

**Abstracts of Scientific Documents Submitted to the  
Commission for the 2013 CSRS Meeting:  
Forecast of Pacific Salmon Production in the Ocean  
Ecosystems under Changing Climate**

by

**NPAFC Secretariat**

*Suite 502, 889 West Pender Street  
Vancouver, BC, V6C 3B2 Canada*

Submitted to the

**North Pacific Anadromous Fish Commission**

April 2013

**THIS PAPER MAY BE CITED IN THE FOLLOWING MANNER:**

NPAFC Secretariat. 2013. Abstracts of scientific documents submitted to the Commission for the 2013 CSRS Meeting: Forecast of Pacific salmon production in the ocean ecosystems under changing climate. NPAFC Doc. 1473. 15 pp. (Available at [www.npafc.org](http://www.npafc.org)).

# **Abstracts of Scientific Documents Submitted to the Commission for the 2013 CSRS Meeting: Forecast of Pacific Salmon Production in the Ocean Ecosystems under Changing Climate**

## **NPAFC Secretariat**

*Suite 502, 889 West Pender Street  
Vancouver, BC, V6C 3B2 Canada*

This document is a compilation of abstracts of new and revised scientific documents submitted to the Commission between adjournment of the 2012 Annual Meeting and April 12, 2013. The compilation is organized into sections. The first section lists the document number and title according to six topics (Section 1). The first five topics are the five research components of the 2011-2015 NPAFC Science Plan:

- (1) migration and survival of juvenile salmon in ocean ecosystems;
- (2) climate impacts on Pacific salmon production in the Bering Sea (BASIS) and adjacent waters;
- (3) winter survival of Pacific salmon in North Pacific Ocean ecosystems;
- (4) biological monitoring of key salmon populations;
- (5) development and application of stock identification methods and models for management of Pacific salmon.

For convenience, one more topic is added:

- (6) Other topics.

Individual documents may pertain to more than one topic and, therefore, may be listed more than once.

The second section lists the document number and title according to the country that submitted the document (Section 2). The third section lists abstracts of documents in order of document number (Section 3).

For consideration at the 2013 CSRS meeting, a total of 22 new documents and one revised document from 2012 by the Working Group on Stock Assessment were submitted. Of the new documents that were submitted, eight documents related to research on juvenile salmon, nine documents related to research on climate impacts on salmon in the Bering Sea and adjacent waters, two documents related to research on salmon winter survival, 15 documents related to research on biological monitoring of key populations, nine documents related to research on development and applications of stock identification methods and models for management, and two documents related to other topics. The number of unique new documents included four from Canada, seven from Japan, three from Korea, three from Russia, and five from the United States.

## Section 1. Documents (number, title) Listed by Topic

1. **Migration and Survival Mechanisms of Juvenile Salmon in Ocean Ecosystems**
  - [Doc. 1448](#) Southeast Alaska Coastal Monitoring (SECM) Survey Plan for 2013
  - [Doc. 1450](#) United States Cruise Plan for BASIS-Northern Bering Sea and Chukchi Sea, August – October 2013
  - [Doc. 1452](#) Korean Research Plan for Salmon in 2013
  - [Doc. 1453](#) Depth distribution of 1SW Chinook Salmon in Quatsino Sound, British Columbia, During Winter
  - [Doc. 1456](#) Russian Bibliography of 2011-2012 Publications Linked to the Current NPAFC Science Plan
  - [Doc. 1457](#) Trawl Survey Plans for Pacific Salmon Marine Life Period Studies in the Far Eastern Seas in Summer and Fall 2013 by Russia
  - [Doc. 1468](#) United States Cruise Plan for The Gulf of Alaska Project, July – October 2013
  - [Doc. 1472](#) Canadian Juvenile Salmon Surveys in 2013-2014
  
2. **Climate Impacts on Pacific Salmon Production in the Bering Sea (BASIS) and Adjacent Waters**
  - [Doc. 1448](#) Southeast Alaska Coastal Monitoring (SECM) Survey Plan for 2013
  - [Doc. 1450](#) United States Cruise Plan for BASIS-Northern Bering Sea and Chukchi Sea, August – October 2013
  - [Doc. 1452](#) Korean Research Plan for Salmon in 2013
  - [Doc. 1456](#) Russian Bibliography of 2011-2012 Publications Linked to the Current NPAFC Science Plan
  - [Doc. 1457](#) Russia Survey Plans for Pacific Salmon Marine Life Period Studies in the Far Eastern Seas in summer and fall 2013 by Russia
  - [Doc. 1461](#) Results of 2012 Salmon Research by the *Oshoro maru*
  - [Doc. 1463](#) Proposed Cruise Plans of Japanese Research Vessels for Salmon in the North Pacific Ocean in 2013
  - [Doc. 1468](#) United States Cruise Plan for The Gulf of Alaska Project, July – October 2013
  - [Doc. 1472](#) Canadian Juvenile Salmon Surveys in 2013-2014
  
3. **Winter Survival of Pacific Salmon in North Pacific Ocean Ecosystems**
  - [Doc. 1456](#) Russian Bibliography of 2011-2012 Publications Linked to the Current NPAFC Science Plan
  - [Doc. 1472](#) Canadian Juvenile Salmon Surveys in 2013-2014
  
4. **Biological Monitoring of Key Salmon Populations**
  - [Doc. 1422 Rev.1](#) Pacific Salmon Status and Abundance Trends - 2012 update
  - [Doc. 1448](#) Southeast Alaska Coastal Monitoring (SECM) Survey Plan for 2013
  - [Doc. 1450](#) United States Cruise Plan for BASIS-Northern Bering Sea and Chukchi Sea, August – October 2013
  - [Doc. 1452](#) Korean Research Plan for Salmon in 2013
  - [Doc. 1453](#) Depth distribution of 1SW Chinook Salmon in Quatsino Sound, British Columbia, During Winter

<a href="#">Doc. 1456</a>	Russian Bibliography of 2011-2012 Publications Linked to the Current NPAFC Science Plan
<a href="#">Doc. 1457</a>	Trawl Survey Plans for Pacific Salmon Marine Life Period Studies in the Far Eastern Seas in Summer and Fall 2013 by Russia
<a href="#">Doc. 1458</a>	Korean Salmon Catch Statistics and Hatchery Releases in 2012-2013
<a href="#">Doc. 1461</a>	Results of 2012 Salmon Research by the <i>Oshoro maru</i>
<a href="#">Doc. 1463</a>	Proposed Cruise Plans of Japanese Research Vessels for Salmon in the North Pacific Ocean in 2013
<a href="#">Doc. 1465</a>	Preliminary Statistics for 2012 Commercial Salmon Catches in Japan
<a href="#">Doc. 1466</a>	Preliminary 2012 Salmon Enhancement Production in Japan
<a href="#">Doc. 1468</a>	United States Cruise Plan for The Gulf of Alaska Project, July – October 2013
<a href="#">Doc. 1469</a>	Alaska Salmon Hatchery Releases, Commercial Fishery Catch Statistics and Sport Fishery Harvest Statistics for 2012 Season
<a href="#">Doc. 1470</a>	Recent Canadian Enhanced Salmonid Production and Commercial Kept Catch Estimates (1979-2012)
<a href="#">Doc. 1472</a>	Canadian Juvenile Salmon Surveys in 2013-2014

**5. Development and Application of Stock Identification Methods and Models for Management of Pacific Salmon**

<a href="#">Doc. 1451</a>	Proposed Thermal Marks for Brood Year 2013 Salmon in Alaska
<a href="#">Doc. 1452</a>	Korean Research Plan for Salmon in 2013
<a href="#">Doc. 1456</a>	Russian Bibliography of 2011-2012 Publications Linked to the Current NPAFC Science Plan
<a href="#">Doc. 1457</a>	Trawl Survey Plans for Pacific Salmon Marine Life Period Studies in the Far Eastern Seas in summer and fall 2013 by Russia
<a href="#">Doc. 1459</a>	Otolith Thermal Mark for Brood Year 2012 and Proposed Thermal Marks for Brood Year 2013 Chum Salmon in Korea
<a href="#">Doc. 1460</a>	Proposed Otolith Marks for Brood Year 2013 Salmon in Russia
<a href="#">Doc. 1467</a>	Proposed Otolith Marks for Brood Year 2013 Salmon in Japan
<a href="#">Doc. 1471</a>	Thermal Marks for Salmon from Canada, Brood Year 2013
<a href="#">Doc. 1472</a>	Canadian Juvenile Salmon Surveys in 2013-2014

**6. Other Topics**

<a href="#">Doc. 1462</a>	Incidental Catches of Anadromous Fishes by Japanese Research Vessels in the North Pacific Ocean in 2012
<a href="#">Doc. 1464</a>	Cruise Plans of Japanese Research Vessels Involving Incidental Takes of Anadromous Fish in the North Pacific Ocean in 2013

## Section 2. Documents (number, title) Listed by Country

### Canada

- [Doc. 1422 Rev.1](#) Pacific Salmon Status and Abundance Trends - 2012 Update  
[Doc. 1453](#) Depth distribution of 1SW Chinook Salmon in Quatsino Sound, British Columbia, During Winter  
[Doc. 1470](#) Recent Canadian Enhanced Salmonid Production and Commercial Kept Catch Estimates (1979-2012)  
[Doc. 1471](#) Thermal Marks for Salmon from Canada, Brood Year 2013  
[Doc. 1472](#) Canadian Juvenile Salmon Surveys in 2013-2014

### Japan

- [Doc. 1422 Rev.1](#) Pacific Salmon Status and Abundance Trends - 2012 Update  
[Doc. 1461](#) Results of 2012 Salmon Research by the *Oshoro maru*  
[Doc. 1462](#) Incidental Catches of Anadromous Fishes by Japanese Research Vessels in the North Pacific Ocean in 2012  
[Doc. 1463](#) Proposed Cruise Plans of Japanese Research Vessels for Salmon in the North Pacific Ocean in 2013  
[Doc. 1464](#) Cruise Plans of Japanese Research Vessels Involving Incidental Takes of Anadromous Fish in the North Pacific Ocean in 2013  
[Doc. 1465](#) Preliminary Statistics for 2012 Commercial Salmon Catches in Japan  
[Doc. 1466](#) Preliminary 2012 Salmon Enhancement Production in Japan  
[Doc. 1467](#) Proposed Otolith Marks for Brood Year 2013 Salmon in Japan

### Republic of Korea

- [Doc. 1422 Rev.1](#) Pacific Salmon Status and Abundance Trends - 2012 Update  
[Doc. 1452](#) Korean Research Plan for Salmon in 2013  
[Doc. 1458](#) Korean Salmon Catch Statistics and Hatchery Releases in 2012-2013  
[Doc. 1459](#) Otolith Thermal Mark for Brood Year 2012 and Proposed Thermal Marks for Brood Year 2013 Chum Salmon in Korea

### Russia

- [Doc. 1422 Rev.1](#) Pacific Salmon Status and Abundance Trends - 2012 Update  
[Doc. 1456](#) Russian Bibliography of 2011-2012 Publications Linked to the Current NPAFC Science Plan  
[Doc. 1457](#) Trawl Survey Plans for Pacific Salmon Marine Life Period Studies in the Far Eastern Seas in Summer and Fall 2013 by Russia  
[Doc. 1460](#) Proposed Otolith Marks for Brood Year 2013 Salmon in Russia

### United States

- [Doc. 1422 Rev.1](#) Pacific Salmon Status and Abundance Trends - 2012 Update  
[Doc. 1448](#) Southeast Alaska Coastal Monitoring (SECM) Survey Plan for 2013  
[Doc. 1450](#) United States Cruise Plan for BASIS-Northern Bering Sea and Chukchi Sea, August – October 2013  
[Doc. 1451](#) Proposed Thermal Marks for Brood Year 2013 Salmon in Alaska

[Doc. 1468](#)

United States Cruise Plan for The Gulf of Alaska Project, July –  
October 2013

[Doc. 1469](#)

Alaska Salmon Hatchery Releases, Commercial Fishery Catch  
Statistics and Sport Fishery Harvest Statistics for 2012 Season

### Section 3. Document Abstracts (numerical order)

**Doc 1422 Rev.1**

**Pacific Salmon Status and Abundance Trends – 2012 Update**

*James R. Irvine, Arlene Tompkins, Toshihiko Saito, Ki Baik Seong, Ju Kyoung Kim, Natalya Klovach, Heather Bartlett, and Eric Volk*

This report updates a major review published in 2009 of commercial catch and hatchery release data for Pacific salmon. Pacific salmon abundance in the North Pacific, as indexed by aggregate commercial catches, is at all time high levels, with no indication of decline. The highest catches on record occurred during 2009 and 2011 when more than 1 million tonnes (>600 million fish) were caught. There are more adult salmon caught in odd numbered years than even years because the most frequent species in the catch, pink salmon, are most abundant in odd years. The ranking of species in the aggregate catch varied little since the time series began in 1925. Pink salmon have generally been the most numerous, usually followed by chum, sockeye, coho, Chinook, and masu salmon. Although the northern North Pacific Ocean continues to produce large quantities of Pacific salmon, temporal abundance patterns vary among species. Currently, pink and chum salmon are very abundant, coho and Chinook salmon are less abundant than they were previously, while sockeye salmon abundance varies among areas.

Pink and chum salmon dominate Asian catches; numbers increased following the 1977 but especially the 1989 regime shift, and remain at all-time highs. Russia currently catches the largest proportion of the Asian catch although in earlier years, Japan often caught a greater proportion; catches by the Republic of Korea are relatively minor. Asian hatchery production continues to increase, primarily because of increased numbers of salmon released from Russian hatcheries. Improved survivals reported for some groups of hatchery-origin salmon are a consequence of both improved hatchery practices and environmental changes. Favourable marine conditions for pink and chum salmon, expanding hatchery operations, and improved hatchery technologies have all played a role in increasing the abundance of chum and pink salmon in Asia.

North American salmon abundance increased following the 1977 regime shift. The relative abundance of salmon species in North America varies from north to south. Pink and sockeye salmon are the primary species in Alaska while in Canada, pink, sockeye, and chum salmon have historically been the most important, and in Washington, Oregon, and California, Chinook and coho salmon are the most abundant species. Interannual variability in the importance of various species in North America has been more pronounced during the last decade than previously.

**Doc 1448**

**Southeast Alaska Coastal Monitoring (SECM) Survey Plan for 2013**

*Joseph A. Orsi, Molly V. Sturdevant, Emily A. Fergusson, Edward V. Farley Jr., and Ronald A. Heintz*

The Southeast Coastal Monitoring (SECM) project was initiated in 1997 by the Alaska Fisheries Science Center (AFSC), Auke Bay Laboratories (ABL), to study the habitat use and early marine ecology of juvenile (age-0) Pacific salmon and associated epipelagic ichthyofauna in Southeast Alaska. SECM surveys are conducted off of government and chartered research vessels in the vicinities of Icy Strait and Icy Point (58° N, 135° W; 57° N, 134° W) to sample fish, zooplankton, nutrients/chlorophyll, and physical water properties using a surface trawl, plankton nets, and an oceanographic profiler. This monitoring has permitted compilation of long-term biological and oceanographic data sets for a region producing all five species of both wild and hatchery salmon during a period of climate change. In 2013, SECM research surveys are scheduled to continue at 13 core stations during four monthly intervals from late May to late August. This 2013 SECM

survey plan reflects accomplishments since the inception of the project, and outlines how this additional survey year will extend the biophysical time series to 17 years.

**Doc 1450**                      **United States Cruise Plan for BASIS-Northern Bering Sea and Chukchi Sea, August – October 2013**

*Edward V. Farley Jr.*

Scientists from the National Marine Fisheries Service (NMFS), Ecosystem Monitoring and Assessment Program, will conduct a survey during late summer and fall 2013 within the northern Bering Sea and Chukchi Sea to provide key ecological data on the pelagic ecosystem. The survey is conducted as part of the Bering Aleutian Salmon International Survey (BASIS) phase 2 research plan. Primary objectives of the survey will be to: (1) collect biological information on ecologically important fish species and to (2) describe the physical and biological oceanographic conditions of the southeastern Bering Sea waters.

A survey of epi-pelagic fish species, zooplankton, ichthyoplankton, and oceanographic measurements will be conducted at stations within the eastern Bering Sea aboard the charter vessel *Bristol Explorer*. The survey will begin 1 August 2013 in Dutch Harbor, Alaska and end on 30 September 2013 in Dutch Harbor, Alaska, for a total of 60 sea days. Fish samples will be collected using a midwater rope trawl. At most stations, the net will be towed at or near the surface for 30 minutes at speeds between 3.5 and 5 kts. All fish species will be counted and standard biological measurements including length and weight will be taken from subsamples of each species. Biological and physical oceanographic data will be collected at each trawl station as well as opportunistically during the survey.

**Doc 1451**                      **Proposed Thermal Marks for Brood Year 2013 Salmon in Alaska**

*Dion S. Oxman*

In Alaska, mass-marking of salmon using otolith thermal marking is an effective research and management tool applicable to a variety of situations. For brood year 2013, approximately 61 million sockeye, 827 million pink salmon, 636 million chum, 9 million coho, and 7 million Chinook salmon will be marked at 22 different hatcheries using 83 thermal marks.

**Doc 1452**                      **Korean Research Plan for Salmon in 2013**

*Kwan Eui Hong, Ju Kyoung Kim, and Ki Yeol Park*

Salmon are political resources due to the characteristics of transboundary distribution and economic importance. The interest in chum salmon biology in Korea was much increased since the establishment of the Yangyang Salmon Station (formerly Cold-water Fish Research Center) of Korea Fisheries Resources Agency in the 1980s. The enhancement program of chum salmon has been expanded thereafter, so that chum salmon were transplanted 18 streams in the coast of the Korean Peninsula. However, ecological research on salmon species was very limited until recently due to the lack of a research program. Though involvement in the NPAFC requires scientific investigation on salmon research by each member nation, the conspicuous increase in research funding was not achieved. Oceanic environments have been rapidly altered by climate change during the last a few decades and ocean ecosystems including salmon populations will be modified under the global warming situation. Especially, a special attention is needed for stocks at southern boundary of distribution, such as Korean chum salmon.

1. To reveal the mechanisms of mass mortality of chum salmon during their early life in rivers and coastal areas in conjunction with the fluctuation of return rates, research will be conducted as follows:

- (1) Identification of prey and predator species for juvenile salmon in the rivers and coastal areas,
  - (2) Stage-by-stage estimation of survival rate after releasing in the rivers and coastal areas,
  - (3) Monitoring of environmental factors in the river and coastal areas,
  - (4) Examination of growth rate during the early life history using otolith and comparison of the growth rate between released juvenile salmon and wild juvenile salmon, and
  - (5) Investigation on the optimal releasing period for juvenile salmon.
2. Climate change effects on salmon distribution, migration route, and abundance will be investigated. This research includes the following:
- (1) Continuous monitoring activities on environmental conditions in the Korean waters and the western Pacific Ocean, and
  - (2) Climate change effects on the biological characteristics of chum salmon returned to the Korean waters.
3. Otolith thermal marking on Korea chum salmon will be carried out to provide information about growth, survival during the early ocean life stage, and hatchery origins from 2013 release (2012 brood).
4. A new microsatellite loci of chum salmon will be developed to investigate genetic variation and population structure of Korean populations.
5. There are plans for a hatchery program for cherry salmon. As a first step in cherry salmon research, stomach contents will be examined to identify prey items and competition for the same prey by other fish species in the coastal area and ocean.
6. Genetic variation of non-anadromous masu salmon in Korea will be investigated to establish baseline data to develop a strategy of conservation and management.

**Doc 1453**                      **Depth Distribution of 1SW Chinook Salmon in Quatsino Sound, British Columbia, During Winter**

*Marc Trudel and Strahan Tucker*

We conducted a trawl survey in Quatsino Sound, British Columbia, to determine the vertical distribution of Chinook salmon during their first winter at sea (1SW) and to test the hypothesis that 1SW Chinook salmon migrate to deeper waters as they get larger. Fifteen-minute tows were performed at 0m, 15m, 30m, and 45 m at seven locations within Quatsino Sound and associated Inlets. We also performed a 15-minute tow at 60 m in four of these locations. Catches peaked at 30-45 m at three locations and were low but stable at all other sites, indicating that the vertical distribution of 1SW Chinook salmon varied among sites within Quatsino Sound. Overall, the size of 1SW Chinook salmon increased with depth, though a bimodal size-frequency distribution was observed at 60 m. Further research will thus be required to understand the processes affecting the distribution of Chinook salmon in the marine environment

**Doc 1456**                      **Russian Bibliography of 2011-2012 Publications Linked to the Current NPAFC Science Plan**

*A.V. Zavolokin, O.S. Temnykh, E.N. Tsareva, M.V. Koval, N.V. Klovach, V.V. Volobuev, A.M. Kaev, A.A. Zhivoglyadov, E.V. Golub, and V.I. Ostrovsky*

The bibliography lists original papers and documents published during 2011-2012 by Russian

scientists and their collaborators relevant to the 2011-2015 NPAFC Science Plan. The bibliography lists 134 papers, corresponding to the five key research components of the Science Plan.

**Doc 1457**                      **Trawl Survey Plans for Pacific Salmon Marine Life Period Studies in the Far Eastern Seas in Summer and Fall 2013 by Russia**

*Olga S. Temnykh, Alexander N. Starovoytov, and Alexander V. Zavolokin*

The document summarizes trawl survey plans for Pacific salmon marine life period studies in the Far Eastern Seas in summer and fall 2013 by Russia (TINRO-Center). The outline of materials, methods, surveys timing and theoretical background are provided.

In 2013 Russia will continue monitoring of the state of the Bering Sea, Okhotsk Sea, and Pacific waters off Kuril and Commander Islands ecosystems. Studies of salmon distribution, food habits, dependence of salmon feeding on biomass and composition of plankton and nekton communities, changes of biological condition of fishes during the foraging, salmon spatial differentiation, structure of stocks contributing to the mixture, and influence of the abiotic environment upon the salmon quantitative allocation and migrations are planned. One of the goals of these studies is the estimation of Pacific salmon survival/mortality at different stages of marine life period.

Surveys will be conducted by vessels of TINRO-Center (R/V *TINRO* and R/V *Professor Kaganovsky*) using uniform methods and approaches. Trawling operations of these vessels are carried out by the standard midwater trawl, model RT/TM 80/396 fished with four 120-m bridles. Heavy orbicular midwater trawl doors (each one 6 square meters) are used. Depending on towing speed, the vertical spread of the trawl is 32-42 m and horizontal spread is 30-34 m. At each station the net is towed for 1 hour. The net is towed at about 4.5-5.0 kts with the headrope located at the surface (fixed layer – 0 m), particularly at night. The warp length is 250-310 m.

Each trawl operation is accompanied (before or after) by the collection of plankton samples using the Jeday net. Samples for fish and squid diet studies are taken from the catch of every trawl operation and these samples undergo on-board processing. The processing of all samples is carried out by means of express methods of analyses that were developed by TINRO-Center. Research on caloric content of food items and their isotope composition will provide further insights into understanding of Pacific salmon biological environment.

Hydrological studies are conducted during the period of the survey by means of the hydrological probe Neil-Brown and ICTD. The data is recorded for the fixed layer 0-1000 meters and for areas where the depth is less than 1000 meters data is measured to the bottom.

**Doc 1458**                      **Korean Salmon Catch Statistics and Hatchery Releases in 2012-2013**

*Kwan Eui Hong, Ju Kyoung Kim, and Doo Ho Kim*

Total catch of chum salmon was 35,491 fish or 72.4 metric tons in 2012. The total release of chum salmon fry was 9,710 thousand fish in 2013 (brood year 2012).

**Doc 1459**                      **Otolith Thermal Mark for Brood Year 2012 and Proposed Thermal Marks for Brood Year 2013 Chum Salmon in Korea**

*Kwan Eui Hong, Ju Kyoung Kim, Kyoung Sik Kim, and Tae Young Kim*

Korea released 2.5 million and 4.1 million thermal-marked chum salmon in March 2012 and 2013, respectively. The marks were 3,3nH in 2012 (brood year 2011) and 3,1,2nH in 2013 (brood

year 2012). Approximately 7.0 million chum salmon of brood year 2013 will be marked, which covers about 50% to ~60% of chum salmon releases at Namdae-cheon (river). Chum salmon will be marked at Yangyang Salmon Station using only one thermal mark (3,2,1H).

**Doc 1460**                      **Proposed Otolith Marks for Brood Year 2013 Salmon in Russia**

*Elena Akinicheva, Vladimir Volobuev, and Evgeny Fomin*

Otolith marking of salmon of the 2013 brood year will be conducted in five regions of the Far East: Kamchatka, Magadan, Khabarovsk, Sakhalin, and Kuril regions. Marking will be carried out using two methods: thermal and “dry”. The choice of application will be determined by the possibilities and specific qualities of the water supply of incubated embryos at hatcheries of the Far East. The dominate method of marking will be the “dry” one – it will be used on 83% of salmon at hatcheries. Salmon will be marked at 29 hatcheries. In total, 40 otolith marks will be used.

**Doc 1461**                      **Results of 2012 Salmon Research by the *Oshoro maru***

*Maki Ohwada, Keiichiro Sakaoka, Naoki Hoshi, Takuzo Abe, Keiri Imai, and Shogo Takagi*

In order to accumulate oceanographic and biological data (including salmonids) and to clarify the oceanic structure and marine ecosystem, the T/V *Oshoro maru* conducted oceanographic observations and fishing surveys in the western North Pacific (along the 155°E longitude line) and eastern North Pacific (along the 150°W longitude line). The survey was conducted during Cruise #242 in May, and Cruise #243-Leg 2 in July 2012.

Nine oceanographic observations and three drift gillnet surveys were conducted along the 155°E during Cruise #242 in May. The Polar Front was observed in the vicinity of 43°N. The Subarctic Boundary was observed in surface (0-100 db) waters near 39°-30'N. Pink salmon was the dominant species at 43°-16.0'N and 42°-57.4'N. Chum salmon was collected at 43°-16.0'N and 42°-57.4'N. A few salmon were caught at 39°-25.2'N. The fork lengths of chum salmon collected by C-gear gillnet ranged between 420-640 mm, and those of pink salmon ranged between 300-510 mm; 86.9% of chum salmon were adult fish. A total of 64 chum and 690 pink salmon was collected.

Seven oceanographic observations and three drift gillnet surveys were conducted along 150°W during Cruise #243-Leg 2 in July. Seasonal thermal stratification was observed to 100 db, and the Alaskan gyre were observed in the vicinity of 51°N. At 42°-49.9'N, no salmon was collected, but at two other stations a total of 14 sockeye, 38 chum, four pink, 10 coho salmon, and one steelhead were collected by C-gear gillnet. Fork length of chum salmon ranged between 360-550 mm, and 5.3% were adult fish. Fork length of coho salmon ranged between 490-660 mm, and all were adult fish. Fork length of sockeye salmon ranged between 330-600 mm, and 21.4% were adult fish.

To collect salmon samples including blood and various tissues, two surface long-line and three hook-and-line gear operations were conducted during the Cruise #242 and #243-Leg 2.

**Doc 1462**                      **Incidental Catches of Anadromous Fishes by Japanese Research Vessels in the North Pacific Ocean in 2012**

*Shigehiko Urawa and Toru Nagasawa*

Japanese research vessels conducted scientific fishing operations to assess Pacific saury and other pelagic fishes using midwater trawls, drift gillnets, and saury dip net in the western and central North Pacific Ocean in summer 2012. During the research surveys, a total of 1,221 salmon including 702 chum, 383 pink, 113 coho, 17 Chinook, and 4 sockeye salmon, and 2 steelhead trout were incidentally caught.

**Doc 1463**                      **Proposed Cruise Plans of Japanese Research Vessels for Salmon in the North Pacific Ocean in 2013**

*Shigehiko Urawa and Toru Nagasawa*

According to the national research plan, two Japanese research vessels are scheduled to conduct the following scientific research in the North Pacific Ocean and Bering Sea in 2013.

- (1) The *Hokko maru* will carry out salmon research with a surface/midwater trawl and hook-and-line to obtain information on the distribution, abundance, and other biological characteristic of Pacific salmon in the Bering Sea from late July to early August.
- (2) The *Oshoro maru* will carry out salmon research with gillnets, longline, and hook-and-line to obtain data on the distribution and ecology of salmon and other pelagic fishes in the western North Pacific in May and in the Bering Sea and Chukchi Sea from June to August. In the case of gillnet operations, gillnets less than 2.5 km in length at sea will be used.

**Doc 1464**                      **Cruise Plans of Japanese Research Vessels Involving Incidental Takes of Anadromous Fish in the North Pacific Ocean in 2013**

*Fisheries Research Agency*

Ten Japanese research vessels are scheduled to conduct high-seas research for pelagic fishes and squids in the North Pacific Ocean in 2013. With these research surveys, there is a possibility of incidental catches of salmon. In case of gillnet operations, lengths of the gillnets will be less than 2.5 km at sea.

**Doc 1465**                      **Preliminary Statistics for 2012 Commercial Salmon Catches in Japan**

*Kei Sasaki, Toshihiko Saito, and Toru Nagasawa*

The commercial catches in coastal and offshore areas of Japan in 2012 totaled 44.1 million fish (128 thousand metric tons), including 40.1 million chum (122 thousand metric tons) and 3.6 million pink (five thousand metric tons) salmon. The catch data were based on Hokkaido National Fisheries Research Institute (HNFRI) data sources. The official specific statistics may be available by the end of March 2014.

**Doc 1466**                      **Preliminary 2012 Salmon Enhancement Production in Japan**

*Kei Sasaki and Satoru Takahashi*

Four species of anadromous Pacific salmon (chum, pink, masu, and sockeye salmon) are currently enhanced in Japan. A total of 1,793 million fry, juveniles, and smolts were released from Japanese hatcheries in 2012. The number of chum salmon fry released in the spring of 2012 was approximately 1,641 million fish, which was lower than the average of annual releases (189 million fish) between 1993 and 2010 because some hatcheries along the Pacific coast of Honshu

were damaged by the East Japan Earthquake in March 2011. Japanese hatcheries also released 138 million pink salmon fry; 13,058 thousand masu salmon fry, juveniles, and smolts; and 284 thousand sockeye salmon fry, juveniles, and smolts in the spring and fall of 2012.

In 2012, the number of adult salmon captured in rivers along the Japanese coasts was 5,778 thousand fish, which corresponded to 16,289 metric tonnes in weight. The primary and secondary species were chum and pink salmon, contributing 95.4% and 4.4% in numbers of all salmon captured in rivers, respectively. Adult masu salmon occur in rivers of both Hokkaido and Honshu, but the number of catches was not available in Honshu. The number of adult masu salmon returns in Hokkaido was approximately 8.2 thousand fish. Anadromous sockeye salmon were caught in several rivers in Hokkaido, where the number caught was approximately 0.7 thousand fish.

**Doc 1467**

**Proposed Otolith Marks for Brood Year 2013 Salmon in Japan**

*Yasutaka Okamoto, Tsutomu Ohnuki, Shunpei Sato, and Shigehiko Urawa*

Japan plans to mark approximately 271 million salmon of brood year 2013 (241 million chum, 27.7 million pink, 3.3 million masu, and 180 thousand sockeye salmon) using 45 discrete thermal patterns and one ALC (alizarin complexone) pattern at 38 hatcheries. Two rings in the first band have been adopted as the base mark to distinguish Japanese chum and pink salmon from other stocks.

**Doc 1468**

**United States Cruise Plan for The Gulf of Alaska Project, July – October 2013**

*Jamal Moss and Wyatt Rhea-Fournier*

Scientists from the National Marine Fisheries Service (NMFS), Pacific Marine Environmental Laboratory (PMEL), and the University of Alaska Fairbanks (UAF) will conduct a fisheries oceanographic survey during summer and fall 2013 within the southeastern and central regions of the Gulf of Alaska (GOA) to provide key ecological data on the pelagic ecosystem, examine oceanographic transport mechanisms, lower trophic level production, and age-0 marine fish and juvenile salmon distribution and condition. Primary objectives of the survey will be to: (1) collect biological information on ecologically important marine fish and salmon and (2) describe the physical, and biological conditions of the GOA.

A survey of epi-pelagic fish species, zooplankton, ichthyoplankton, and oceanographic measurements will be conducted at predetermined survey stations within the southeastern GOA in summer and fall and central GOA in summer aboard a contracted stern ramp trawling vessel. In addition, the *NOAA Ship Oscar Dyson* will sample survey stations in the central GOA during fall. The survey will begin 1 July 2013 in Juneau, Alaska and end on 14 October 2013 in Kodiak, Alaska with a total duration of 92 survey days.

Fish samples will be collected using a midwater rope trawl and the trawl will be towed at or near the surface for 30 minutes at speeds between 3.5 and 5 kts at each station. All fish species will be counted and standard biological measurements including length and weight will be taken from subsamples of each species. Marine fish and juvenile salmon will be collected for food habits and laboratory analyses. Biological and physical oceanographic data will be collected at each trawl station.

**Doc 1469****Alaska Salmon Hatchery Releases, Commercial Fishery Catch Statistics and Sport Fishery Harvest Statistics for 2012 Season***Eric C. Volk and Ronald P. Josephson*

In 2012, there were 26 private nonprofit, 3 federal, and 2 state hatcheries operating in Alaska. Most of these facilities (19) are located in Southeast Alaska. The Cook Inlet and Prince William Sound regions have 9 hatcheries and the Kodiak region has 2 hatcheries. Alaskan hatcheries released approximately 1.7 billion fish in 2012. Of the fish released, 56% were pink and 38% were chum salmon. Hatcheries in Prince William Sound contributed 51% and hatcheries in Southeast Alaska contributed 37% of the fish released.

The Alaska salmon harvest of all species combined for 2012 totaled 127.4 million fish, which was about 5 million less than the preseason forecast of 132.1 million. In 2012, pink salmon catch was 68.0 million compared to the preseason projection of 70.2 million. Prince William Sound fisheries harvested 27.2 million, about 7.6 million below the projected harvest. The Southeast Alaska harvest of 21.3 million pink salmon was above the 17 million forecast, but well below the recent 10-year average harvest of 39.6 million and the long term average since statehood of 30.0 million. The statewide chum salmon harvest of 20.2 million was nearly equal to a projected harvest of 19 million. Coho salmon catches of 3.2 million were below projections of 4.3 million. Statewide, sockeye salmon stocks were expected to yield a harvest of 38.4 million fish and provided 35.7 million fish. The Bristol Bay harvest of 20.8 million sockeye was slightly below forecast of 21.8 million. Cook Inlet's catch of 3.3 million sockeye salmon was below forecast of 4.6 million. The Chinook salmon catch of 353,000 was below average; however, Chinook catch outside of Southeast Alaska (75,000) was the lowest since 1940. Alaskan Chinook salmon appear to be showing coherent declining abundance trends among major runs throughout the state. In 2012, fishery disasters were declared for Chinook runs on the Yukon, Kuskokwim, and Kenai Rivers due to severe restrictions on subsistence, commercial, and sport fisheries. The State of Alaska has engaged scientists, stakeholders and the public on development of a research and assessment plan to better understand and address these declines.

The preliminary estimate for the total exvessel value of Alaska's 2012 harvest was \$506 million.

Sport fishery harvests in Alaska for 2012 are not yet available.

Inseason harvest information, postseason statistics, and other information about salmon in Alaska can be found at <http://www.adfg.alaska.gov>

**Doc 1470****Recent Canadian Enhanced Salmonid Production and Commercial Kept Catch Estimates (1979-2012)***J. R. Irvine, J. Sandher, R. Houtman, and L. Fitzpatrick*

The purpose of this document is to update Canadian hatchery release information and commercial catch estimates for Pacific salmon (*Oncorhynchus* spp.) from those provided in 2012.

The Salmonid Enhancement Program (SEP) was initiated in British Columbia, Canada, in 1977 primarily to rebuild depressed stocks and increase catch through the expanded use of enhancement technology. The program was designed to increase fishing opportunities, involve the public and raise awareness, create jobs and increase economic development in coastal and First Nations communities, and improve understanding of salmonid populations. The SEP currently comprises approximately 150 projects throughout British Columbia that produce Chinook, coho, chum, pink, and sockeye salmon, as well as small numbers of steelhead and cutthroat trout.

The Department of Fisheries and Oceans Canada (DFO) generates estimates of kept salmon in commercial fisheries (DFO 2009) as well as catch estimates for recreational and aboriginal fisheries. Updated estimates from recreational and aboriginal fisheries were not available in time to include in this report. Commercial estimates are derived using a variety of information including sale slips, log books, interview and observer information.

**Doc 1471**                      **Proposed Thermal Marks for Salmon from Canada, Brood Year 2013**

*Susan DiNovo, David O'Brien, and Wilf Luedke*

Thermal marking continues to play an important role for both research and fisheries management in Canada. Canada plans to thermally mark approximately 66 million Pacific salmon for release in 2014/15. Thermal marking will include 53 thermal marks applied at 18 hatcheries with marked salmon released at 40 locations. The plan is similar to the 2012 brood year marking plan for fish that will be released in 2013/14.

**Doc 1472**                      **Canadian Juvenile Salmon Surveys in 2013-2014**

*Marc Trudel, Chrys Neville, and Ruston Sweeting*

Canada currently maintains two research programs on the marine biology of Pacific salmon to understand the processes regulating Pacific salmon production in the marine environment, the interactions between wild and hatchery-reared salmon, the potential interactions between wild/hatchery salmon and aquaculture production, the impacts of ocean conditions and climate change on marine ecosystems and salmon resources, and to provide a sound scientific basis for optimizing hatchery production. Thus, an offshore program conducts research off the west coast of British Columbia and Southeast Alaska, and an inshore program works in the Strait of Georgia and Puget Sound. In this document, we present the juvenile salmon research surveys planned in offshore and inshore areas by Canada for 2013-2014.

Three integrated epipelagic mid-water trawl surveys have been planned for the *CCGS W.E. Ricker* in 2013-14: an early summer (June 25-July 22, 2013), a fall survey (September 17-November 10, 2013), and a winter survey (March 6-21, 2014). These surveys will focus on water bodies surrounding Vancouver Island including the Strait of Georgia, Gulf Islands, Juan the Fuca Strait, Johnstone Strait, Queen Charlotte Strait, Queen Charlotte Sound, the west coast of Vancouver Island, and Puget Sound. The primary objectives of these surveys will be to (1) collect biological information on Pacific salmon and associated epipelagic fish community, (2) collect DNA samples for stock identification purposes, (3) describe the ambient oceanographic conditions, and (4) quantify the biomass of zooplankton and describe zooplankton species community composition in coastal waters of British Columbia.

A mid-water trawl survey has also been planned for June 1-10, 2013. For this survey, scientific operations will be conducted in the Strait of Georgia using the same sampling equipment as for the *CCGS W.E. Ricker* surveys. The primary focus of this survey is to determine the distribution, abundance, and health of juvenile Fraser River sockeye salmon during their early marine life and peak abundance. The dates for this survey are currently tentative, as this survey will be conducted using a fishing vessel that will be chartered later this year. The *CCGS W.E. Ricker* and chartered vessel will fish a mid-water trawl at 4.5 – 5 kts for 30 minutes at the surface, 15m, 30m, or 2.5-3.0 kts at 45m or 60m. Occasionally deeper sets may be conducted and the length of tow may be reduced.

Two mid-water trawl surveys have been planned for the *CCGS Neocaligus*: a spring survey (April 30-May 8, 2013) and a summer survey (June 22-28, 2013). The trawl net is a smaller version of the net fished from the *CCGS W.E. Ricker*. The primary objectives of these surveys will be to test the trawl gear that have been designed for this vessel to ensure adequate fishing speed and net opening can be achieved. In addition, some trawl sets will be conducted alongside the *CCGS W.E. Ricker* in late June for comparison. The *CCGS Neocaligus* surveys will be conducted in the Strait of Georgia and the Gulf Islands.

Fish samples will be sorted by species, enumerated, and measured onboard. If the catches are too large, then random subsamples of 60-200 fish will be measured. Stomach contents of juvenile salmon will be collected for dietary analyses either on board the ship or in the laboratory.

At oceanographic stations, CTD (conductivity-temperature-depth) casts will be conducted. On some surveys oceanographic sampling will also (1) collect seawater samples at 10 m from the surface, and (2) filter surface seawater for chlorophyll a. Vertical bongo tows to approximately 150 m or within 10 m of the bottom will be conducted.