the product of 1) mean transect density and 2) total survey area, where mean transect density is obtained as the product of 1) observed school surface area along a transect line and 2) mean density of the sampled schools. Mean school density is obtained by dividing the at-sea estimated tonnage from purse seine sampling of the school by the observed school area. Care will be taken to ensure that only fully captured schools are used for the school density analysis. Sampling variance will be estimated for each parameter and the overall variance of the biomass estimate calculated. Schools will most likely be stratified by school size (and possibly other factors such as location, time of day, tidal cycle, or weather conditions) to reduce the variance of the final biomass estimate.

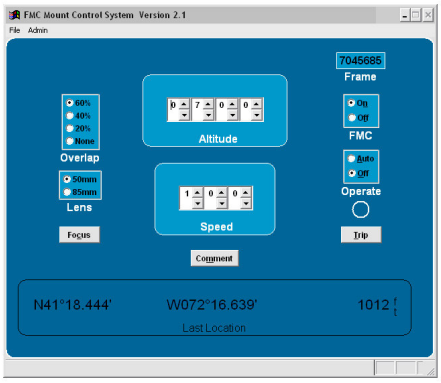
AERIAL IMAGING SOLUTIONS
FMC MOUNT SYSTEM



DESCRIPTION

An aerial mount system for digital cameras that reduces image blur caused by the forward motion of the aircraft while the shutter is open. The mount and camera are connected to, and remotely controlled by, a program running on a customer-supplied (Windows-based) computer. Flight and camera parameters entered by the computer's operator determine the required forward motion compensation (FMC) and camera firing interval. The system also takes inputs from the customer-supplied GPS and radar altimeter and will, optionally, use these data to automatically determine the required FMC and firing interval. The system includes a remote viewfinder that displays the image seen through the camera's eyepiece on a small monitor to permit the computer operator to observe camera operation to ensure successful coverage of sites. It also includes a data acquisition system that interfaces with the camera, GPS, radar altimeter, and computer to record position and altitude readings as each frame is collected.





TECHNICAL SPECIFICATIONS

Cameras Accepted

- Canon EOS-1Ds (Standard)
- Any small or medium format digital camera (Custom)

- **FMC Drive**
  - Servo motor with closed-loop control circuit

- **Weight and Dimensions (Approximate)**
  - Weight w/Camera and cables: 15 lbs (6.8 kg)
  - Length: 11.3” (287 mm)
  - Width: 9.8” (250 mm)
  - Height: 9.3” (237 mm)

- **Environmental**
  - 32° F to 113° F (0° C to 45° C)

- **Power**
  - 28 V DC @ 3A

- **Setup and Pre-flight Testing Time**
  - Approximately 2 hours

Contents of System

- Mount
- Mount Controller
- Control Program
- Data Logger
- Cables
- Transportation Box

Sardine Survey Planning Workshop
March 18, 2008
Portland, Oregon

The Northwest Sardine industry is sponsoring an aerial survey of sardine abundance off Oregon and Washington to augment the current NMFS acoustic survey. The industry believes that a better assessment of abundance can be developed through a cooperative research approach using industry resources. To facilitate this survey a coalition of fishermen and processors hired two biologists to develop and oversee the survey effort. The first step was the preparation of a survey plan that utilizes the industry's resources of vessels and aircraft. This workshop was designed to get input from all agencies and public that have an interest in Pacific sardine, including parties from Canada who were invited but unable to attend.

Jerry Thon of Astoria Holdings opened the meeting, thanking all those in attendance for their interest in participating. He stated that industry is committed to doing the survey this summer and he hoped that this meeting will provide ideas to improve the survey and to develop cooperative efforts among parties. The next steps in the process are to 1) take input and ideas on the draft proposal, 2) flesh out the survey details, and 3) prepare a final survey plan for implementation. He strongly encouraged all to speak up with any issues, ideas, and input they could contribute to help the success of the project.

The meeting went on to a short review of ongoing sardine research starting with the current NMFS survey program. Roger Hewitt, SWFSC described the NMFS program. Four coast wide synoptic survey in 2006. Two coastwide surveys are planned for April and July of 2008, which will cover all three states. NMFS will sample eggs and adult spawners for an egg-production survey out to 150-200 miles offshore. Acoustic work will also be done. One ship will work from Cape Flattery, WA to the south, the other from San Diego, CA to the north. Data from the April survey will be used to inform the next sardine stock assessment. Data from the July survey will be collected too late for the assessment.

His account was followed with some questions from participants relating to survey methodology, area coverage, and timing.

Roger Hewitt related that the survey vessel will use an EK-60 with multi-frequencies (18-200kHz.) in order to use spectral analysis to discriminate sardines from other species. Downward looking acoustics do present a problem for epipelagic species like sardine; the unobserved proportion of fish near the surface must be estimated. Scientific sounders and procedures used to estimate biomass will be similar to surveys for hake and other pelagic species

NMFS currently is not conducting aerial surveys for sardines. However, it has extensive experience collecting, analyzing and including spotter pilot data in pelagic fish stock assessments (1962 - 2002). In addition, a systematic aerial survey with regular transect

lines was conducted for 3 years. Diane Pleshner-Steele related that there was also a joint NMFS/ spotter pilot aerial effort in 1993.

Kym Jacobson from the NWFSC Newport Lab described the surveys they conducted on juvenile salmon. These surveys also capture sardines and survey variation in sardine abundance may reflect abundance of sardine in the area. Jacobson is also examining macro-parasites in sardines, along with her student, Rebecca Baldwin. This work may provide some insights into the stock structure of sardines.

After the review of current research and planned work on sardine by other investigators the workshop moved to a description of the industry planned surveys. Industry members, utilizing charts, showed the range of where the fishery has operated, mostly off the Columbia River and extending slightly northward.. Fish were caught two years ago off the Northern WA coast; recently less so. Most fishing occurs within 30 miles of shore; further offshore it is difficult to capture sardines, presumably because of fish avoidance due to water clarity.

Fish ticket data presented by WDFG confirmed the localized fishing distribution. It was pointed out that numbers of sardine schools have been spotted off Crescent City and Cape Blanco as well and fishermen have delivered sardines in March and April from around Heceta bank

The fishery distribution data indicated that the survey bounds are the US border on the North and the approximate Oregon-California border as the southern boundary. There was some discussion of concentrating the survey off the Columbia River; however, the group thought conducting a wide-area/more synoptic survey would give a more complete picture of sardine distribution and better characterize variability and patchiness. Kim Jacobson and others advocated conducting the survey with a southward extent reaching to at least Cape Blanco.

Offshore work appears limited beyond the continental slope because of difficulty in capturing sardine. . The exchange of information further indicated the scope of the survey is from Cape Flattery to Coos Bay. The first step is a feasibility study to see if fishermen’s equipment on the grounds can be used.

The camera and data-acquisition setup. A seamless series of photos will be taken along a transect line and the strut, with the camera system software. Relevant data are logged with each photo and include altitude, position, and observer notations.

The camera can be mountable on multiple planes, the manufacturer (Don LeRoi-Aerial Imaging Solutions) says it could be mounted on the strut, with the controller box inside the plane. Roger Hewitt said this is similar to a system used by the SWFSC for marine mammal surveys. It was included in the SWFSC aerial survey plan that was distributed in January and estimated to cost about $30,000. For previous spotter-pilot surveys, SWFSC has used a separate data logging system to automate recording the pilot's counts of particular species and index them by time and position.

Frank Foode related that from a pilots perspective, mid day and slack tides are best for sighting fish. High water at 11 am is best. In September, schools down to 20-30 fm deep. How will you account for what you miss from the air?

Frank Foode related that from a pilot's perspective, mid day and slack tides are best for sighting fish. High water at 11 am is best. In September, schools get more dense and deeper (20-30 fm in the water column) compared to July when schools are 10-15 fm deep. In general, the higher altitude you can go the better, if clouds don't get in the way. Small tides from July 20 – August 20 with a light NW wind (15 knots) would provide optimum conditions for spotting fish.

This followed with a discussion of how the survey results will be used. Vidar stated that the primary design is an index survey. The initial goal is to develop a means to measure the surface area of the schools as seen from the air, and then use a combination of sonar and echosounders to develop relationships between surface area and actual school volume and school height. Roger Hewitt noted that in anchovy schools, he has observed much more variability in the surface formation than in the sub-surface shape. If this is true for sardine, focusing on getting the surface area would be a good first cut. If this is true for sardine, focusing on estimating the surface area would be a good first cut. A subset of the observed schools could then be sampled to determine their weight per unit of surface area. He further suggested that the sampling be stratified by school size, season, and geographic area in order to account for potential changes in fish behavior. The result will be a distribution of values that will form the basis for estimating the parameter weight-per-unit-of-school-surface area. The work should be done over several seasons to observe variability.

Mike Okoniewski agreed with Roger that we should do the calibration work as soon as possible to establish the relationship between surface area and the density of schools. Vidar stated that yes; we want to start observing as soon as the fishery starts.

The aspect of offshore observation and catchability of sardines suggests that it may be beneficial to try and do aerial surveys in cooperation with the NMFS SWFSC acoustic surveys. It was noted that the July survey on the R/V David Starr Jordan, the segment from Cape Flattery, WA to Coos Bay, OR, will take about 15 days, and will have 30-40 nautical mile spaced tracklines. This could provide a good opportunity for collaboration with the pilots flying some of the same transects. Mike Okoniewski noted it may be possibly to conduct collaborative work in April too since some companies plan to conduct fishing operations in April. Further discussions are planned to coordinate aerial flights with the SWFSC surveys to compare observations and controlled sets by fishing vessels if possible.

A general discussion ensued regarding the process of sampling schools at sea that are identified from the spotter pilot in the air. Doyle Hannan asked if pilots locate the school first, then send a boat to fish on it, or the reverse. Roger replied that ideally, you want to identify a particular school first, so you can measure its surface area without vessel

interference. Then, send a boat over to capture the entire school. Stan and some of the pilots responded that capturing the entire school may be problematic at times.

What the pilot sees from the air could turn out to be quite different when approached by the vessel. For example a school could be much larger than it appeared to be from the air. Pilots stated that there is a low probability of misidentification of schools from the air. The pilots said it is pretty easy to discriminate from the air; and cues like location and timing can help identify schools by species and camera images should show the same characteristics.

Rod Moore asked what can realistically be accomplished in year one? The reply was that the outcome depends on if we can coordinate the aircraft and the vessels to obtain a series of school observations with vessel density estimation. We will need at least a month of air-vessel calibration work before engaging in any synoptic survey. Calibration and refinement will continue into the full survey, too.

Keith Matteson asked if there have been other species that have been assessed by aerial surveys. Participants noted that aerial surveys have been used for Alaska herring and African sardine, but primarily as an in-season management tool rather than a quantitative assessment.

Tom Jagielo presented several PowerPoint slides (attached) and discussed how the aerial survey data could be incorporated into the current stock assessment model:

1) Items that will ultimately be required to incorporate the survey data into the Stock Synthesis Model.
2) Factors important to consider in the full survey design (Phase II),
3) Elements of the belt transect methodology, and
4) factors to consider for sampling the sardine schools at sea.

There was a discussion about details of the survey sampling design. For the sample unit, the survey will likely start with each individual East-West (E-W) transect as a sampling unit. Transects could be broken into segments or even down to the individual photos as sampling units. A series of these E-W transects will be run along the coast. Averaging them will give the average surface area coverage of the schools. On transect direction (run North-South (N-S) or E-W), the goal is to design a survey where sample units are placed with randomization such that each sample has the same probability of detection. The advantage of E-W transects is they are more likely to cross the density gradient of sardines running in a bathymetric band along the coast. This will help to reduce the variance of the estimate. Roger Hewitt suggested that a zig-zag transect arrangement with a randomized starting point for each survey may be a more efficient use of air time and yet still meet the requirements of a random sample.

At the conclusion of the discussions of the aerial survey it was determined that the work should proceed on quantifying the relationship between aerial observations and school volume. If this work is promising then planning should proceed toward attempting

broad scale surveys on a zigzag pattern between at least Cape Blanco and the US Canada boundary.

A final step was collection of biological data and validation of actual haul weight. Roger Hewitt related that the SWFSC is interested in obtaining samples for age, fecundity and other biological data. He suggested that 100 fish/haul be collected for length frequency, and 50 fish be preserved for SWFSC analysis. As for haul weight the program will attempt to get a combination of "hailed weight" by the vessel as well as actual delivery weights. There could be problems of estimation if multiple hauls are combined for delivery. The fish are held in slush ice which may make it difficult to do volumetric estimation from the ships tanks. If a suitable method can not be worked out calibration hauls may have to be limited to one haul per delivery.

Jerry Thon asked how the industry can be assured that the data collected will be acceptable by the Council, NMFS, or peer-reviewed standards. Tom and Vidar related that the aerial surveys should have enough data from the camera system that the results can be completely reconstructed. Documenting the work at sea will be more difficult. We will have observation and sampling at sea by a student intern/scientific technician; however, we may need additional field samplers.

It was asked how much motivation is there be among the boats and pilots participating to continue this activity on a continuing basis. The proponents stated they have a strong level of commitment and expect to carry this on for multiple years to get the best information possible for the assessment

Diane Pleshner-Steele said that she would like to conduct a similar survey at the same time in the CA region. Mike Okoniewski added that work may also be occurring in Canada at the same time, as well. So, if coordination is established it may be possible to get a complete synoptic view of sardine abundance over most of the range.

The discussions then moved to questions relating to the availability of fish for research. It was noted that there is a high demand for sardine and catch rates relative to quota may result in periods where research can not be conducted during fishing. Jerry Thon asked if NMFS allows the use of set-aside fish for research, to accomplish the calibration work outside of the harvest season (for example between January-June or after September).

Josh Lindsay of the SWRO stated that this may be problematic. To collect whole schools may require an Experimental Fishing Permit (EFP). Pending an EFP the industry representatives present discussed possible changes in fishing to allow some fish to remain available for research in the closed fishing periods.

That concluded the agenda and discussions and the industry agreed to produce a modified proposal based on the discussions and to coordinate with NMFS on final survey planning.

Rod Moore suggested that an informational report on the progress of the proposal, and possibly the notes from this meeting to be included in the April Council briefing book.

Jerry Thon thanked all participants for coming and contributing to the effort. It is much appreciated and a successful meeting.

Attendees
Jerry Thon – Astoria Holdings
Carol Henry – WDFW Montesano
Theresa Tsou –WDFW Olympia
Cory Niles – WDFW Montesano
Mike Burner – PFMC staff
Josh Lindsay – NMFS SWR
Tom Jagielo - Jagielo International
Vidar Wespestad - Resource Analysts Intl.
Keith Matteson – ODFW Newport
Sam Herrick – NMFS SWFSC
Roger Hewitt – NMFS SWFSC
Ron Dodson – NMFS SWFSC
Ty Vuong – State Fish Co., San Pedro CA
Diane Pleshner-Steele - CWPA
Doyle Hannan - CWPA
Mike Okoniewski – Pacific Seafoods
Rod Moore – WCSPA; PFMC Council Member
Josh Lindsay-NOAA Fisheries Longbeach
Pierre Marchand – Ilwaco Fish Co.
Stan Schones - Commercial Fisherman
Gene Law - CPSAS, Fisherman
Bob Seidel – Astoria Holdings
Kym Jacobson – NMFS NWFSC, Newport.

Participants via conference call:
Frank Foode – Spotter pilot
Ryan Kapps
Merrel_____

Pacific Fishery Management Council

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Donald K. Hansen, Chairman Donald O. McIsaac, Executive Director

April 4, 2008

Dr. James Balsiger
Acting Assistant Administrator
National Marine Fisheries Service
Building SSMC3, F
1315 East-West Highway, Room 14555
Silver Spring, MD 20910

Re: Pacific Fishery Management Council Request for Scientific Review of Factors Affecting Certain West Coast Salmon Stocks

Dear Dr. Balsiger:

The Pacific Fishery Management Council (Council) is currently considering ocean fishery management alternatives that address the unprecedented collapse of the Sacramento River fall Chinook stock and the generally poor status of many West Coast salmon stocks that are involved in Council area fisheries. It is evident how extreme the situation is when one considers that the Council has asked for public comment on three options, two of which call for no commercial or sport salmon fishing off California and most of Oregon—something that has never happened before—and the third is for small "spot fisheries" so minor that they collectively would constitute the worst season in history. In response to the dire state of affairs, the U.S. Congress has already indicated they intend to consider a federal disaster relief request from the Governors of California, Oregon, and Washington.

We have seen a common reaction from the people concerned about these important salmon fisheries: as soon as people become cognizant of the severity of the situation, they ask how this could have happened. The sudden collapse of the Sacramento River fall Chinook salmon stock is particularly curious in that it has been a sudden and precipitous decline, with the most recent two brood returns of two-year-old fish at consecutive new record low levels and the most recent return an order of magnitude less than the previous one. Without an obvious singular event that explains the sudden decline of the Sacramento River fall Chinook stock, the Council considered a list of 46 focus areas for investigation into potential causative factors (attached). There are also many questions about what appears to be a broader depression of salmon productivity for stocks involved in West Coast fisheries, from the Sacramento River north to Puget Sound. The Council considered a letter from the two West Coast National Marine Fisheries Service Science Centers that provided informative comments on these important questions and described intent to further investigate relevant matters (attached).

Consequent to the Council process considering this issue, the Council voted to request the National Marine Fisheries Service take the lead in convening a scientific forum to investigate these important questions. The Council is particularly concerned with delineating causative factors associated with the unprecedented status of the 2004 and 2005 brood years for the Sacramento River fall Chinook run, any factors that can explain current status of Council related salmon stocks in general, and any ideas that may improve the advance forecasting of salmon abundance. The Council requests that in arranging for this investigative forum, invitations be extended for individuals from appropriate agencies represented at the Council table and others on the basis of achieving comprehensive expertise. We offer the services of Council staff to more fully describe the Council request and coordinate the delivery of written products from the forum. Lastly, the Council would appreciate a report on results at the September 7 – 12, 2008 Council meeting in Boise, Idaho.

We want to emphasize our appreciation of the offer to provide scientific analysis of these salmon issues that are paramount at this time. Please have your staff contact Mr. Chuck Tracy, Council Staff Officer for Salmon Fishery Management, regarding any questions about this request and whom we should consider the contact person for the National Marine Fisheries Service.

Enclosures

DOM:ckm

Sincerely,

D. O. McIsaac, Ph.D.

cc: Council Members
Mr. Randy Fisher
Mr. John Oliver
Mr. Samuel Rauch
Mr. Alan Risenhoover
Dr. Steve Murawski
Dr. Usha Varanasi
Dr. Norm Bartoo
Dr. John Coon
Mr. Chuck Tracy
Scientific and Statistical Committee
Salmon Technical Team
Salmon Advisory Subpanel

FOCUS AREAS OF RESEARCH RELATIVE TO THE STATUS OF THE 2004 AND 2005 BROODS OF THE CENTRAL VALLEY FALL CHINOOK SALMON STOCK

Freshwater Biological Focus

1) Was the level of parent spawners too low, for natural or hatchery populations?
2) Was the level of parent spawners too high, for natural or hatchery populations?
3) Was there a disease event in the hatchery or natural spawning areas?
4) Was there a disease event in the egg incubation, fry emergence, rearing, or downstream migration phases?
5) Was there any disease event during the return phase of the 2 year old jacks?
6) Were there mortalities at the time of trucking and release of hatchery fish?
7) Was there a change in the pattern of on-site release of hatchery fingerlings compared to trucked downstream release?
8) Was there a change in recovery, spawning and/or release strategies during hatchery operations?
9) Did thermal marking occur for any hatchery releases? What were the effects of this or other studies (e.g. genetic stock identification of parental broodstock)?
10) Was there a change in the methodology or operations of the SF Bay net pen 'acclimation' program for trucked hatchery fish?
11) Were there any problems with fish food or chemicals used at hatcheries?

Freshwater Habitat Areas Focus

1) Were there drought or flood conditions during the spawning, incubation, or rearing phases?
2) Was there any pollution event where juveniles were present?
3) Was there anything unusual about the flow conditions below dams during the spawning, incubation, or rearing phases?
4) Were there any in-water construction events (bridge building, etc.) when this brood was present in freshwater or estuarine areas?
5) Was there anything unusual about the water withdrawals in the rivers or estuary areas when this brood was present?
6) Was there an oil spill in the estuary when the 2005 brood was present, as juveniles or jacks?
7) Were there any unusual temperature or other limnological conditions when this brood was in freshwater or estuarine areas?
8) Was there any unusual population dynamics of typical food or prey species used by juvenile Chinook salmon in the relevant freshwater and estuarine areas?
9) Was there anything unusual, in the same context as above for juvenile rearing and outmigration phases, about habitat factors during the return of the 2 year olds from this brood?
10) Were there any deleterious effects caused by miscellaneous human activities (e.g., construction, waterfront industries, pollution) within the delta and SF bay areas?
11) Was there a change in the recovery of juvenile outmigrants observed in the USFWS mid-water trawl surveys and other monitoring programs in the Delta.

Freshwater Species Interactions Focus

1) Was there any unusual predation by bird species when this brood was in freshwater or estuarine areas?
2) Was there any unusual sea lion abundance or behavior when this brood was in freshwater or estuarine areas?
3) Was there any unusual striped bass population dynamics or behavior when this brood was in freshwater or estuarine areas?
4) Were northern pike present in any freshwater or estuarine areas where this brood was present?
5) Is there a relationship between declining Delta smelt, longfin smelt, and threadfin shad populations in the Delta and CV Chinook survival.
6) Was there additional inriver competition or predation with increased hatchery steelhead production?

Marine Biological Focus

1) Was there anything unusual about the ocean migration pattern of the 2004 and 2005 broods?
2) Was there anything unusual about the recovery of tagged fish groups from the 2004 and 2005 broods the ocean salmon fisheries?
3) Has the bycatch in non-salmonid fisheries (e.g., whiting, groundfish) increased?

Marine Habitat Areas Focus

1) Were there periods of reduced upwelling or other oceanographic physical conditions during the period of smolt entry into the marine environment, or during the period of marine residence up to the return to freshwater of the jacks?
2) Were there any effects to these fish from the 'dead zones' reported off Oregon and Washington in recent years?
3) Were plankton levels depressed off California, especially during the smolt entry periods?
4) Was there a relationship to an increase in krill fishing worldwide?
5) Limnology: temperature, salinity, upwelling, currents, red tide, etc.
6) Were there any oil spills or other pollution events during the period of ocean residence?
7) Was there any aquaculture occurring in the ocean residence area?
8) Was there any offshore construction in the area of ocean residence, for wave energy or other purposes?

Marine Species Interactions Focus

1) Was there any unusual population dynamics of typical food or prey species used by juvenile Chinook salmon in marine areas? (plankton, krill, juvenile anchovy or sardines, etc.)
2) Was there an increase in bird predation on juvenile salmonids caused by a reduction in the availability of other forage food?
3) Was there an increase of marine mammal predation on these broods?
4) Was there predation on salmonids by Humboldt squid?
5) Was there increased predation on salmonids by other finfish species (e.g., lingcod)?

Cumulative Ecosystem Effects Focus

1) Were there other ecosystem effects?
2) Were there synergistic effects of significant factors?

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Northwest Fisheries Science Center
2725 Montlake Boulevard East
Seattle, WA 98112-2097

February 22, 2008

MEMORANDUM TO: D. Robert Lohn, NWR
Rodney R. McInnis, SWR

FROM: Usha Varanasi, NWFSC | Norm Bartoo, SWFSC

SUBJECT: Evaluating Causes of Low 2007 Coho and Chinook Salmon Returns

Returns of several West Coast Chinook and coho salmon stocks were lower than expected in 2007. In addition, low jack returns in 2007 for some stocks suggest that 2008 will be at least as bad. Here, we consider possible causes of unexpectedly low returns and make recommendations to address the issue technically.

The most prominent example is Central Valley (CV) fall Chinook salmon, for which spawning escapement is estimated to have been less than 25% of predicted returns and below the escapement goal (122,000 - 180,000) for the first time since the early 1990s, continuing a declining trend since recent peak abundance (near 800,000 spawners) in 2002.. Similar low returns have been documented for coastal coho salmon. For California populations, data compiled by the SWFSC indicate that coastal coho salmon returns this season averaged 27% of parent stock abundance in 2004, with a range from 0% (Redwood Creek) to 68% (Shasta River). In Oregon, spawner estimates for the Oregon Coast natural (OCN) coho salmon were less than 25% of predicted returns and 30% of parental spawner abundance. These returns are the lowest since 1999, approaching the low abundances of the 1990s. Columbia River coho and Chinook stocks experienced mixed returns, with some stocks near predictions and others well below predictions.

For coho salmon there is a clear north-south gradient, with returns improving to the north. California and Oregon coastal returns were down sharply, while Columbia River hatchery coho were down only slightly (82% of prediction). Washington coastal coho returns were similar to 2006, and British Columbia coho returns exceeded expectations by a moderate amount. Even within the OCN region, there was a clear north-south pattern, with the north coast region (predominantly Nehalem River and Tillamook Bay populations) returning at 46% of parental abundance while the mid-south coast region (predominantly Coos and Coquille populations) returned at only 14% of parental abundance. The Rogue population was at only 21% of parental abundance.

Low 2007 returns of jacks for three stocks suggest a continuing severe problem in 2008. Jack returns were at record low numbers for fall Chinook salmon in the Klamath Basin and Central Valley. In addition, coho salmon jack returns to the Columbia River were near record lows.

Potential Causes

There are two interrelated questions to answer: First, what caused the observed low salmon returns, and second, why did current stock abundance predictors fail to anticipate the problem? A full assessment of the problem would be premature at this time, while return data are still being processed. However, we can look at general patterns to draw some tentative conclusions.

To answer the first question, we need to recognize that salmon exhibit complex life histories, with potential influences on their production at a variety of life stages in freshwater, estuarine, and marine habitats. Thus, salmon typically have high variation in adult returns, which may be explained by a variety of human and environmental factors. However, when short-term patterns are coherent over broad geographic areas, it is likely that they are caused by regional environmental variation. This could include such events as widespread drought or floods affecting river flow and temperature, or regional variation in ocean conditions (temperature, production, predator abundance). Given the observed pattern of widespread low returns for two species this year, and a gradient from California to British Columbia, this type of regional environmental variation is the most likely cause.

In freshwater, the major recent regional event that would likely affect river flows or temperature in a number of basins was the severe California drought in 2007, which extended (with less severity) into southern Oregon. The geographic extent of this event is consistent with observed low returns, but its timing is not: the drought occurred after this year's returning salmon had migrated to the ocean. (It may, however, be a factor in future returns.) At this time, we are aware of no other widespread events in freshwater that would explain this year's returns, but it would be prudent to look more closely at river flow and temperature data throughout the region before dismissing freshwater causes.

For ocean factors, two efforts are underway by the two Centers to develop and use ocean environmental indicators to explain variations in salmon marine survival. The Northwest Fisheries Science Center is using a number of physical and biological indicators for the Oregon and Washington coasts to provide qualitative predictions of coho and Chinook salmon returns (described at http://www.nwfsc.noaa.gov/research/divisions/fed/oeip/a-ecinhome.cfm). At the Southwest Fisheries Science Center, estimates of zooplankton, rockfish, seabirds, and 15 other ocean variables have been combined into a composite productivity index to describe variation in ocean production for the central California coast. Although the relationship between this index and California salmon population dynamics has not yet been fully tested, preliminary analyses indicate it tracks the CV Chinook population index (CVI) fairly well over the past 15 years.

For the spring and summer of 2005 (the ocean-entry year for 2004 brood fall Chinook and 2003 brood coho), both approaches indicated very poor conditions for juvenile salmon entering the ocean, indicating poor returns for coho in 2006 and age 3 fall Chinook in 2007. Coast-wide observations showed that 2005 was quite an unusual year for the northern California Current, with delayed onset of upwelling, anomalously high surface temperatures, and very low zooplankton biomass (Peterson et al. 2006, CalCOFI Reports 47:30-74; see also the special issue "Warm Ocean Conditions in the California Current in Spring/Summer 2005: Causes and Consequences" in Geophysical Research Letters, Vol. 33, No. 22, 2006). For the 2006 ocean-entry year, the SWFSC index was also poor, while the indicators used by the NWFSC provided a mixed assessment, which may explain the north-south trend observed in coho returns in 2007. Taken together, these poor ocean conditions, reflected in the indicators, provide a plausible explanation for the observed low returns of coho salmon in 2006 and 2007, and the low CV fall Chinook adult returns in 2007. Consistent with the CV fall Chinook record low jack return in 2007, the ocean indicators also would predict very low CV fall Chinook adult returns in 2008.

The second question is why current stock abundance predictors for coastal coho and CV Chinook salmon failed to capture this environmental signal. The answer is probably different for the two predictors, given the different methods employed. The CVI predictor uses a sibling-type regression to predict ocean stock abundance (predominantly age-3 fish) from the return of age-2 jacks the previous year. However, this regression has overestimated the CVI for the past three years, and the PFMC Salmon Technical Team is currently re-examining the data and statistical methods used for this predictor. A sibling-type regression should account for any variation in freshwater or early ocean mortality, but does not ordinarily account for variation in the maturation schedule. Research has shown that the maturation schedule in Chinook salmon is determined in part by coincident ocean conditions. Thus, incorporating an appropriately defined index of ocean conditions in a sibling regression has the potential to improve its predictive power. The SWFSC recently received NMFS funding to evaluate the merits of this approach for forecasting Klamath River fall Chinook ocean abundance, and this work will be extended to include forecasting of the CVI. In contrast, in recent years the OCN rivers coho salmon predictor has been based on a regression that does include two environmental indices (January sea-surface temperature and spring upwelling anomalies) that has a moderately good statistical fit using data from 1970 to the present. However, for 2008 predictions, the OPI Technical Team (OPITT) adopted a revised data series starting in 1986. The environmental relationship was not statistically significant using the shorter time series so OPITT adopted an alternative method. The poor statistical fit of this predictor in recent years may indicate that the processes controlling early ocean survival for coho are no longer adequately reflected by these two variables. More inclusive indices may provide improved prediction. The multivariable approaches cited above, incorporating biological and environmental data, may more completely characterize ocean ecosystem conditions of the California Current at the appropriate scale affecting salmon early marine survival and their maturation schedules.

In summary, pending further analysis, it appears that unusual ocean conditions are the most likely cause of the low returns examined here, and that continued efforts to quantify the affects of ocean conditions on salmon population abundance should be supported.

Recommendations

We recommend that two technical tasks be undertaken to address the problem:

1) A cross Center team should be tasked to evaluate the likelihood of various causal factors for these events on a coast-wide basis for both coho and Chinook salmon stocks. It is important to have an integrated regional perspective, rather than a localized stock-by-stock analysis. The team should also make recommendations about data needs beyond what is currently available.

2) A program to re-examine predictors for these stocks should be initiated. This should focus on evaluating the statistical methods employed, the potential utility of incorporating environmental indicators into predictors, and evaluating uncertainty in predictors and the management consequences of that uncertainty.

cc. Churchill Grimes, SWFSC
John Stein, NWFSC
Steve Murawski, F