

**Abstracts of Scientific Documents Submitted to the
Commission for the 2014 CSRS Meeting:
Forecast of Pacific Salmon Production in the Ocean
Ecosystems under Changing Climate**

by

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Submitted to the

North Pacific Anadromous Fish Commission

April 2014

THIS PAPER MAY BE CITED IN THE FOLLOWING MANNER:

NPAFC Secretariat. 2014. Abstracts of scientific documents submitted to the Commission for the 2014 CSRS Meeting: Forecast of Pacific salmon production in the ocean ecosystems under changing climate. NPAFC Doc. 1534. 17 pp. (Available at www.npafc.org).

Abstracts of Scientific Documents Submitted to the Commission for the 2014 CSRS Meeting: Forecast of Pacific Salmon Production in the Ocean Ecosystems under Changing Climate

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Keywords: migration, survival, climate impact, monitoring, key population, stock identification, management

This document is a compilation of abstracts of new and revised scientific documents submitted to the Commission between adjournment of the 2013 Annual Meeting and April 22, 2014. 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). Documents submitted by CSRS working groups or the Secretariat are not listed in this section. The third section lists abstracts of documents in order of document number (Section 3).

For consideration at the 2014 CSRS meeting, a total of 34 new documents and one revised document from 2013 by the BASIS Working Group were submitted. Of the new documents that were submitted, ten documents related to research on juvenile salmon, 11 documents related to research on climate impacts on salmon in the Bering Sea and adjacent waters, four documents related to research on salmon winter survival, 21 documents related to research on biological monitoring of key populations, 18 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 six from Canada, eight from Japan, three from Korea, six from Russia, nine from the United States, and one document submitted by both Russia and the United States.

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

1. **Migration and Survival Mechanisms of Juvenile Salmon in Ocean Ecosystems**
 - [Doc. 1505](#) Trawl Survey Plans for Pacific Salmon Marine Life Period Studies in the Far Eastern Seas in Summer and Fall 2014 by Russia
 - [Doc. 1506](#) Russian Bibliography of 2013 Publications Linked to the Current NPAFC Science Plan
 - [Doc. 1508](#) Southeast Alaska Coastal Monitoring (SECM) Survey Plan for 2014
 - [Doc. 1520](#) Bibliography of Publications on the Marine Ecology of Juvenile Pacific Salmon in North America, 2006-2014
 - [Doc. 1522](#) United States Cruise Plan for the Gulf of Alaska Project, July - August 2014
 - [Doc. 1523](#) United States Cruise Plan for BASIS on the R/V *OSCAR DYSON*, August – October 2014
 - [Doc. 1526](#) Korean Research Plan for Salmon in 2014
 - [Doc. 1527](#) Otolith Thermal Mark for Brood Year 2013 and Proposed Thermal Marks for Brood Year 2014 Chum Salmon in Korea
 - [Doc. 1529](#) Canadian Juvenile Salmon Surveys in 2014-2015
 - [Doc. 1530](#) United States Cruise Plan for Northern Bering Sea Surface Trawl Surveys, August - September 2014

2. **Climate Impacts on Pacific Salmon Production in the Bering Sea (BASIS) and Adjacent Waters**
 - [Doc. 1474 \(Rev. 1\)](#) Annual Report of Bering-Aleutian Salmon International Survey (BASIS) Research Activities 2009 to 2012 Related to the 2009 to 2013 BASIS Science Plan Research Questions
 - [Doc. 1499](#) Proposed Cruise Plans of Japanese Research Vessels for Salmon in the North Pacific Ocean in 2014
 - [Doc. 1505](#) Trawl Survey Plans for Pacific Salmon Marine Life Period Studies in the Far Eastern Seas in Summer and Fall 2014 by Russia
 - [Doc. 1506](#) Russian Bibliography of 2013 Publications Linked to the Current NPAFC Science Plan
 - [Doc. 1512](#) Data Files from Data Storage Tags Placed on Pacific Salmon and Steelhead Trout by the High Seas Salmon Research Program, University of Washington
 - [Doc. 1514](#) Results of 2013 Salmon Research by the *Oshoro maru*
 - [Doc. 1518](#) The Summer 2013 Japanese Salmon Research Cruise of the R/V *Hokko maru*
 - [Doc. 1520](#) Bibliography of Publications on the Marine Ecology of Juvenile Pacific Salmon in North America, 2006-2014
 - [Doc. 1522](#) United States Cruise Plan for the Gulf of Alaska Project, July - August 2014
 - [Doc. 1523](#) United States Cruise Plan for BASIS on the R/V *OSCAR DYSON*, August – October 2014
 - [Doc. 1526](#) Korean Research Plan for Salmon in 2014

[Doc. 1530](#) United States Cruise Plan for Northern Bering Sea Surface Trawl Surveys, August - September 2014

3. Winter Survival of Pacific Salmon in North Pacific Ocean Ecosystems

[Doc. 1506](#) Russian Bibliography of 2013 Publications Linked to the Current NPAFC Science Plan

[Doc. 1507](#) Spatial Distribution of Pink Salmon in the Subarctic Front Zone in Winter and Spring

[Doc. 1512](#) Data Files from Data Storage Tags Placed on Pacific Salmon and Steelhead Trout by the High Seas Salmon Research Program, University of Washington

[Doc. 1520](#) Bibliography of Publications on the Marine Ecology of Juvenile Pacific Salmon in North America, 2006-2014

4. Biological Monitoring of Key Salmon Populations

[Doc. 1499](#) Proposed Cruise Plans of Japanese Research Vessels for Salmon in the North Pacific Ocean in 2014

[Doc. 1501](#) Revision of Data on Pink Salmon Abundance in East Sakhalin and Kuril Islands

[Doc. 1502](#) Biostatistical Information on Salmon Catches, and Enhancement Production in Russia in 2013

[Doc. 1505](#) Trawl Survey Plans for Pacific Salmon Marine Life Period Studies in the Far Eastern Seas in Summer and Fall 2014 by Russia

[Doc. 1506](#) Russian Bibliography of 2013 Publications Linked to the Current NPAFC Science Plan

[Doc. 1508](#) Southeast Alaska Coastal Monitoring (SECM) Survey Plan for 2014

[Doc. 1512](#) Data Files from Data Storage Tags Placed on Pacific Salmon and Steelhead Trout by the High Seas Salmon Research Program, University of Washington

[Doc. 1514](#) Results of 2013 Salmon Research by the *Oshoro maru*

[Doc. 1515](#) Preliminary Statistics for 2013 Commercial Salmon Catches in Japan

[Doc. 1516](#) Preliminary 2013 Salmon Enhancement Production in Japan

[Doc. 1518](#) The Summer 2013 Japanese Salmon Research Cruise of the R/V *Hokko maru*

[Doc. 1519](#) Genetic Variation Among Major Sockeye Salmon Populations in Kamchatka Peninsula Inferred from SNP and Microsatellite DNA Analyses

[Doc. 1520](#) Bibliography of Publications on the Marine Ecology of Juvenile Pacific Salmon in North America, 2006-2014

[Doc. 1522](#) United States Cruise Plan for the Gulf of Alaska Project, July - August 2014

[Doc. 1523](#) United States Cruise Plan for BASIS on the R/V *OSCAR DYSON*, August – October 2014

[Doc. 1525](#) Korean Chum Salmon Catch Statistics and Hatchery Releases in 2013-2014

[Doc. 1526](#) Korean Research Plan for Salmon in 2014

[Doc. 1528](#) High Seas Salmonid Coded-Wire Tag Recovery Data, 2013
[Doc. 1529](#) Canadian Juvenile Salmon Surveys in 2014-2015
[Doc. 1530](#) United States Cruise Plan for Northern Bering Sea Surface Trawl Surveys, August - September 2014
[Doc. 1531](#) Canadian Commercial Catches and Escapements of Chinook and Coho Salmon Separated into Hatchery- and Wild-Origin Fish

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

[Doc. 1501](#) Revision of Data on Pink Salmon Abundance in East Sakhalin and Kuril Islands
[Doc. 1504](#) Proposed Otolith Marks for Brood Year 2014 Salmon in Russia
[Doc. 1506](#) Russian Bibliography of 2013 Publications Linked to the Current NPAFC Science Plan
[Doc. 1509](#) Proposed Thermal Marks for Brood Year 2014 Salmon in Alaska
[Doc. 1510](#) Releases of Otolith Marked Salmon from Alaska in 2013
[Doc. 1511](#) Microsatellite Identification of Sockeye Salmon Rearing in the Bering Sea During 2009-2013
[Doc. 1512](#) Data Files from Data Storage Tags Placed on Pacific Salmon and Steelhead Trout by the High Seas Salmon Research Program, University of Washington
[Doc. 1517](#) Proposed Otolith Marks for Brood Year 2014 Salmon in Japan
[Doc. 1519](#) Genetic Variation Among Major Sockeye Salmon Populations in Kamchatka Peninsula Inferred from SNP and Microsatellite DNA Analyses
[Doc. 1520](#) Bibliography of Publications on the Marine Ecology of Juvenile Pacific Salmon in North America, 2006-2014
[Doc. 1521](#) Stock Composition Analysis of Juvenile Chum and Chinook Salmon Captured on the 2012 Bering Sea and Chukchi Sea Research Surveys
[Doc. 1524](#) SALOSIS (Salmon Ocean Surveillance Information System)
[Doc. 1526](#) Korean Research Plan for Salmon in 2014
[Doc. 1527](#) Otolith Thermal Mark for Brood Year 2013 and Proposed Thermal Marks for Brood Year 2014 Chum Salmon in Korea
[Doc. 1528](#) High Seas Salmonid Coded-Wire Tag Recovery Data, 2013
[Doc. 1531](#) Canadian Commercial Catches and Escapements of Chinook and Coho Salmon Separated into Hatchery- and Wild-Origin Fish
[Doc. 1532](#) Proposed Thermal Marks for Salmon from Canada, Brood Year 2014
[Doc. 1533](#) Improvements to the Range-Wide Genetic Baseline for Chum Salmon Through the Western Alaska Salmon Stock Identification Program (WASSIP) and PacSNP Collaboration

6. Other Topics

[Doc. 1503](#)

Cruise Plans of Japanese Research Vessels Involving Incidental
Takes of Anadromous Fish in the North Pacific Ocean in 2014

[Doc. 1513](#)

Incidental Catches of Anadromous Fishes by Japanese Research
Vessels in the North Pacific Ocean in 2013

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

Canada

- [Doc. 1511](#) Microsatellite Identification of Sockeye Salmon Rearing in the Bering Sea During 2009-2013
- [Doc. 1520](#) Bibliography of Publications on the Marine Ecology of Juvenile Pacific Salmon in North America, 2006-2014
- [Doc. 1524](#) SALOSIS (Salmon Ocean Surveillance Information System)
- [Doc. 1529](#) Canadian Juvenile Salmon Surveys in 2014-2015
- [Doc. 1531](#) Canadian Commercial Catches and Escapements of Chinook and Coho Salmon Separated into Hatchery- and Wild-Origin Fish
- [Doc. 1532](#) Proposed Thermal Marks for Salmon from Canada, Brood Year 2014

Japan

- [Doc. 1499](#) Proposed Cruise Plans of Japanese Research Vessels for Salmon in the North Pacific Ocean in 2014
- [Doc. 1503](#) Cruise Plans of Japanese Research Vessels Involving Incidental Takes of Anadromous Fish in the North Pacific Ocean in 2014
- [Doc. 1513](#) Incidental Catches of Anadromous Fishes by Japanese Research Vessels in the North Pacific Ocean in 2013
- [Doc. 1514](#) Results of 2013 Salmon Research by the *Oshoro maru*
- [Doc. 1515](#) Preliminary Statistics for 2013 Commercial Salmon Catches in Japan
- [Doc. 1516](#) Preliminary 2013 Salmon Enhancement Production in Japan
- [Doc. 1517](#) Proposed Otolith Marks for Brood Year 2014 Salmon in Japan
- [Doc. 1518](#) The Summer 2013 Japanese Salmon Research Cruise of the R/V *Hokko maru*

Republic of Korea

- [Doc. 1525](#) Korean Chum Salmon Catch Statistics and Hatchery Releases in 2013-2014
- [Doc. 1526](#) Korean Research Plan for Salmon in 2014
- [Doc. 1527](#) Otolith Thermal Mark for Brood Year 2013 and Proposed Thermal Marks for Brood Year 2014 Chum Salmon in Korea

Russia

- [Doc. 1501](#) Revision of Data on Pink Salmon Abundance in East Sakhalin and Kuril Islands
- [Doc. 1502](#) Biostatistical Information on Salmon Catches, and Enhancement Production in Russia in 2013
- [Doc. 1504](#) Proposed Otolith Marks for Brood Year 2014 Salmon in Russia
- [Doc. 1505](#) Trawl Survey Plans for Pacific Salmon Marine Life Period studies in the Far Eastern Seas in Summer and Fall 2014 by Russia

- [Doc. 1506](#) Russian Bibliography of 2013 Publications Linked to the Current NPAFC Science Plan
- [Doc. 1507](#) Spatial Distribution of pink salmon in the Subarctic Front Zone in Winter and Spring
- [Doc. 1519](#) Genetic Variation Among Major Sockeye Salmon Populations in Kamchatka Peninsula Inferred from SNP and Microsatellite DNA Analyses

United States

- [Doc. 1508](#) Southeast Alaska Coastal Monitoring (SECM) Survey Plan for 2014
- [Doc. 1509](#) Proposed Thermal Marks for Brood Year 2014 Salmon in Alaska
- [Doc. 1510](#) Releases of Otolith Marked Salmon from Alaska in 2013
- [Doc. 1519](#) Genetic Variation Among Major Sockeye Salmon Populations in Kamchatka Peninsula Inferred from SNP and Microsatellite DNA Analyses
- [Doc. 1521](#) Stock Composition Analysis of Juvenile Chum and Chinook Salmon Captured on the 2012 Bering Sea and Chukchi Sea Research Surveys
- [Doc. 1522](#) United States Cruise Plan for the Gulf of Alaska Project, July – August 2014
- [Doc. 1523](#) United States Cruise Plan for BASIS on the R/V *OSCAR DYSON*, August – October 2014
- [Doc. 1528](#) High Seas Salmonid Coded-Wire Tag Recovery Data, 2013
- [Doc. 1530](#) United States Cruise Plan for Northern Bering Sea Surface Trawl Surveys, August - September 2014
- [Doc. 1533](#) Improvements to the Range-Wide Genetic Baseline for Chum Salmon Through the Western Alaska Salmon Stock Identification Program (WASSIP) and PacSNP Collaboration

Section 3. Document Abstracts (numerical order)

Doc. 1474 (Rev. 1) Annual Report of Bering-Aleutian Salmon International Survey (BASIS) Research Activities 2009 to 2012 Related to the 2009 to 2013 BASIS Science Plan Research Questions

BASIS Working Group, Committee on Scientific Research and Statistics

In October 2006, the NPAFC Parties agreed to continue the international effort to study salmon in the Bering Sea and requested a draft scientific plan for BASIS Phase II. Phase II continued the efforts of Phase I by proposing a set of surveys within three regions of the Bering Sea to establish when and where salmon stocks migrate and rear in the Bering Sea, and to clarify the mechanisms of biological response by salmon and ecological related species to the conditions affected by climate change. This document summarizes the published results for research questions proposed within the BASIS Phase II research plan. BASIS Phase II began during 2009 and finished in 2013.

Doc. 1499 Proposed Cruise Plans of Japanese Research Vessels for Salmon in the North Pacific Ocean in 2014

Shigehiko Urawa, Shunpei Sato, and Toru Nagasawa

Two Japanese research vessels are scheduled to conduct high-seas salmon surveys. The FRA (Fisheries Research Agency) research vessel *Hokko maru* will carry out a summer monitoring survey for salmon and their habitat in the central Bering Sea. The Hokkaido University research vessel *Oshoro maru* will accomplish salmon research in the western North Pacific in middle May 2014.

Doc. 1501 Revision of Data on Pink Salmon Abundance in East Sakhalin and Kuril Islands

Alexander M. Kaev and Nataliya V. Klovach

Pink salmon reproduction parameters vary substantially in different regions of the East Sakhalin coast and northern and southern Kuril Islands. Trends in population dynamics differ as well. On this evidence we conducted a revision of data on pink salmon abundance (catches) in the East Sakhalin coast and Kuril Islands. The data were represented separately on the northwest coast, north and south parts of the east coast of Sakhalin Island, as well as on northern and southern Kuril Islands.

Doc. 1502 Biostatistical Information on Salmon Catches, and Enhancement Production in Russia in 2013

Nataliya V. Klovach, Olga S. Temnykh, Valeriy A. Shevlyakov, Alexander V. Bugaev, Alexander M. Kaev, and Vladimir V. Volobuev

Commercial, subsistence, and sport catch statistics, escapement of adult salmon, and fry releases from hatcheries in 2013 are summarized by species and region. In total, 405,884.39 tonnes of salmon was caught in commercial fisheries in Russia in 2013. Most of the catch comprised pink (59%), chum (25%), sockeye (13%), and coho (2%) salmon by weight. Hatchery releases of salmon fry numbered 1,039,059.0 thousand fish. Most of the hatchery releases were chum (65%), pink (33%), and sockeye (1%) salmon.

- Doc. 1503** **Cruise Plans of Japanese Research Vessels Involving Incidental Takes of Anadromous Fish in the North Pacific Ocean in 2014**
Fisheries Research Agency
- Japanese research vessels are scheduled to conduct 10 high-seas surveys for pelagic fishes and squids in the North Pacific Ocean in 2014. These surveys have a possibility of incidental salmon catch during the fishing operations with gillnets, trawl or saury dip-net. In the case of gillnet operation, lengths of gillnets will be less than 2.5 km at sea.
- Doc. 1504** **Proposed Otolith Marks for Brood Year 2014 Salmon in Russia**
Elena Akinicheva, Vladimir V. Volobuev, and Evgeny Fomin
- Otolith marking of salmon of 2014 brood year will be conducted in five regions of the Far East: Kamchatka, Magadan, Sakhalin, Khabarovsk and Kuril regions. Marking will be carried out using two methods: thermal and “dry”. Their application will be determined by the possibilities and specificity of water supply of incubated embryos at hatcheries of the Far East. The dominate method of marking will be a “dry” one – it will be used on the 77% of salmon hatcheries. Salmon will be marked at 32 hatcheries. In total, 42 otolith marks will be used.
- Doc. 1505** **Trawl Survey Plans for Pacific Salmon Marine Life Period Studies in the Far Eastern Seas in Summer and Fall 2014 by Russia**
Olga S. Temnykh, Alexander V. Zavolokin, and Alexander N. Starovoytov
- The document summarizes trawl survey plans for Pacific salmon marine life period studies in the Far Eastern Seas in summer and fall 2014 by Russia (TINRO-Center). The outline of materials, methods, surveys timing, and theoretical background are provided.
- Doc. 1506** **Russian Bibliography of 2013 Publications Linked to the Current NPAFC Science Plan**
Alexander V. Zavolokin, Olga S. Temnykh, Svetlana V. Naydenko, Maxim V. Koval, Nataliya V. Klovach, Vladimir V. Volobuev, Alexander M. Kaev, Andrey A. Zhivoglyadov, Elena V. Golub, and Vladimir. I. Ostrovsky
- The bibliography lists original papers and documents published in 2013 by Russian scientists and their collaborators relevant to the 2011-2015 NPAFC Science Plan. The bibliography lists 80 papers, corresponding to the five key research components of the NPAFC Science Plan.
- Doc. 1507** **Spatial Distribution of Pink Salmon in the Subarctic Front Zone in Winter and Spring**
Alexander L. Figurkin and Svetlana V. Naydenko
- Spatial distribution of pink salmon and the habitat conditions in the central and western parts of the Subarctic Front Zone are considered from the data obtained in the winter-spring season of 1986–1992 and 2009–2011. The pink salmon spreads widely in the epipelagic layer of the mixing zone and adjacent waters, in a wide range of the salinity (32.7–34.9 ‰) and sea surface temperature (0.5–12.0 °C). Its distribution is determined by the shape of the landscape zone favorable for its dwelling in winter-spring, so it depends on the mode of the western Subarctic gyre in the North-West Pacific, on the mode of the Subarctic Front, and on intensity of the ocean branches of the East-Kamchatka Current and Aleutian Current. Besides, the quantitative parameters of its distribution depend on fluctuations of pink salmon abundance between odd- and even-numbered years.

Doc. 1508 **Southeast Alaska Coastal Monitoring (SECM) Survey Plan for 2014**

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

This survey plan details the proposed sampling for the Southeast Coastal Monitoring (SECM) project in May, June, July, and August of 2014. The SECM project is supported by the Alaska Fisheries Science Center (AFSC), Auke Bay Laboratories (ABL), with an objective to study the habitat use and early marine ecology of juvenile (age-0) Pacific salmon (*Oncorhynchus* spp.) and associated epipelagic ichthyofauna in Southeast Alaska and in the Gulf of Alaska ecosystem. The SECM surveys have been continuous since 1997, and they have provided long-term biological and oceanographic data sets associated with all five species of both wild and hatchery salmon during a period of climate change.

Doc. 1509 **Proposed Thermal Marks for Brood Year 2014 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 2014, approximately 65 million sockeye, 827 million pink salmon, 677 million chum, 10 million coho, and 8 million Chinook salmon will be marked at 27 different hatcheries using 89 thermal marks, three dry marks, and one strontium mark.

Doc. 1510 **Releases of Otolith Marked Salmon from Alaska in 2013**

Dion S. Oxman

In Alaska, mass-marking of salmon using otolith thermal marking is an effective research and management tool for a variety of situations. This document reports the otolith mark patterns applied to hatchery-raised salmon stocks released in Alaska during 2013. It includes five species of salmon from brood years 2011 through 2013. Release numbers, mark patterns, and release locations are summarized.

Doc. 1511 **Microsatellite Identification of Sockeye Rearing in the Bering Sea During 2009–2013**

*Terry D. Beacham, John R. Candy, Shunpei Sato, and
Shigehiko Urawa*

Stock composition of sockeye salmon (*Oncorhynchus nerka*) caught in the southern central Bering Sea during Japanese research cruises in the summers of 2009, 2011, 2012, and 2013 was estimated through an analysis of microsatellite variation. Variation at 14 microsatellites was analyzed for immature sockeye salmon, and a 404-population baseline spanning Japan, Russia, Alaska, Canada, and Washington State was used to determine the stock composition of the fish sampled. Alaskan-origin sockeye salmon were the most abundant in the catch, comprising 86.1% of all sockeye salmon caught (United States total 86.1%), with the catch dominated by sockeye salmon of Bristol Bay origin. Russian-origin salmon accounted for an average of 10.6% of the annual catch, while Canadian-origin sockeye salmon accounted for 3.4% of the annual catch.

Doc. 1512 **Data Files from Data Storage Tags Placed on Pacific Salmon and Steelhead Trout by the High Seas Salmon Research Program, University of Washington**
NPAFC Secretariat

Information collected by data storage tags carried by salmon during their high-seas migrations provides researchers with new tools to examine important salmon behavioral responses to environmental variables in the ocean. This information is crucial to understanding how changes in production and salmon migration might be impacted by ocean conditions and pertains directly to the 2011-2015 NPAFC Science Plan on forecasting Pacific salmon production in ocean ecosystems under conditions of changing climate. The High Seas Salmon Research Program of the University of Washington offered to provide the NPAFC Secretariat with data storage tag information gathered by tags recovered from salmon and steelhead ocean tagging operations. Robert Walker, Project Leader of the High Seas Salmon Program (now retired), who is a published expert on these tags, was contracted by NPAFC to organize the transfer of the data storage tag information. To complete the work, he organized, reviewed, interpreted, and fully documented the data gathered from the individual data storage tags. This task represents a portion of the work undertaken by the Committee on Scientific Research and Statistics to address the transfer of data sets to the Secretariat and to make them available in electronic form as outlined in CSRS List of Actions No. 7. A total of 92 data storage tags was recovered from 38 chum, 21 sockeye, 15 coho, 10 pink, 7 Chinook salmon and one steelhead trout. Of the 92 tags, eight failed completely and four others experienced partial failures. This report provides explanations for raw and modified tag data files, individual tag metadata, and graphs for data visualization for the functioning tags. Investigators considering exploring and using the data files from the data storage tags will find the information and guidance provided in this report crucial to understanding data file organization and data considerations important to appropriate use of the information from the tags. Previously published peer-reviewed articles and processed reports based on data originating from these data storage tags are listed for the convenience of researchers needing additional background information.

Doc. 1513 **Incidental Catches of Anadromous Fishes by Japanese Research Vessels in the North Pacific Ocean in 2013**
Shigehiko Urawa and Toru Nagasawa

Japanese research vessels conducted scientific fishing operations to assess stock status of Pacific saury, and other pelagic fishes and squids using midwater trawls, drift gillnets, and saury dip net in the western and central North Pacific Ocean. A total of 412 salmon including 101 chum, 265 pink, 28 coho, 17 Chinook, and 1 sockeye salmon was incidentally caught during the research surveys between June and October 2013.

Doc. 1514 **Results of 2013 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 Bering Sea. The survey was conducted during the Cruise #254 in May, and the Cruise #255 in June 2013. Six oceanographic observations and three drift gillnet surveys were conducted along the 155°E during the Cruise #254 in May. The Polar Front was observed in the vicinity of 43°N, which was similar to the location in previous years. A total of 673 salmonids was caught by gillnet surveys, including 95 chum and 573 pink salmon. Pink salmon was the dominant

species at 43°-14'N and 42°-56'N. Chum salmon was abundant at 44°-20'N. The fork lengths (F.L.) of chum salmon collected by C-gear gillnet ranged between 484-608 mm F.L., and those of pink salmon ranged between 375-524 mm F.L. All chum salmon caught along 155°E were mature fish. To collect salmonid samples extensively and to collect fresh salmon blood and various tissues, two surface long-line and four hook-and-line gear samplings were conducted during Cruise #254. One sockeye, five chum and 297 pink salmon were collected. During Cruise #255-Leg1, three hook-and-line gear samplings were conducted. A total of nine sockeye and 11 chum salmon were collected in the southern Bering Sea.

Doc. 1515 **Preliminary Statistics for 2013 Commercial Salmon Catches in Japan**
Kei Sasaki, Toshihiko Saito, and Toru Nagasawa

The commercial catches in coastal and offshore areas of Japan in 2013 totaled 52.3 million fish (164 thousand metric tons), including 47.5 million chum (156 thousand metric tons) and 4.8 million pink (seven thousand metric tons) salmon. The official specific statistics data may be available by the end of March 2015.

Doc. 1516 **Preliminary 2013 Salmon Enhancement Production in Japan**
Ayumi Nakashima and Kei Sasaki

Four species of anadromous Pacific salmon (chum, pink, masu, and sockeye salmon) are currently enhanced in Japan. A total of 1,729 million fry, juveniles, and smolts were released from Japanese hatcheries in 2013. The number of chum salmon fry released in the spring of 2013 was approximately 1,615 million fish. Japanese hatcheries also released 102 million pink salmon fry, 11,926 thousand masu salmon fry, juveniles, and smolts, and 192 thousand sockeye salmon fry and smolts in the spring and fall of 2013.

Doc. 1517 **Proposed Otolith Marks for Brood Year 2014 Salmon in Japan**
Yasuo Tomida, Tsutomu Ohnuki, and Shigehiko Urawa

Japan plans to mark approximately 250 million salmon of 2014 brood year (221.3 million chum, 24.5 million pink, 4.2 million masu, and 150 thousand sockeye salmon) using 101 discrete thermal patterns and three ALC (alizarin complexone) patterns at 43 hatcheries. Two rings in the first band are adopted as the base mark to distinguish Japanese chum and pink salmon from other stocks.

Doc. 1518 **The Summer 2013 Japanese Salmon Research Cruise of the R/V**
Hokko maru

Shunpei Sato, Tomoki Sato, Takashi Ohkubo, Shingo Nakamura, and Manabu Kagaya

A summer high-seas research cruise to investigate the biology of Pacific salmon was conducted from July 20 to August 10 in the Bering Sea aboard the Japanese research vessel *Hokko maru*. Research cruise activities included the collection of data on oceanography, zooplankton, micronekton, salmonids, and other organisms. In addition, seawater samples were collected for environmental DNA analysis. A total of 3,443 salmonids were caught by trawls and angling. Chum salmon was the most abundant species (87.5%), followed by sockeye salmon (8.9%), Chinook salmon (3.5%), coho salmon (0.09%), and pink salmon (0.06%). Salmonids were measured with respect to fork length and body and gonad weights by sex, and the scales were removed for age determination. Isotope, genetic, otolith, stomach, muscle of chum and Chinook salmon, brain and pituitary of chum and sockeye salmon, and seawater samples were obtained for

future study. There were 116 chum salmon and one sockeye salmon tagged with disk tags and released in the Bering Sea. Among tagged fish, 19 small and seven large chum salmon were released with DST (Data Storage Tag) micro and DST magnetic tags, respectively. Age-specific catch per a surface trawl (CPUE), scale mass index of chum salmon at 17 fixed sampling stations from 2007 to 2013, and estimated stock composition and abundance of chum salmon in 2013 are documented in this report.

Doc. 1519 **Genetic Variation Among Major Sockeye Salmon Populations in Kamchatka Peninsula Inferred from SNP And Microsatellite DNA Analyses**

Anastasia M. Khrustaleva, Morten T. Limborg, James E. Seeb

Sockeye salmon samples from six populations from Kamchatka Peninsula were tested for polymorphism at six microsatellite (STR) and forty-five single nucleotide polymorphism (SNP) loci. These populations included the five largest populations in the region. Statistically significant genetic differentiation among the local populations examined from this part of the species range was demonstrated. The STR variability points to pronounced genetic divergence of the populations from two geographical regions, Eastern and Western Kamchatka. The results of SNP analysis further revealed that the populations of the two northern Kamchatka rivers (Palana River and Pakhacha River) differed significantly from the other populations studied. We estimated the efficiency for both types of markers for individual assignment of fish taken in mixtures. Accuracy was generally higher for assignment with SNP data; however, pooling of the STR and SNP data sets provided higher accuracy than with either one alone.

Doc. 1520 **Bibliography of Publications on the Marine Ecology of Juvenile Pacific Salmon in North America, 2006-2014**

Eric Hertz and Marc Trudel

In this document, we provide a compilation of primary publications in peer-reviewed journals, as well as applicable NPAFC publications (Bulletin and Documents) that have been published on juvenile Pacific salmon (*Oncorhynchus* spp.) by North American scientists since 2006. This compilation formed the basis of an overview on recent progress in understanding the marine ecology of juvenile salmon in North America that was presented at the “Third International Workshop on Migration and Survival Mechanisms of Juvenile Salmon and Steelhead in Ocean Ecosystems” in Honolulu.

Doc. 1521 **Stock Composition Analysis of Juvenile Chum and Chinook Salmon Captured on the 2012 Bering Sea and Chukchi Sea Research Surveys**

Christine M. Kondzela, Charles M. Guthrie III, Colby T. Marvin, Jacqueline A. Whittle, Hanhvan T. Nguyen, Colleen Ramsower, and Jeffrey R. Guyon

Juvenile chum (*Oncorhynchus keta*) and Chinook salmon (*O. tshawytscha*) were collected in the Bering and Chukchi seas as part of the 2012 U.S. BASIS/Arctic Ecosystem Integrated Survey (Arctic EIS) cruises. Juvenile chum salmon were more commonly encountered on the survey and 1,222 juveniles were genotyped for 11 microsatellite markers to determine their stock of origin. The most northern sample set was relatively small; juvenile chum salmon collected in the Chukchi Sea were predominantly from the Kotzebue Sound stock group. Juvenile chum salmon collected in the northern Bering Sea near Norton Sound were predominantly of Norton Sound origin. Yukon River chum salmon were present in both survey areas of the Bering Sea, but were more prevalent between latitude 60-63°N. Juvenile Chinook salmon were not encountered in the

Chukchi Sea, but a small sample of 81 juveniles from the Bering Sea was genotyped for 43 single nucleotide polymorphism (SNP) markers. Most of the Chinook salmon were from the Upper Yukon, Coastal Western Alaska, and Middle Yukon stock groups. This study determined the freshwater origin of juvenile chum and Chinook salmon from the northern Bering and Chukchi seas during late-summer/fall based on genetic data and may be used to help guide future surveys of juvenile salmon abundance in western Alaska.

Doc. 1522 **United States Cruise Plan for the Gulf of Alaska Project, July - August 2014**

Jamal Moss

Scientists from the National Marine Fisheries Service (NMFS) will conduct a fisheries oceanographic survey during summer of 2014 within the southeastern region 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.

Doc. 1523 **United States Cruise Plan for BASIS on the R/V OSCAR DYSON, August – October 2014**

Edward V. Farley, Jr.

This cruise plan outlines the dates, locations, and activities of a fisheries oceanographic survey conducted in the southeastern Bering Sea during late summer and fall 2014. This survey is in part a continuation of the Bering Aleutian Salmon International Survey (BASIS). The primary objectives are to collect biological information on important fish species and describe the physical and biological oceanographic conditions in the southeastern Bering Sea.

Doc. 1524 **SALOSIS (Salmon Ocean Surveillance Information System)**

Skip McKinnell and Marc Trudel

The overarching objective is to understand the distribution of Pacific salmon in relation to oceanographic features that can be measured remotely from satellites or other global ocean observing assets. This first pilot project examined the relation between salmon and sea surface temperature. An historical data analysis and literature review was conducted to develop and understanding of monthly sea surface temperature frequency distributions where pink salmon and sockeye salmon were caught beyond territorial limits in the North Pacific Ocean, particularly in the Gulf of Alaska where British Columbia salmon are known to be abundant. For comparison, a preliminary exploration of the northwestern North Pacific was conducted using Hokkaido University's HUFODAT database to understand the relationship between salmon distribution there and sea surface temperature. Maps of suitable thermal habitat for pink and sockeye salmon in the Gulf of Alaska were computed for the months April through July 2013 using the NOAA/OIv2SST 1° X 1° lat/long database. Extrapolation of suitable thermal habitat, based on measurements in the Gulf of Alaska, to the northwestern North Pacific did not accurately represent known distributions. Salmon are known to be subarctic animals, so the monthly position of the Subarctic Boundary was computed monthly for 2013 using salinity data that are transmitted from profiling lagrangian floats (deployed by Project Argo) to the US-GODAE Argo server. While the Subarctic Boundary may potentially be a relevant feature in the northwestern North Pacific, in the eastern North Pacific, it veers sharply southward and does not correspond with the known offshore limits to salmon distribution. SST frequency data where salmon have

been known to be caught, combined with the monthly SST data described above for 2013 produced monthly coloured maps of salmon relative vulnerability to IUU fishing at 1° X 1° lat/long. Vulnerability is a function of the overlap of the salmon-SST probability distribution function (pdf) with the SST pdf. No overlap indicates no vulnerability to IUU fishing, and complete overlap indicates high exposure. Mismatches in some regions between suitable thermal habitat and known salmon distributions suggest that surveillance planning will require a more comprehensive view of salmon oceanic habitat than can be ascertained from SST alone. Ocean colour, hydrography, and altimetry are sources of additional information that could be fruitfully explored, perhaps within the context of an ocean circulation model.

Doc. 1525 **Korean Chum Salmon Catch Statistics and Hatchery Releases in 2013-2014**

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

Total catch of chum salmon was 95,057 fish or 218.6 metric tons (MT) in 2013. Among these, 53,388 fish or 122.7 MT were caught from the coastal areas for the commercial purpose (i.e., mostly set-net fishery) and 41,669 fish and 95.8 MT from the river for artificial propagation in a hatchery. Chum salmon were caught in coasts (56.1%) and rivers (43.9%). Average weight of chum salmon in 2013 was 2.30 kg and in 2012 was 2.04 kg.

Doc. 1526 **Korean Research Plan for Salmon in 2014**

Kwan Eui Hong, Ju Kyoung Kim, and Ha Yeun Song

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 establishment of the Yangyang Salmon Station (formerly Cold-water Fish Research Center) of the Korea Fisheries Resources Agency in the 1980s. The enhancement program of chum salmon has been expanded thereafter, so that chum salmon were transplanted to 18 streams in the coast of the Korean Peninsula. On the other hand, however, ecological research on salmon species was very limited until recently due to the lack of research programs. Though involvement in the North Pacific Anadromous Fisheries Commission requires scientific investigation on salmon research of each member nation, a 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. A special intention is needed for stocks at the southern boundary of distribution, such as Korean chum salmon.

Doc. 1527 **Otolith Thermal Mark for Brood Year 2013 and Proposed Thermal Marks for Brood Year 2014 Chum Salmon in Korea**

Kwan Eui Hong, Ju Kyoung Kim, and Seung Min Yoon

Korea released 4.1 million and 6.2 million thermal marked chum salmon in March 2013 and 2014, respectively. The marks were 3,1,2H in 2013 (2012 BY). In 2014 (BY 2013), Korea released chum salmon with the 3,2,1H (6.0 million) and 3,4,2H (0.2 million) otolith marks. Approximately 7.5 million chum salmon (BY 2014) will be otolith marked, which covers about 50% ~60% of releases of chum salmon at Namdae-cheon and Wangpi-cheon (river). Chum salmon will be marked at two different hatcheries (Yangyang Hatchery and Uljin Hatchery) using two thermal marks.

Doc. 1528**High Seas Salmonid Coded-Wire Tag Recovery Data, 2013**

Adrian G. Celewycz, Emily A. Fergusson, Jamal H. Moss, and Joseph A. Orsi

Information on high seas recoveries of salmonids (*Oncorhynchus* spp.) tagged with coded-wire tags (CWTs) has been reported annually to the International North Pacific Fisheries Commission (1981-1992) and to the North Pacific Anadromous Fish Commission (1993-present). Data from these CWT recoveries are also reported to the Regional Mark Processing Center (RMPC, <http://www.rmpec.org>) of the Pacific States Marine Fisheries Commission (PSMFC) for inclusion into their Regional Mark Information System (RMIS) Database. This document lists recovery data for 324 CWT salmonids that will be reported to PSMFC/RMPC for the first time. These CWTs were recovered from (1) the U.S. groundfish trawl fishery in the Gulf of Alaska (GOA) as sampled by observers (10 Chinook salmon, *O. tshawytscha*) in 2012 and 2013; (2) the U.S. groundfish trawl fishery in the GOA as sampled in a CWT tunnel detector test conducted at a Kodiak processing plant (71 Chinook salmon) in 2012; (3) Salmon Excluder Device testing in the GOA (40 Chinook salmon) in 2013; (4) rockfish trawl fishery in the GOA (113 Chinook salmon) in 2013; (5) the U.S. groundfish trawl fishery in the eastern Bering Sea-Aleutian Islands (BSAI, 7 Chinook salmon) in 2012 and 2013; and (6) U.S. trawl research in the GOA (68 Chinook salmon and 15 coho salmon, *O. kisutch*) in 2012. No new CWT recoveries from either the at-sea Pacific hake (*Merluccius productus*) trawl fishery in the northern Pacific Ocean off Washington/Oregon (WA/OR) or the West Coast trawl fishery off Washington/Oregon/California (WA/OR/CA) have been reported to the RMPC since 2011. No new CWT recoveries from foreign high seas research have been reported to the RMPC since 2010.

Doc. 1529**Canadian Juvenile Salmon Surveys in 2014-2015**

Marc Trudel and Chrys Neville

In this document, we present the juvenile salmon research surveys that have been planned in both the offshore and inshore areas by Canada for 2014-2015. The offshore program will conduct sampling off the west coast of British Columbia, whereas the inshore program will conduct sampling in the Strait of Georgia and Puget Sound. In addition to these two long-term programs, Canada will conduct three research projects in nearshore waters: (1) weekly purse seine survey in Johnstone Strait to monitor the northward migration of juvenile Fraser River Sockeye Salmon (May-July); (2) purse seine surveys in Cowichan Bay on the east coast of Vancouver Island as part of a study examining the factor causing mortality of juvenile Chinook Salmon in Southern British Columbia; and (3) a mid-water trawl survey performed with a small net (4 m X 4 m) to describe the dispersion of juvenile Chinook Salmon in nearshore waters.

Doc. 1530**United States Cruise Plan for Northern Bering Sea Surface Trawl Surveys, August - September 2014**

Kathrine Howard and Jim Murphy

This survey plan details the proposed sampling of juvenile salmon in the northern Bering Sea in August-September 2014. This represents the first year of a three-year collaborative project between Alaska Department of Fish and Game and Alaska Fisheries Science Center, Auke Bay Laboratories (ABL), with funding from the State of Alaska Chinook Salmon Research Initiative. This project builds upon prior juvenile salmon surveys conducted in the northern Bering Sea and led by ABL.

Doc. 1531

Canadian Commercial Catches and Escapements of Chinook and Coho Salmon Separated into Hatchery- and Wild-Origin Fish

Athena D. Ogden, James R. Irvine, Michael O'Brien, Nicholas Komick, Gayle Brown, and Arlene Tompkins

This report presents preliminary estimates of Canadian salmon abundance time series partitioned into hatchery- and wild-origin fish for return years 1975-2012. We present a novel coded-wire tag based method to estimate the numbers of hatchery-origin coho and Chinook salmon in the Canadian catch, a method developed that also identifies the jurisdiction of origin of hatchery fish. Escapements were also estimated and partitioned into hatchery- and wild-origin coho and Chinook salmon using spawner escapement data, hatchery-origin escapement estimates, and hatchery release numbers. Missing data in time series of annual escapement were imputed using a method of infilling expected values in contingency tables. When taking into account the entire time series for each species, wild fish were always more abundant than hatchery fish in both catch and escapement, except for Chinook catches off the West Coast of Vancouver Island. Catches of migrating U.S. hatchery fish resulted in higher proportions of hatchery fish in the catch than escapements for coho on the West Coast Vancouver Island and Chinook throughout British Columbia. We are currently making refinements to the methods that may result in changes to the preliminary results presented here.

Doc. 1532

Proposed Thermal Marks for Salmon from Canada, Brood Year 2014

Susan DiNovo 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 67 million Pacific salmon for release in 2015/16. Thermal marking will include 59 thermal marks applied at 17 hatcheries with marked salmon released at 44 locations. The plan is similar to the 2013 brood year marking plan, fish planned for release in 2014/15.

Doc. 1533

Improvements to the Range-Wide Genetic Baseline for Chum Salmon Through the Western Alaska Salmon Stock Identification Program (WASSIP) and PacSNP Collaboration

William D. Templin, Chris Habicht, Lisa W. Seeb, James E. Seeb, and Eric C. Volk

Chum salmon (*Oncorhynchus keta*) are important to the economy and culture of many communities in Western Alaska. The Western Alaska Salmon Stock Identification Program (WASSIP) was initiated as a means to determine stock of origin of chum and sockeye (*O. nerka*) salmon harvests in western Alaska fisheries. The foundation for this study was built through the North Pacific Anadromous Fish Commission by the Working Group on Stock Identification Studies and through a United States/Japanese collaboration that coordinated and developed a DNA database for chum salmon based on SNPs "PacSNP". WASSIP increased the baseline for chum salmon from 114 to 310 populations and from 60 to 95 SNPs selected from 188 SNPs. WASSIP also implemented novel quality control procedures for both laboratory and statistical analyses and developed statistical methods for handling linked loci. These data can serve as the springboard for collaborations among investigators from throughout the Pacific Rim to examine questions ranging from population structure, migratory behavior, stock-specific harvest, post-glacial colonization, and methods to select subsets of the data for specific research applications. Through PacSNP, the U.S. party is open to providing data and expertise in collaboration with scientists from other parties that will advance the use of these data for research on chum salmon.