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Abstracts of Scientific Documents Submitted to the Commission for the 2010 Annual Meeting

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Abstracts of Scientific Documents Submitted to the Commission for the 2010 Annual Meeting

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This document compiled abstracts of scientific research documents submitted to the Commission from the adjournment of the 2009 Annual Meeting to October 2010. A total of 60 documents (10 from Canada,15 from Japan, 8 from Korea, 10 from Russia, 14 from the United States, and 3 from the Committee on Scientific Research and Statistics) was presented for the consideration of scientific research and statistics. Each abstract contained document number, title, and name of author(s) or agency (if available).

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Canada

1219 Canada's Pacific Salmon Science Plan 2010-2015

M. W. Saunders

Canada maintains two major field programs that study the factors that affect the survival, behaviour and growth of juvenile wild and hatchery salmon in the ocean. One program has a focus on juvenile Pacific salmon on the high seas and the other program concentrates on juvenile Pacific salmon in the Strait of Georgia. The high seas program collects biological information and associated oceanographic data, including plankton composition. The Strait of Georgia program studies the trend in early marine survival of specific stocks of juvenile Pacific salmon in relation to growth and climate related impacts. Both of these programs have shown that a faster rate of growth in the early marine period results in higher marine survival. The studies have also shown that there are differences in the rate of growth among species, among stocks of the same species, and between the rearing areas in the south and north of the Province of British Columbia. Differences in growth relate to the timing of ocean entry, climate-related effects on the amount of prey and possibly to the quality of prey. There are also differences between hatchery and wild rearing types of the same species. There is some evidence that wild juvenile Pacific salmon survive better in a stressful marine environment than hatchery-reared fish of the same species. This means that in the future, it is necessary to study the factors that affect juvenile, wild salmon directly and not rely only on the more accessible information for hatchery fish.

1239 Canadian juvenile salmon surveys in 2010-2011

M. Trudel, R. Sweeting, and R. Beamish

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 impacts of ocean conditions and climate change on marine ecosystems and salmon resources, and to provide a sound scientific basis for optimizing hatchery production: an offshore program conducted off the west coast of British Columbia and Southeast Alaska, and an inshore program conducted in the Strait of Georgia and Puget Sound.

1) Juvenile salmon research in offshore areas

Three surveys have been planned by the Canadian Program on High Seas Salmon for 2010-2011: a summer survey on June 15 – July 6, 2010, a fall survey on October 12 – November 19, 2010, and a winter survey on February 1 – March 1, 2011. The primary objectives of these surveys will be to: (1) collect biological information on Pacific salmon and associated epipelagic fish community; (2) describe the ambient oceanographic conditions; and (3) quantify the biomass of zooplankton and describe zooplankton species community composition in coastal waters of British Columbia and Southeast Alaska.

2) Juvenile salmon research in the Strait of Georgia

Two surveys have been planned for the Strait of Georgia program for 2010: a summer survey, running from June 29 – July 18, 2010, and an early fall survey from Sept 10 – October 10, 2010. The primary objectives of these surveys will be to: (1) collect biological information on juvenile Pacific salmon and the

associated fish community; (2) collect information on ambient oceanographic conditions; and (3) collect DNA samples for stock identification purposes. Recent research by our group has shown strong seasonality in location and abundance of Chinook stocks within the Strait of Georgia. This variability appears to be related to types of life history strategies, ie., ocean type vs stream type. A similar strategy appears to be promoting the higher survival exhibited by Harrison River sockeye, one of the few North American stock that enters the ocean as fry rather than smolts.

1241 Proposed thermal marks for salmon from British Columbia for brood year 2010

J. Till

In British Columbia thermal marking continues to play an important role for both research and for fisheries management. For the 2010 brood year we expect to thermally mark approximately 61 million salmon. This will include 40 different thermal marks applied at 13 hatcheries and released from 46 locations. The plan is similar to that proposed and carried out for the 2009 brood year. British Columbia's main production releases remain unchanged while a few smaller programs have seen some modifications to their marking.

1256 Development of the POST acoustic tracking network and database

J. Thar and G.L. Kristianson

The Pacific Ocean Shelf Tracking Project (POST) was conceived in 2001 as one of 17 projects of the Census of Marine Life, a global network of scientists engaged in a 10-year effort to assess and explain the distribution, diversity and abundance of life in the ocean – past, present and future. POST was designed to determine the scientific value and feasibility of building a permanent, large-scale acoustic telemetry array for studying the movement and behavior of marine animals. Acoustic tracking was not a new technology, but its coordinated application on a continental scope had never been attempted before. Although at the outset POST was mainly seen as a means to explore questions around salmon migration and survival, it quickly became apparent that the array is capable of answering questions around more than just salmon behavior. Today, POST serves as an accessible research tool for studying a variety of marine animals along the west coast of North America, contributing to conservation and stewardship of marine resources.

1258 Canadian enhanced salmonid production during 1978-2009 (1977-2008 brood years)

J. Sandher,, R. Cook, and J. R. Irvine

The Salmonid Enhancement Program (SEP) in British Columbia, Canada was initiated in 1977 to rebuild stocks and increase catch through the expanded use of enhancement technology. The program comprises over 400 projects that produce Chinook, coho, chum, pink, and sockeye salmon, as well as small numbers of steelhead salmon and cutthroat trout. Projects include hatcheries, fishways, spawning and rearing channels, habitat improvements, flow control works, lake fertilization, and small classroom incubators, and range in size from spawning channels releasing nearly 100 million juveniles annually, to schools with classroom incubators that release fewer than one thousand. Data from facilities that operate outside the

direction of SEP are not included in this report. Steelhead and cutthroat are a provincial government responsibility, but some enhancement takes place at SEP facilities under a cooperative arrangement. Steelhead and cutthroat numbers in this report do not include releases from facilities operated by the Freshwater Fisheries Society of British Columbia.

1282 A late ocean entry life history strategy improves the marine survival of Chinook salmon in the Strait of Georgia

R.J. Beamish, R.M. Sweeting, T.D. Beacham, K.L. Lange, and C.M. Neville

The productivity of juvenile chinook salmon that enter the Strait of Georgia has generally declined over the past two decades. One aggregate of 15 populations from the South Thompson drainage of the Fraser River drainage, however, has increased. The increased productivity appears to be related to a life history strategy that results in juveniles entering the ocean in July, much later than most other chinook salmon populations. Juveniles from the South Thompson drainage are generally not common in the Strait of Georgia early in July, but they are abundant in September. They appear to leave the Strait of Georgia by November, probably through Juan de Fuca Strait. Late ocean entry, sea-type, Harrison River sockeye salmon are also surviving better in recent years than the majority of sockeye salmon that are entering the ocean earlier. Because pink and chum salmon that enter the ocean early are at high levels of abundance, it is possible that very early and very late ocean entry times are life history strategies that match the current state of the Strait of Georgia ecosystem.

1283 Late ocean entry of sea type sockeye salmon from the Harrison River in the Fraser River drainage results in improved productivity

R.J. Beamish, K.L. Lange, C.M. Neville, R.M. Sweeting, and T.D. Beacham

The productivity of sockeye salmon from the Fraser River declined from the early 1990s to 2009. However, the productivity of sea-type sockeye salmon from the Harrison River increased. Sockeye salmon with a sea-type life history enter the ocean after emerging from the gravel without rearing for a year in a lake. Sea-type sockeye salmon are rare in the Fraser River, representing only about one percent of the average production. However, in the most recent five years they represented an average of 9%. They enter the Strait of Georgia about six weeks later than the lake-type sockeye salmon and remain in the Strait of Georgia for three to four months during which they more than double their size. There is evidence that competition from juvenile pink salmon affects their age at return which may indicate that growth rates in the early marine period are associated with age at return. The condition of the juvenile sea-type Harrison River fish in September, compared to the condition of all other juvenile sockeye salmon in July, indicates that the improved survival is a result of better feeding conditions later in the summer in the Strait of Georgia. Harrison River sockeye salmon probably leave the Strait of Georgia through Juan de Fuca Strait in the south, compared to the lake-type that migrate north out of the Strait of Georgia through Johnstone Strait. The increased production of the sea-type life history is evidence of the importance of managing the diversity of life history strategies within sockeye salmon populations to maximize their survival in a changing climate.

1284 Competitive interactions between pink salmon and other juvenile Pacific salmon in the Strait of Georgia

R.J. Beamish, R.M. Sweeting, C.M. Neville, and K.L. Lange

Hundreds of millions of juvenile pink salmon enter the Strait of Georgia from the Fraser River in even-numbered years. In odd-numbered years, there are very few juvenile pink salmon. This alternating pattern of very large and very small abundance provides an excellent opportunity to study the competitive interactions between juvenile pink salmon and other juvenile Pacific salmon in the Strait of Georgia. In July, juvenile sockeye salmon were consistently smaller and had a higher percentage of empty stomachs in years of large pink salmon abundance. Other species of Pacific salmon also had higher percentages of empty stomachs in some years when pink salmon were abundant. The early marine survival of juvenile coho salmon was lower in years of pink salmon abundance, but this occurred mostly for hatchery coho salmon and not wild coho salmon. An interpretation is that wild coho salmon survive better than hatchery coho salmon in a stressful environment. There was a consistent response between juvenile pink salmon and the dominant line of juvenile sockeye salmon that was present in the Strait of Georgia every four years. Catches of pink salmon were more abundant in July in this four-year cycle, but less abundant in September. However, the daily rate of growth of juvenile pink salmon between July and September was greater in the years when the dominant line of sockeye salmon was abundant earlier in the year. An explanation may relate to juvenile migration patterns, but the explanation remains to be discovered. The catches in 2010 were seven times higher than the average of all other surveys and the abundance estimate of 24 million juvenile pink salmon was five times the average abundance in all other surveys. This abundance may indicate that an exceptional return will occur in 2011. The large abundances of juvenile pink salmon and their interactions with other juvenile Pacific salmon in the Strait of Georgia indicates that the management of Pacific salmon returning to the Fraser River needs to extend beyond the stewardship of escapements and into the consequences of interactions among juveniles within the Strait of Georgia ecosystem.

1285 Changes in the diet composition of juvenile sockeye salmon in the Strait of Georgia from the 1960s to the early 21st Century

D. Preikshot, R.J. Beamish, and R.M. Sweeting

Studies of the diet of juvenile sockeye salmon in the Strait of Georgia over the past 40 years show a trend of decreasing consumption of copepods and increasing consumption of decapod zooea and larvae. Presently, amphipods and decapods are the dominant prey items on the diet, representing approximately 60% of a relatively restricted number of items. The dominance of decapods in the diet appeared to be unique among the diets of juvenile salmon examined in other studies. Amphipods were usually the most common diet item in all examined studies of juvenile sockeye salmon diets. Studies of the diets of juvenile sockeye salmon, including our own, provide patchy information about a critical period in the establishment of brood year abundance. More comprehensive studies are needed that monitor the diets of juvenile sockeye salmon throughout the early marine period in relation to the composition of their zooplankton prey items.

1286 The use of acoustic tags to monitor the movement and survival of juvenile Chinook salmon in the Strait of Georgia

C.M. Neville, R.J. Beamish, and C. Chittenden

A total of 278 acoustic tags were placed in juvenile chinook salmon that were captured and released in the Strait of Georgia in 2007 and 2008. These tags could be detected at receiver arrays within the Strait of Georgia and at a receiver array at a northern exit point in Queen Charlotte Strait and a southern exit point in Juan de Fuca Strait. There were 83 (30%) of these fish detected at least once after they were released. Of the 100 fish tagged in September 23-24, 2007 only six fish were detected leaving the Strait of Georgia and all detections were at the southern exit point in Juan de Fuca Strait. Of the 30 fish tagged in the central Strait of Georgia in June 19-20, 2008, only one fish was detected leaving the Strait of Georgia through Queen Charlotte Strait. None were detected leaving the Strait of Georgia of the 78 fish tagged in the central Strait of Georgia in July 16-19, 2008. Only one was detected leaving the Strait of Georgia through Juan de Fuca Strait of the 40 fish tagged in the Gulf Islands area in July 14-15, 2008. None of the 30 tagged fish that were reared in the net pen and released in the Gulf Islands area were detected at any receiver. A tagging mortality and tag loss study indicated that the tagging procedures were an unlikely source of low detection rates of fish leaving the Strait of Georgia. It was also unlikely that the tagged fish remained in the Strait of Georgia over the winter and into the spring of the following year as trawl studies capture very few juvenile chinook salmon in the Strait of Georgia in the winter. Therefore, we concluded that there were large mortalities of the tagged fish which we interpret to indicate that the early marine mortality of chinook salmon within the Strait of Georgia is the major regulator of their brood-year strength.

Japan

1195 Rev. 1 Proposed cruise plans of Japanese research vessels for salmon in the North Pacific Ocean in 2010

M. Fukuwaka and K. Morita

Three Japanese salmon research vessels have been tentatively scheduled to conduct the following scientific research in the North Pacific and Bering Sea in 2010. The *Oshoro maru* will conduct research with gillnets, longline, hook-and-line and surface/bottom trawl to obtain data on the distribution and ecology of salmon and other pelagic fishes in the western North Pacific in May 2010, and in the western and central North Pacific, and Bering Sea from June to July. The *Wakatake maru* will conduct research with gillnets and longlines to obtain data on the distribution and abundance of salmon along 180° longitude in the central North Pacific and Bering Sea from early June to late July. While this vessels has been the main salmon research vessel, this will be the last salmon research cruise for the vessel. This will be the last year of research cruise using *Wakatake maru*. The *Kaiun maru* will conduct research with gillnets to obtain data on the distribution and ecology of neon flying squid, salmon and other pelagic fishes in the western and central North Pacific Ocean from July to August.

1226 Results of 2009 salmon research cruises of the *Oshoro maru*

N. Hoshi, K. Sakaoka, T. Abe, Y. Kamei, and S. Takagi

In order to clarify the oceanic structure and marine ecosystem, oceanographic observations and fishing surveys (including for salmonids) were conducted in the Northwest Pacific Ocean (along 155°E), in the central North Pacific Ocean (along 47°N), in the sea area around the Aleutian Islands and in the Bering Sea. Each survey was conducted during the Cruise #201 in May and the Cruise #202 from June to July, 2009. The polar front was located at 44°N and the Subarctic boundary was located at 40°N in the 155°E research line. Three drift gillnet were conducted along 155°E in May during the Cruise #201 (OSG0901: 43°-33'N, OSG0902: 41°-45'N, OSG0903: 37°-05'N). A total of 70 chum salmon and 552 pink salmon were caught by the drift gillnet operations. The CPUE value of chum salmon was highest at 43°-33'N, on the other hand, that of pink salmon was highest at 41°-45'N. No salmonids were caught 37°-05'N. A total of 14 chum and 609 pink salmon were caught by four hook-and-line gear samplings. Almost all chum salmon caught along 155°E in May were mature, and this result was same as before. The 47°N latitude line between 160°E and 175.5°W longitude in the North Pacific, the surface temperature got colder from east to west. Temperature under 2°C was observed about depth of 100db at 160°E. The halocline was observed about depth of 150db in this research line. Four drift gillnets and nine hook-and-line gear samplings were conducted along the 47°N line in the North Pacific. One surface long-line and three hook-and-line gear samplings were conducted around the sea area of Aleutian Islands during the Cruise #202 -Leg 1. A total of 109 sockeye, 230 chum, 895 pink, 46 coho and 10 steelhead salmon were collected by every sampling gear. Three drift gillnets, one surface long-line and 10 hook-and-line gear samplings were conducted in the Bering Sea during the Cruise #202-Leg 2. A total of 76 sockeye, 302 chum, 1909 pink salmon and one coho and three Chinook salmon were collected by drift gillnets and hook-and-line gear samplings.

1227 Incidental catches of anadromous fish by Japanese research vessel in the North Pacific Ocean in 2009

M. Fukuwaka

Japanese research vessels conducted the scientific fishing operation to assess Pacific saury, and other pelagic fishes using midwater trawls, drift gillnets, and hook-and-lines with possibilities of the incidental catch of anadromous fish in the western and central North Pacific in 2009. During these research surveys, a total of 509 salmonids including 54 chum, 442 pink, 12 coho salmon, and one steelhead trout were caught in June-July 2009.

1228 Rev. 1 The Cruise plans of Japanese research vessels involving incidental takes of anadromous fish in the North Pacific Ocean in 2010/2011 fiscal year

Fisheries Agency of Japan

Eight Japanese research vessels are scheduled to conduct the following scientific research for pelagic fishes in the North Pacific in 2010/2011 fiscal year. There are some possibilities of incidental catch of salmon during these cruises. In case of gillnet operation, lengths of gillnets will be less than 2.5 km at sea.

1232 Rev. 1 Proposed otolith marks for brood year 2010 salmon in Japan

M. Takahashi, and T. Sakamoto

In Japan, otolith marks are used for migration, growth and survival surveys of juvenile salmon in the coastal waters, and for offshore migration surveys in the Okhotsk Sea, North Pacific Ocean, and Bering Sea. In addition, hatchery origins of maturing adults are determined using thermal marks to evaluate their homing migrations. The proposed otolith marks for the 2010 brood year salmon include 50 discrete thermal patterns and two ALC (alizarin complexone) patterns. Japan plans to mark approximately 149 million chum, 26.7 million pink, 3.2 million masu, and 220 thousand sockeye salmon at 19 hatcheries. The thermal marking pattern is presented as the Hatch code notation. As the base mark, two rings in the first band have been adopted to distinguish Japanese chum and pink salmon from other stocks since 1999 brood year stock. All thermal rings are induced by cooler temperature exposures. ALC marks will be used for chum salmon surveys by Hokkaido Fish Hatchery.

1237 Japanese salmon research under the NPAFC science plan 2006-2010: a review and future issues

Nagasawa, T., M. Fukuwaka, T. Saito, and S. Sato

The major purpose of Japanese salmon research is to accomplish sustainable fisheries, balancing the conservation and use of salmon stocks in the North Pacific ecosystem. Thus, Japan will concentrate future salmon studies on population dynamics and ocean ecosystems in specific waters such as the central Bering Sea. These researches include: (1) population ecology of Japanese salmon stocks; (2) salmon

studies in the Bering Sea and other waters; and (3) monitoring of major salmon stocks. These issues may be incorporated into a new NPAFC Science Plan.

1259 Japan salmon commercial catch statistics for 2009

Fisheries Agency of Japan

The Fisheries Agency of Japan reported preliminary total commercial catches of Pacific salmon in 2009 by weight. The total catches in coastal, and offshore areas of Japan in 2009 was 215.9 thousand tons. Species specific statistics data may be available by the end of March 2011.

1260 Preliminary 2009 salmon enhancement production in Japan

M. Takahashi and K. Sasaki

Four species of Pacific salmon (chum, pink, masu, and sockeye salmon) are currently enhanced in Japan. A total of 1,973 million juveniles and smolts were released from Japanese hatcheries in 2009. Approximately 1,808 million chum salmon fry were released in the spring of 2009, the almost same level as in the previous year. Japanese hatcheries also released 150 million pink salmon fry, 14,544 thousand juveniles and smolts of masu salmon, and 312 thousand juveniles and smolts of sockeye salmon.

In 2009, a total of 6,417 thousand adult salmon were captured in rivers along the Japanese coasts. Chum and pink salmon accounted for 79.3 % and 20.5 % of the total river catches, respectively. Within Hokkaido, the number of adult returns was 12,923 fishes for anadromous masu salmon, and 1,263 fishes for anadromous sockeye salmon.

1261 Releases of otolith marked salmon from Japan in the fall of 2009 and spring of 2010

M. Takahashi, M. Iida, K. Kusumo, H. Ikka, Y. Katayama, Y. Hirabayashi, M. Fukuhara, T. Chiba and Y. Miyauchi

This document provided information of Japanese otolith mark releases, including release site, date, number, and mark patterns with images. In the spring of 2010, approximately 152.9 million chum, 28.5 million pink, 1.9 million masu, and 131 thousand sockeye salmon fry (2009 brood year) with thermal marks or ALC (alizarin complexone) patterns were released from 21 hatcheries in Japan. In addition, 445 thousand masu salmon smolts and 52 thousand sockeye salmon smolts (2008 brood year) were released in the spring of 2010 after thermally marked. In the fall of 2009, 606 thousand juveniles of otolith-marked masu salmon (2008 brood year) were also released. Two thermal rings as base mark were adopted to distinguish Japanese salmon from other stocks. ALC marks were used for chum salmon surveys by the Hokkaido Fish Hatchery. These data are uploaded to the database on the website of NPAFC Working Group on Salmon Marking (http://npafc.taglab.org).

1262 Total lipid contents and RNA/DNA ratios of sockeye, chum and pink salmon in the North Pacific Ocean and the Bering Sea during the summer of 2009

T. Kaga and S. Sato

This document reports the total lipid contents and RNA/DNA ratios of sockeye, chum and pink salmon which were caught in the North Pacific Ocean and the Bering Sea during the summer (June-July) of 2009. A total of 526 salmon which includes 106 sockeye, 180 chum and 240 pink salmon, was examined for total lipid contents. A total of 180 salmon which includes 51 sockeye, 74 chum and 55 pink salmon, was examined for RNA/DNA ratio. Older sockeye and chum salmon had higher total lipid content than younger fish. Total lipid content correlated positively with fork length in sockeye and chum salmon, but did not in pink salmon. RNA/DNA ratio negatively correlated with fork length in chum salmon. Comparing the RNA/DNA ratios in the present results with a past study, RNA/DNA ratios in 2009 was lower than that in 1994 and 1995. Total lipid content of chum salmon in 2009 was significantly higher than the mean total lipid content from 1998 to 2007, lipid storage state of chum salmon in 2009 was regarded as high. These biochemical parameters of pink salmon were higher than sockeye and chum salmon at the same ocean age. This difference in biochemical parameters among salmon species might reflect the difference in life history that the pink salmon had a shorter ocean life than sockeye and chum salmon.

1263 Salmon demand trends by the variations of expenditure elasticity

I. Shimizu

The future demand forecasting will be expected by the observation for current level and direction of the change of expenditure elasticity. This document studies the salmon demand trends in Japanese market by the variations of expenditure elasticity of workers' households between 1981 and 2009. Expenditure elasticity is one of the indicators to understand the demand trends. The relation between income and expenditure elasticity was computed by the linear least squares method. Yellowtail, octopus, shrimp (or prawn), scallop and salmon showed bigger demand despite of the increase of supply. Though the expenditure elasticity of fresh salmon has decreased since 1981, it has turned upward after 2005. The expenditure volume of salted salmon was bigger than that of fresh salmon from 1981 to 1993. However, the expenditure volume of fresh salmon has been bigger than that of salted salmon since 1994. The expenditure ratio of salmon to seafood per person per year showed more than 10%.

1264 Salmon stock assessment in the North Pacific Ocean, 2010

M. Fukuwaka, T. Ishihara, M. Sakai, and Y. Kamei and K. Morita

Results of annual research cruises on salmon stock assessment conducted by Japan in the summer of 2010 were summarized. Three Japanese salmon research vessels (*Oshoro maru*, *Kaiun maru* and *Wakatake maru*) conducted oceanographic observations, 47 gillnet (2,324 tans), 29 longline (800 hachi) and 15 hook-and-line fishing operations in the North Pacific and the Bering Sea from May to early August. Mean sea surface temperature and abundance of salmonids in 2010 were compared to those from 1992 to 2009. Mean sea surface temperature at gillnet research stations in 2010 were lower than the mean of 1992-2009 in the Bering Sea. A total of 7,739 salmonids was caught during fishing operations including

4,788 chum (61.9%), 1,486 pink (19.2%), 842 sockeye (10.9%), 488 coho (6.3%), 68 Chinook salmon (0.9%), and 67 steelhead trout (0.9%). In the Bering Sea, mean CPUE of sockeye salmon in the summer of 2010 was higher than the mean in 1992-2010, while mean CPUEs of chum and pink salmon were lower. Mean CPUEs of other salmonids including coho, Chinook salmon and steelhead trout were at a low level in 2010.

1265 International salmon research aboard the R/V *Wakatake maru* in the central North Pacific Ocean and Bering Sea during the summer of 2010

T. Ishihara., J. Seki, T. Koide, and M. Fukuwaka

An annual high-seas salmonid research cruise was conducted in the central North Pacific Ocean and Bering Sea from June 10 to July 19, 2010, onboard the Japanese research vessel, *Wakatake maru*, to investigate salmon stock condition. Research cruise activities included collection of data on oceanography, primary production, zooplankton, salmonids, and other organisms. Average sea surface temperature in the central North Pacific Ocean in 2010 was 8.3°C, which was cooler by 1°C than the average temperature in 2009. The Subarctic Boundary was located between 41°N and 42°N, which was further north of its position in 17 of the previous 19 years. In the central Bering Sea, average sea surface temperature in 2010 was 6.5°C, which was 0.1°C warmer than in 2009. At 24 experimental fishing stations, a total of 5,816 salmonids was caught by longline and gillnet: 790 fish in the central North Pacific and 5,026 fish in the central Bering Sea. In the central North Pacific, coho salmon was the most abundant species (46.6% of the salmonid catch), followed by chum (31.9%), pink (10.1%), steelhead (6.6%), sockeye (3.3%), and Chinook salmon (1.5%). In the Bering Sea, chum salmon was the most abundant species (81.3% of the salmonid catch), followed by sockeye (15.5%), pink (2.2%), Chinook (1.0%), and coho salmon (0.02%). A total of 1,401 salmonids was disk tagged during the survey, which included 18 sockeye, 102 chum, 21 pink, 84 coho, and one Chinook salmon, and nine steelhead released in the central North Pacific and 74 sockeye, 1,067 chum, 14 pink, and 11 Chinook salmon released in the Bering Sea. Snouts from 14 adipose fin-clipped steelhead were collected for later potential recovery of coded-wire tags. Other salmonid research activities included sampling for total lipid content, otolith thermal marks, genetic stock identification, food habits, and stable isotopes.

1266 Vertical distribution of Pacific salmon in the central Bering Sea in summer 2007

K. Morita

The vertical distribution of Pacific salmon sampled by trawl net, in the central Bering Sea in summertime was examined. The abundance of Pacific salmon caught decreased with increasing depth and the majority of Pacific salmon were caught within the upper 50 m. The inter-specific variation in vertical distribution was relatively small.

1267 Proposed cruise plans of Japanese research vessels for salmon in the North Pacific Ocean in 2011

M. Fukuwaka

Three Japanese salmon research vessels have been tentatively scheduled to conduct the following scientific research in the North Pacific, Bering, and Chukchi seas in 2011. In case of gillnet operation, gillnets less than 2.5 km in length at sea will be used.

(1) The *Hokko maru* will conduct research with a surface/midwater trawl and hook-and-line to obtain information on the distribution, abundance and some biological characteristic of summering salmon in the Bering, Chukchi seas, eastern and western North Pacific from mid July to late August.

(2) The *Oshoro maru* will conduct research with gillnets, longline, hook-and-line and surface trawl to obtain data on the distribution and ecology of salmon and other pelagic fishes in the western North Pacific in May, and in the North Pacific from June to July.

(3) The *Kaiun maru* will conduct research with gillnets to obtain data on the distribution and ecology of neon flying squid, salmon and other pelagic fishes in the western and central North Pacific from July to August.

Republic of Korea

1218 Rev. 1 Korean research plan for salmon in 2011-2015

K.B. Seong

Oceanic environments have been rapidly altered by climate change during the last decades and ocean ecosystems including salmon populations will be modified under the global warming situation. A special attention is needed for stocks in southern boundary of distribution such as Korean chum salmon. Future Korean salmon researches will focus on: (1) coastal migration route and timing of adult chum salmon; (2) mechanisms of mass salmon mortalities during their early life; (3) climate change effects on salmon distribution, migration route and abundance; 4) stock identification of chum salmon by parasites and genetic marks; and 5) cherry salmon releasing program and feeding ecology.

1220 Korean research plan for salmon in 2010

K.B. Seong and K.E. Hong

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 intention is needed for stocks in southern boundary of distribution such as Korean chum salmon. In 2010 Korea plans the following researches:

1. Adult salmon attached to disc type tag will be carried out to investigate the coastal migration route and timing of Korean chum salmon. Salmon will catch from set net fisheries at eastern coastal areas of Korea.
2. 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, Korea will carry out the researches 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 compare the growth rate between released juvenile salmon and wild juvenile salmon; and (5) Investigation on the optimal releasing period for juvenile salmon.
3. Climate change effects on salmon distribution, migration route, and abundance will be investigated. This research includes: (1) Continuous monitoring activities on environmental conditions in the Korean waters, and (2) Climate change effects on the biological characteristics of chum salmon returned to the Korean waters.
4. 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 2010 release (2009 brood).
5. For the stock identification, Korea will study on the parasitic fauna as a biological tag for the returned chum salmon to Namdae-cheon (stream).
6. Korea plans to expand cherry salmon releasing program every year
7. International cooperative research in Japan and other countries will be continued.

1221 Review of 2006-2010 Korean research

K.B. Seong

The first salmon hatchery in Korea was built in Kowon, Hamkyungnamdo in 1913. Modern fish culture in Korea began when hatcheries were established on the Milyang River of Kyungsangnamdo and on the Osip River in Samcheok City in 1967. The Cold-water Fish Research was established in 1984. Hatchery produced chum salmon are released in 18 streams on the east coast of Korea. Through the period from 1970 to 2010, the number of juvenile chum salmon released from hatchery programs increased from 600,000 to 21,500,000. The number of chum salmon harvested in freshwater has increased from 410 in 1970 to 37,000 in 2002. An average total of 120,000 chum salmon have been harvested in Korean waters annually since 1990, when set nets were first deployed in marine waters to harvest these fish. Through this period the rate of survival of juvenile chum salmon at release to adult has ranged from 0.2% to 1.5%. Adult chum salmon were captured from October through November of each year. After capture, male and female fish were sorted and artificial fertilized. The juveniles were released between March and April as they reached about 1 g in weight. We released some juveniles into the Namdae River through the fishway linking the institute to the river, while others were transported to other rivers for release. Korea has released CWT tagged juvenile chum salmon since 2003 and CWT chum salmon were recovered at Namdae-cheon and harbor of coastal area (set net) during the spawning seasons. Most chum salmon sampled were age 3 and age 4. 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 2005 brood. Korea released 2.2 million thermal marked chum salmon in March 2006 and 5.0 million in March 2007 and 5.0 million in March 2008 and 1.2 million in March 2009 and 6.0 million in March 2010. The marks were 3,3nH for 2005 Brood Year (BY), 3,1,2H for 2006 BY, and 3,2,1H for 2007 BY. Korea has total 54,000 of cherry salmon smolt was released in to Namdae-cheon from 2006 to 2009.

1250 Korean chum salmon catch statistics and hatchery releases in 2009-2010

K.B. Seong and K.E. Hong

The total catch of chum salmon was 49,760 fish or 133.8 metric tons (MT) in 2009. Among these, 27,800 fish or 74.8 MT were caught from the coastal areas for the commercial purpose (i.e., mostly set-net fishery) and 21,960 fish and 59.1 MT from the river for artificial propagation in hatchery. Average weight of chum salmon in 2009 was 2.69kg, while 2.63kg in 2008. The total released fingerlings of chum salmon were 5,835 thousand fish in 2009 (2008 BY) and 17,194 thousand fish in 2010 (2009 BY).

1251 Recoveries of coded wire tag for chum salmon in Korea in 2009

K.B. Seong

Korea has released CWT tagged juvenile chum salmon since 2003 and 45 CWT chum salmon were recovered at Namdae-cheon and harbor of coastal area (set net) during the spawning seasons in 2009. Among 45 chum salmon, 27 salmon were female and 18 were male. Most salmon sampled were age 3 (15.5 %) and age 4 (77.7%), which were released in 2007 and 2006.

1252 Korean research plan for salmon in 2011

K.B. Seong

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 Cold-water Fish Research Center (formerly Yangyang Inland Hatchery) of National Fisheries Research and Development Institute during mid 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. On the other hand, however, the ecological research on salmon species was very limited until recently due to the lack of research program. Though the involvement to the North Pacific Anadromous Fisheries Commission (NPAFC) requires scientific investigation on salmon research of 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 intention is needed for stocks in southern boundary of distribution such as Korean chum salmon.

1. Adult salmon attached to disc tag will be carried out to investigate the coastal migration route and timing of Korean chum salmon. Salmon will catch from set net fisheries at eastern coastal areas of Korea.

2. 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, we will carry out the researches 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 compare the growth rate between released fingerling salmon and wild fingerling salmon, and
(5) Investigation on the optimal releasing period for fingerling salmon.

3. Climate change effects on salmon distribution, migration route, and abundance will be investigated. This research includes
(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.

4. 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 2011 release (2010 brood).

5. For the stock identification, we will study on the parasitic fauna as a biological tag for the returned chum salmon to Namdae-cheon(stream).

6. We plan to expand cherry salmon releasing program, and as the first step of cherry salmon research, we will examine stomach contents to know the prey items of cherry salmon and the competitions for preys with other fish species in the coastal area and ocean.

8. International cooperative research (e.g. Republic of Korea and U.S. panel Conference on Fisheries Sciences) in the North Pacific will be continued.

1253 Otolith thermal mark for brood year 2009 and proposed thermal marks for brood year 2010 chum salmon in Korea

K.B. Seong and K.E. Hong

Korea released 1.2 million and 6.5 million thermal marked chum salmon in March 2009 and 2010, respectively. The marks were 3,3nH for 2009 (2008BY) and 3,1,2H for 2010 (2009BY) . We will mark approximately 5.0 million chum salmon in BY 2010, which covers about 50% of release of BY 2010 chum salmon at Namdae-cheon (river). Chum salmon will be marked at Cold -water Fish Research Center using only 1 thermal mark (3,2,1H).

1257 *Anisakis simplex* (Nematode: Anisakidae) L3 larvae infection in chum salmon (*Oncorhynchus keta*) from Namdae River, South Korea in 2009

E. Setyobudi, K.B. Seong and J.H. Kim.

This study was conducted for investigating prevalence and intensity of *Anisakis simplex* L3 larvae isolated from 120 chum salmon collected during October and November 2009 from the Namdae River, Korea. The same prevalence (100%) and slightly higher mean intensity was observed when compared with the previous year's data. All of chum salmon samples caught in the Namdae River were infected with *A. simplex* L3 larvae (100 %) and the mean intensity of infection was 79.65±84.85 (larvae/host). The nematodes were found mostly in muscle (98.00 %).

Russia

1217 Trawl survey plans for Pacific salmon marine life period studies in the Far Eastern Seas in 2010 by Russia

O.S. Temnykh, A.N. Starovoytov, and A.V. Zavolokin

The document described three research cruise plans on studies for Pacific salmon marine life in 2010. In 2010 TINRO Center will continue monitoring of the state of ecosystems in the Bering Sea, Okhotsk Sea, and western North Pacific Ocean. The plans include studies on salmon distribution, food selectivity, 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 the influence of abiotic environment upon the salmon quantitative allocation and migrations. One of the goals of these studies is the estimation of Pacific salmon survival/mortality at the different stages of marine life period.

1) Cruise plan for Pacific salmon marine period of life research in the wintering area
Winter Pacific salmon studies in the subarctic waters of western North Pacific Ocean between 145ºE and 170ºE are conducted by R/V *TINRO* during February and March 2010. The major objectives are to: (1) determine the current status of Pacific salmon in the pelagic ecosystems; (2) elucidate Pacific salmon position and role in the trophic structure of epipelagic zone; (3) evaluate pelagic ecosystem status as well as oceanic and overall ecological conditions during winter and spring; and (4) estimate salmon mortality during fall and winter.

2) Cruise plan for Pacific salmon marine period of life research during their anadromous migrations
Studies during Pacific salmon anadromous migrations were planned in the Pacific waters off Kuril Islands. The major purpose of these studies is the estimation of anadromous Pacific salmon abundance and biomass for short-term forecasting of their returns and possible catch. The cruise of R/V *Professor Kaganovsky* will be carried out in the North Pacific waters near the Okhotsk Sea in June and July 2010.

3) Cruise plan for Pacific salmon marine period of life research during their catadromous migrations
Studies during Pacific salmon catadromous migrations were planned in the Bering Sea and Okhotsk Sea. The major purpose of these studies is the estimation of anadromous Pacific salmon abundance and biomass for forecasting of their returns and possible catch in the next years. The first phase of R/V *Professor Kaganovsky* cruise (September 18-October 19, 2010) will be devoted to the catadromous migrations of Pacific salmon in the western Bering Sea. The second phase (October 2-November 20, 2010) are planned to study the catadromous migrations of Pacific salmon in the southern Okhotsk Sea.

1231 Russian Pacific salmon research program for 2010-2014 period

V.P. Shuntov

Russian studies of salmon in 2010-2014 will be conducted in accordance with the 5-year multi-disciplinary Pacific Salmon Research Program of Scientific Technical Association “TINRO” which includes: 1) Reproductive range and state of spawning pool; 2) Assessment of natural reproduction

efficiency; 3) Estuarine and coastal life of salmon juveniles; 4) Salmon ecology during marine and ocean life; 5) Population structure and stock units of salmonid fish; 6) Dynamics in abundance and short- and long-term forecasts of salmon number and time of approach; 7) Artificial reproduction of salmon; 8) Studies on sanitary and epidemiologic conditions in salmon populations; 9) Studies on salmon predation by marine mammals in river mouths and adjacent areas; and 10) Development of scientific basis for recreational fishery in Pacific salmon habitats.

1238 Russian salmon research under the NPAFC Science Plan 2006-2010: a review and future issues

O. Temnykh, A. Zavolokin, and M. Koval

Large-scale ecosystem monitoring during the marine and oceanic life of salmon is important to investigate the North Pacific carrying capacity. To clarify status of salmon in the North Pacific ecosystem, Russia focuses the following research items: (1) season and long-term dynamics of content and structure of pelagic nekton communities in different regions of the North Pacific in which salmon are one of the component; (2) season and long-term dynamics of content and structure of plankton communities; (3) salmon in trophic structure of pelagic nekton communities; and (4) carrying capacity of the epipelagic layer of North Pacific for Pacific salmon (causes of temporal changes in salmon carrying capacity). Those studies will make it possible to understand how changes in pelagic community's structure affect on migration, mortality, growth, production of salmon during the marine period of life.

The Bering Sea is very important feeding area for the most American and Asian salmon stocks. Continuation of investigations in the frame of BASIS-II program (Doc. 1164) will make it possible to continue the time series of biological and oceanographic data to focus on how climate change and cycles affect the Bering Sea ecosystem. Realization of these issues is possible only if the large-scale ecosystem monitoring in the Okhotsk Sea, Bering Sea and adjacent Pacific waters will be continued.

1242 Proposed otolith marks for brood year 2010 salmon in Russia

E. Akinicheva and V. Volobuev

Mass marking will be carried out in four regions of the Far East: Kamchatka, Sakhalin, Magadan, and Khabarovsk region. The marking will be conducted in two different ways: thermal and "dry" depending upon the possibilities and specificity of water supply of hatcheries. Juvenile salmon will be marked at twenty-four salmon hatcheries and thirty-two marks will be used. Thirty marks will be used for marking chum, eleven for pink, eight for coho, two for sockeye, one for masu and Chinook salmon. It is supposed about 220 millions of juvenile salmon will be marked in 2010.

1269 Biostatistical information on salmon catches, and enhancement production in Russia in 2009

Pacific Research Fisheries Center (TINRO-center)

The coastal catches of Pacific salmon in the Russian Far East totaled 551,277 tonnes or 358.6 million fish

in 2009. The main species caught were pink salmon (425,455 tonnes), followed by chum (93,018 tonnes), sockeye (28,396 tonnes), coho (3,693 tonnes), Chinook (695 tonnes), and masu salmon (19 tonnes).

1270 The Peculiarities of pre-spawning migration of pink salmon in the western Bering Sea and northwestern Pacific Ocean in 2009

E.V. Kurenkova, A.A. Khoruzhiy, and A.V. Zavolokin

The trawl surveys by R/V *TINRO* and R/V *Professor Kaganovskiy* were conducted during the summer of 2009 in the upper epipelagic layer of the western Bering Sea and northwestern Pacific Ocean. Its continued observations of north-west Pacific epipelagic community state during early summer period. One of main goal of these surveys was total registration of pink salmon on its early pre-spawning migration ways. Estimates of pink salmon abundance and biomass as well as it percentage of the nekton community were provided. The distributions and biological parameters of adult pink salmon were described in detail.

1271 Origin and distribution of local stocks of immature chum salmon *Oncorhynchus keta* in the western Bering Sea during the fall of 2004 and 2006

A.V. Bugaev, E.A. Zavolokina, A.V. Zavolokin, L.O. Zavarina, I.N. Kireev, A.O. Shubin, Yu.I. Ignatyev, S.F. Zolotukhin, N.F. Kaplanova, and M.V. Volobuev

Results of identification of regional complexes of immature chum salmon local stocks on the data of trawl survey accomplished by R/V *TINRO* in the course of the Bering-Aleutian Salmon International Survey (BASIS) in the Western Bering Sea (the EEZ RF) in September-October 2004 and August-October 2006 were represented. The part of the immature individuals for the period of sampling was over 90% in the total catch of this species. The study was carried out inside the boundaries of districts used in the TINRO-Center to provide biocenological monitoring. The districts were also united into the “northern” (districts 2-8) and the “southern” (districts 9-12) groups. Differentiation was made on the base of scale structure. The total aged sample size in the mixed marine samples of immature chum salmon was 3985 fishes, 3411 of them were identified. The age groups 0.1, 0.2 and 0.3 were used to analyzing, the groups in the whole included more than 99% of immature chum salmon in the trawl catches. The baseline data base included 8039 chum salmon individuals from the age group 0.3 + 0.4. This pool was used to analysis of chum salmon scale phenotypic diversity in Asia and North America. 2400 individuals were literally engaged to be identified as representatives of the principle chum salmon production sites in the North Pacific Ocean. The baselines have formed through the cluster analysis. The analysis provides 7 chum salmon stock complexes outlined: 1) of South-East Sakhalin + the south-west continental coast of the Sea of Okhotsk; 2) of West and South-West Kamchatka + North-West Kamchatka; 3) of North-East Kamchatka; 4) of the north and north-west continental coast of the Sea of Okhotsk; 5) of Chukotka; 6) of West Alaska + North-West Alaska; 7) of the west and east coasts of Hokkaido + the north coast of Honshu. The resolution ability of the baseline data base was 87,47% (the age group 0.3 + 0.4). As a result the identification we accomplished provides the ratio between the regional complexes of the immature chum salmon local stocks (the age groups 0.1 + 0.2 + 0.3) in the Western Bering Sea in

September-October 2004, as next: 1) the “northern” group (districts 3-8) - Russia – 60.1%, Japan – 30.7%, the USA – 9.2%; 2) the “southern” group (district 12) – Russia – 70.8%, Japan – 21.0%, the USA – 8.2%. In August-October 2006 the ratio between the complexes was as: 1) the “northern” group (districts 2-8) - Russia – 63.8%, Japan – 31.9%, the USA – 4.3%; 2) the “southern” group (districts 9-12) – Russia – 82.4%, Japan – 16.3%, the USA – 1.3%. On the base of estimations of the immature chum salmon abundance in the districts of the Western Bering Sea obtained by experts of TINRO-Centre and of the results of the identification demonstrated we can estimate relative abundance of principle complexes of stocks of this species in the course of fall feeding in the Bering Sea part of the EEZ RF. The estimation obtained for September-October 2004 is: 1) the “northern” group (districts 3-8) - Russia – 71.09 mil. fishes, Japan – 36.27 mil. fishes, the USA – 10.94 mil. fishes; 2) the “southern” group (district 12) – Russia – 48.29 mil. fishes, Japan – 14.29 mil. fishes, the USA– 5.63 mil. fishes. For August-October 2006 the estimation is: 1) the “northern” group (districts 2-8) - Russia – 195.35 mil. fishes, Japan – 97.52 mil. fishes, the USA – 13.19 mil. fishes; 2) the “southern” group (districts 9-12) – Russia – 90.96 mil. fishes, Japan – 18.01 mil. fishes, the USA – 1.43 mil. fishes. Actually in the Bering Sea part of the EEZ RF for the period of trawl surveys by R/V *TINRO* Russian stocks of immature chum salmon provided 64.0% (119.38 mil. fishes) in 2004 and 68.8% (286.31 mil. fishes) in 2006. Japan stocks in 2004 and 2006 provided 27.1% (50.56 mil. fishes) and 27.7% (115.53 mil. fishes) respectively. The share of American stocks was the least in both cases: 8.9% (16.57 mil. fishes) in 2004 and 3.5% (14.62 mil. fishes) in 2006.

1272 Rev. 1. Result of research survey by R/V *TINRO* in winter-spring 2010 in subarctic frontal zone

S.V. Naydenko, A.Ya. Efimkin, K.K. Karyakin, A.A. Balanov, N.A. Kuznetsova, A.L. Figurkin, R.G. Ovsyanikov, S.S. Ponomarev, A.V. Klimov, I.Y. Spirin, and A.V. Kojevnikov

The document summarizes results of R/V *TINRO* trawl surveys of upper epipelagic water layer in the western part of Subarctic frontal zone in the February-April 2010. The data to register of nekton and plankton communities, spatial distribution of main nekton species, biological parameters of salmon, feeding of salmon, forage base and oceanographic environment is reviewed.

1273 Marked salmon production by the hatcheries of Russia in 2010

E. Akinicheva and V. Volobuev

Salmon marking at the hatcheries of the Far East of Russia has been conducted for more than 15 years and the aim is, first of all, to evaluate the efficiency of hatchery releases. The number of marked salmon releases has lately increased as the result of their marking in Sakhalino-Kurilski region where the biggest number of hatcheries is located. In 2010 about 455 million of otolith marked salmon were released from 23 hatcheries (4 hatcheries in Magadan, 5 hatcheries in Kamchatka, one hatchery in Khabarovsk region, and 13 hatcheries in Sakhalino-Kurilski region). The major releases of marked salmon were chum (288.12 million fish) and pink salmon (157.7 million fish). Sockeye and coho salmon occupied 1.2% and 0.8% of total marked salmon, respectively. Besides 0.88 million of marked Chinook salmon were released. More than 89% of marked salmon was released from hatcheries in Sakhalino-Kurilski region. Thirty eight unique marks were used in the process of marking: 30 marks for chum salmon, 4 marks for

coho salmon, 2 marks for sockeye salmon, 10 marks for pink salmon, and one mark for Chinook salmon.

1274 Studies in genetic structure of Pacific Salmon populations in the Russian Far East with use of microsatellite markers

L.A. Zhivotovsky

The paper outlines the current state in creating population data bases on Pacific and other salmon in the Russian Far East based on DNA microsatellite markers. Microsatellite analysis is a very powerful genetic tool that is able to distinguish well population structures, which is necessary to know for fish identification, mixed stock analysis, ecological certification, etc. The most developed is a data base on chum salmon, a commercially important species in Russia, with more than 200 population samples (30 to 50 fish each) from more than 80 rivers in the main geographic regions of the Russian Far East, characterized with ten microsatellite markers. These markers reveal a relatively large differentiation between populations from geographically distant regions. As an example, FST-values, which estimate genetic differentiation, between chum salmon populations in South Kuril Islands and those in Sakhalin Island exceed 7%. The data base is being updated every year. Besides, we introduce additional DNA primers to fix deficiencies that are caused by null alleles due to mutations in the DNA primer regions, as well as develop an additional set of markers for a finer differentiation of geographically close populations of chum salmon. Population data bases on other salmonid species in the Russian Far East are under construction. Among the latter is pink salmon, commercially the most important salmon in the Russian Far East. However, previous rich data on allozyme variation and preliminary DNA data have revealed an exclusively low genetic differentiation of Asian pink salmon, with an indefinite, labile population structure, that was hypothesized to be caused by spatially and temporally varying strong between-stock gene flows (the ‘pink salmon fluctuating stocks’ hypothesis). Another direction of research is studying population structure of rare and endangered salmonid species, among which are sockeye salmon in Iturup Island, where this species is rare and represents the most southern part of its habitat in the Russian Far East, Sakhalin taimen (*Parahucho perryi*) that inhabits the Sakhalin-Kuril and neighbouring regions, and populations of other species for conservation genetics purposes.

United States

1224 Southeast Alaska Coastal Monitoring (SECM) Survey Plan for 2010

J.A. Orsi, M.V. Sturdevant, E.A. Fergusson, B.L. Wing, and W.R. Heard

The Southeast Alaska Coastal Monitoring (SECM) project was initiated in 1997 by the Auke Bay Laboratory, National Marine Fisheries Service, to study the habitat use and early marine ecology of juvenile (age-0) Pacific salmon and associated epipelagic ichthyofauna. SECM research addresses the five fundamental activities identified under this goal, which include: 1) monitor and observe the land, sea, atmosphere; 2) understand and describe how natural systems work together; 3) assess and predict the changes in natural systems; 4) engage, advise, and inform individuals, partners, communities, and industries; and 5) manage coastal and ocean resources. SECM research emphasizes long-term monitoring of coastal marine habitats used by juvenile salmon and associated epipelagic fishes, to understand how environmental variation affects the sustainability of these marine resources in an ecological context.

In 2010, SECM research is scheduled to be conducted in the northern region at up to 13 core stations during four intervals from late May to late August. This sampling schedule is similar to what was done in the years prior to 2005. No inter-vessel calibration of CPUE between vessels is planned for 2010. SECM has collaborated with many agencies, institutions, and individuals over its lifespan and has contributed numerous reports and publications to the scientific community (http://www.afsc.noaa.gov/ABL/MSI/msi_secm.htm, see also section on selected publications). Annual presentations on pink salmon forecasting are made to the Purse Seine Task Force, (http://www.afsc.noaa.gov/ABL/MSI/msi_sae_psf.htm) and both oral and poster presentations on topics in salmon ecology are made at professional meetings and seminars, including the Pink and Chum Salmon Workshop, Salmon Ocean Ecology meeting, American Fisheries Society, Hatchery Managers Meeting, NPAFC, Alaska Marine Science Symposium, and local schools and universities. A complete data summary is reported annually to the North Pacific Anadromous Fish Commission as an NPAFC document (lagged one year). These contributions are an important service and continue to provide data that will improve understanding the role of salmon in local and regional ecological processes.

1233 United States cruise plan for GOAIERP on the F/V *Northwest Explorer*, July 2 - 24, 2010

Anonymous

Scientists from the National Marine Fisheries Service (NMFS), Marine Ecosystem and Stock Assessment (MESA) Program, BASIS group will conduct a survey during summer 2010 within the southeastern Gulf of Alaska to provide key ecological data on the pelagic ecosystem. Primary objectives of the survey will be to collect biological information on ecologically important fish species, and to describe the physical and biological oceanographic conditions of the southeastern Gulf of Alaska. A survey of epi-pelagic fish species, zooplankton, ichthyoplankton, and oceanographic measurements will be conducted at stations within the southeastern region of the Gulf of Alaska aboard the commercial fishing vessel Northwest Explorer. The survey will begin 2 July 2010 in Juneau, Alaska and end on 24 July 2010 in Juneau,

Alaska, for a total of 23 sea days. The cruise will be conducted aboard the commercial fishing vessel Northwest Explorer. Fish samples will be collected using a midwater rope trawl. At each station, the net will be towed at or near the surface for 30 minutes at speeds between 3.0 and 3.5 kts. All fish species will be counted and standard biological measurements including length and weight will be taken from subsamples of each species. Diets of subsamples of marine fish will not be examined. Biological and physical oceanographic data will be collected at each trawl station as well as opportunistically during the survey.

1234 United States cruise plan for BASIS on the R/V *Oscar Dyson,* August-September 2010

Anonymous

The NOAA ship *Oscar Dyson* will be used to collect biological information on ecologically important fish species and provide descriptions of the physical and biological oceanographic conditions of the southeastern Bering Sea waters during August and September 2010. Fish samples will be collected using a midwater rope trawl. At each station, 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. Diets of subsamples of marine fish will be examined onboard. Biological and physical oceanographic data will be collected at each trawl station as well as opportunistically during the survey. This is part of the integrated eco-system science research.

1235 United States cruise plan for BASIS on the F/V *Epic Explorer,* September 2010

Anonymous

Scientists from the National Marine Fisheries Service (NMFS), Marine Ecosystem and Stock Assessment (MESA) Program will conduct a survey during fall 2010 within the northern Bering Sea shelf to provide key ecological data on pelagic fish species and their habitat. Primary objectives of the survey will be to: (1) assess the status of juvenile salmon for use in run projection models and pre-season harvest guidelines, (2) collect information on the distribution, abundance, trophic relationships, and population structure (age and stock structure) of key pelagic fish species within the northern Bering Sea shelf, and (3) describe the physical and biological oceanographic conditions and features of the northern Bering Sea shelf. A survey of pelagic fish species, zooplankton, ichthyoplankton, and oceanographic measurements will be conducted at stations within the eastern Bering Sea aboard the F/V *Epic Explorer*. The survey will begin on 3 September 2010 in Dutch Harbor, Alaska and end on 27 September 2010 in Dutch Harbor, Alaska, for a total of 25 sea days. Fish samples will be collected using a midwater rope trawl. At each station, the net will be towed at or near the surface for 30 minutes at speeds between 3.5 and 5 kts. Biological and physical oceanographic data will be collected at each trawl station as well as opportunistically during the survey.

1236 Rev. 1 Proposed thermal marks for brood year 2010 salmon in Alaska

D.S. Oxman, and R.P. Josephson

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 2010, approximately 56 million sockeye, 700 million pink salmon, 590 million chum, 9 million coho, and 6 million Chinook salmon will be marked at 19 different hatcheries using 62 thermal marks.

1240 NPAFC Science Plan 2006-2010: a US review

E.V. Farley, Jr.

Scientists from the United States have actively participated within the North Pacific Anadromous Fish Commission to address the goals and objectives of the Commission in regards to status and trends in production of anadromous stocks in ocean ecosystems. Each year, the US provides statistics and updates on salmon genetic baselines (NPAFC Docs. 1027, 1138), salmon bycatch within the US groundfish fisheries (NPAFC Docs. 1104, 1174), the number of hatchery salmon released into the North Pacific Ocean (NPAFC Docs. 1052,1062,1134,1135,1198) and associated otolith thermal marks on hatchery released fish (NPAFC Docs. 1090, 1091), as well as documents on coded wire tag salmon captured in the NPO and those salmon tagged with disc and recording tags released during ocean research surveys (NPAFC Doc. 1038).

The US conducted annual surveys of juvenile salmon ecology in coastal ecosystems from the California current to the Arctic during spring through fall. These surveys are used to assess ecosystem productivity and to determine relative abundance and overall health of juvenile salmon during their first year at sea. Surveys reported annually to the NPAFC include those conducted by the Alaska Fisheries Science Center (AFSC) that take place in southeast Alaska (NPAFC Docs. 937, 1015, 1094, 1153) and the eastern Bering Sea (NPAFC Docs. 941, 1023, 1024, 1093, 1156). Cruise reports for southeast Alaska coastal monitoring (SECM) are reported annually to NPAFC (NPAFC Docs. 1057, 1110, 1181). During 2009, the NPAFC accepted BASIS Phase II research plan to continue international research related to the effect of climate change and variability on anadromous stocks and related nekton (NPAFC Doc. 1164).

To address salmon ecology in the Gulf of Alaska and Bering Sea, the AFSC takes measurements on the physical and biological oceanographic characteristics and collects fish samples using a rope trawl rigged to fish near-surface waters. Random samples of fish collected from the trawl are measured (fork length (mm) and weight (g)), and analyzed for diet composition, age and growth, and energetic status. Distribution and migration pathways for juvenile salmon are inferred based on the survey design and from genetic stock identification.

Abstracts of published research related to the 2006 – 2010 NPAFC Science plan are presented for each objective. However, objectives 1 and 3 were combined as much of the research conducted in the Gulf of Alaska is on juvenile salmon.

1254 Incidental catches of salmonids by U.S. groundfish fisheries in the Bering Sea/Aleutian Islands and the Gulf of Alaska, 1990-2010

Berger, J.D.

In the U.S. groundfish fisheries in the Bering Sea/Aleutian Islands, annual estimated numbers of Chinook salmon have ranged from 8,223 to 129,534 and the annual average weight has ranged from 2.82 kg to 5.21 kg. Annual estimated numbers of non-Chinook salmon have ranged from 16,416 to 709,391. Chum salmon typically accounts for over 95% of the non-Chinook salmon catch. The annual average chum salmon weight has ranged from 2.07 kg to 3.43 kg. In the U.S. groundfish fisheries in the Gulf of Alaska, annual estimated numbers of Chinook salmon have ranged from 7,898 to 40,356 and the annual average weight has ranged from 2.02 kg to 4.60 kg. Annual estimated numbers of non-Chinook salmon have ranged from 2,156 to 64,792. Chum salmon typically accounts for over 95% of the non-Chinook salmon catch. The annual average chum salmon weight has ranged from 2.16 kg to 4.87 kg. Incidental catches of Pacific salmonids in foreign and joint venture groundfish fisheries off Alaska are presented for 1977-1990. The last joint venture operations took place in 1990 in the Bering Sea/Aleutian Islands, with an incidental catch of 152 salmon. Through August 14, 2010, the incidental catches were 9,444 Chinook salmon and 225 non-Chinook salmon in the Bering Sea/Aleutian Islands and 13,695 Chinook salmon and 1,284 non-Chinook salmon in the Gulf of Alaska.

1275 Alaska salmon hatchery releases, commercial fishery catch statistics, and sport fishery catch statistics for 2009 season

E.C. Volk and R.P. Josephson

In 2009 there were 27 private non-profit, 2 federal, and 2 state hatcheries operating in Alaska. Most of these facilities (18) are located in southeast Alaska. The Cook Inlet and Prince William Sound Regions have 11 hatcheries and the Kodiak region has 2 hatcheries. Alaskan hatcheries released approximately 1.5 billion fish in 2009. Of the fish released, 56% were pink salmon and 38% were chum salmon. Hatcheries in Prince William Sound contributed 55% and hatcheries in Southeast Alaska contributed 32% of the fish released.

The Alaska salmon harvest of all species combined for 2009 totaled 163.0 million fish, which was about 11.9 million fish less than the preseason forecast of 174.9 million, and the 12th largest salmon harvest since 1960. In 2009, pink salmon catch was 97.2 million compared to the preseason projection of 113.2 million. Prince William Sound fisheries harvested 19.0 million, well below the 37.8 million forecast for that area, while the Southeast harvest of 38 million was slightly below the 42.2 million forecast. The statewide chum harvest of 18.0 million approached the 18.6 million projection. Coho catches of 4.1 million were only slightly lower than the forecast of 4.7 million. Sockeye salmon were expected to yield a harvest of 38.1 million fish and provided 43.3 million fish. The Chinook catch of 369,000 was about half the forecast of 672,000. The preliminary estimate for the total value of Alaska's 2009 harvest is $370 million.

1276 Releases of otolith marked salmon from Alaska in 2009

D.S. Oxman and R.P. Josephson

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 2009. It includes five species of salmon from brood years 2007 through 2009. Release numbers, mark patterns, and release locations are summarized.

1277 Calibration of juvenile salmon catches using paired comparisons between two research vessels fishing Nordic 264 surface trawls in Southeast Alaska, July 2009

A.C. Wertheime, J.A. Orsi, E.A. Fergusson, and M.V. Sturdevant

Juvenile salmon catches were compared from 28 pairs of surface trawl hauls fished by two vessels in marine waters of the northern region of Southeast Alaska in July 2009. Calibration studies have been conducted for three years to develop fishing efficiency measures and calibration factors to adjust trawl catches from the long-term Southeast Coastal Monitoring (SECM) data set for consistency with catches obtained using different vessels. In 2009, the chartered commercial fishing vessel *Chellissa* fished concurrently with the Alaska Department of Fish and Game research vessel *Medeia* in Icy and Chatham Straits. Both vessels fished Nordic 264 rope trawls synoptically for 20 minutes at the surface along adjacent, staggered trawl paths. Trawl speed, distance trawled, catch rates, species compositions, and sizes of juvenile salmon were compared between vessels. In paired-difference tests, trawl paths were not significantly different ($P = 0.175$) for the two vessels; the Chellissa averaged 1.76 km, and the Medeia averaged 1.74 km per trawl. The total number of juvenile salmon caught was, however, greater for the *Chellissa* than the *Medeia* (5,638 versus 3,303). For the catch comparisons between vessels, the numbers of juvenile salmon caught per trawl were first ln-transformed (ln[catch] +1), then paired comparisons were made of the aggregate catch, species-specific catch, and overall species composition. The *Chellissa* caught significantly ($P < 0.05$) more total juvenile salmon, juvenile pink salmon, and juvenile chum salmon. Catches of juvenile sockeye salmon and coho salmon did not differ significantly ($P > 0.4$) between vessels. Numbers of Chinook salmon caught were too low for statistical comparisons to be made. Overall species composition differed significantly (Chi-square, $P < 0.001$) between the two vessels. Sizes of juvenile pink, chum, and sockeye salmon were similar ($P > 0.20$) between the vessels, while size of juvenile coho salmon captured by the *Chellissa* was significantly larger ($P < 0.05$) than for the *Medeia*. The ratios of average ln-transformed catches between the *Chellissa* and the *Medeia* for each species of juvenile salmon were used to develop calibration factors to adjust the *Chellissa* catches relative to the 2007 comparisons between the *Medeia* and the NOAA ship *John N. Cobb*. Thus, this study maintains the consistency of juvenile salmon abundance data with the long-term time series of SECM. However, in contrast to the 2007 and 2008 calibration studies, differences in catches between the two vessels were not explained by differences in vessel speed and trawl distances. Instead, the differences appeared to be a function of the net deployment (warp distance and width between trawl blocks) by the chartered commercial trawler compared to the research vessel. These findings suggest that when different vessels are used for juvenile salmon surveys, calibration of fishing power is important to maintain interannual consistency in catch per unit effort data series.

1278 Forecasting pink salmon harvest in Southeast Alaska from juvenile salmon abundance and associated environmental parameters: 2009 harvest and 2010 forecast

A.C. Wertheime, J.A. Orsi, E.A. Fergusson, and M.V. Sturdevant

The Southeast Alaska Coastal Monitoring (SECM) project has been sampling juvenile salmon and associated environmental parameters in northern Southeast Alaska (SEAK) annually since 1997 to better understand effects of environmental change on salmon production. A pragmatic application of this sampling effort is to forecast the abundance of adult salmon returns in subsequent years. Since 2004, juvenile peak salmon catch per unit effort (CPUE) from SECM, modified by other environmental parameters as appropriate, has been used to forecast harvest of adult pink salmon in SEAK. The 2009 return of 38.0 million fish was 17% below the forecast of 44.4 million. This represents the fifth forecast over the period 2004-2009 which was within 0-17% of the actual harvest. Conversely, the forecast for 2006 did not follow this pattern and was 200% higher than the actual harvest; however, the simple CPUE forecast model did indicate a downturn in harvest that year. These results show that the CPUE information has great utility for forecasting year class strength of SEAK pink salmon, but additional environmental data are needed to avoid "misses" such as the forecast of the 2006 return. Beginning with the forecast for the 2007 return, the simple CPUE forecast model was enhanced to include stepwise multiple regression, jackknife hindcast analysis, and bootstrap confidence intervals. For 2010, a three-parameter model was selected as the "best" forecast model. Juvenile pink salmon CPUE in northern SEAK accounted for 82% of the variability in annual harvest of SEAK pink salmon over the period 1997-2009. The amount of variability explained was improved to 94% when the May 20-m integrated sea water temperatures and an index of the El Niño Southern Oscillation (ENSO) were included in the model. The forecast for the 2010 harvest was 26.8 million fish, with an 80% bootstrap confidence interval of 18-35 million fish. Preliminary end of the season pink salmon harvests for 2010 are currently 23.4 million (17 Sept 2010, Alaska Department of Fish and Game) and are within 15% of the SECM 2010 harvest forecast.

1279 High seas salmonid coded-wire tag recovery data, 2010

A.G. Celewycz, L. M. Thompson, J. Cusick, M. Fukuwaka, and J. M. Murphy

Information on high seas recoveries of salmonids 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 (NPAFC, 1993-present). Data from these CWT recoveries are also reported into the Regional Mark Information System Database maintained by the Regional Mark Processing Center (RMPC, http://www.rmpc.org) of the Pacific States Marine Fisheries Commission (PSMFC). This document lists recovery data for 61 CWT salmonids that will be reported to

PSMFC/RMPC for the first time. These 61 CWTs were recovered from the 2008, 2009, and 2010 U.S. groundfish trawl fishery in the Gulf of Alaska (16 Chinook salmon), the 2009 U.S. groundfish trawl fishery in the eastern Bering Sea-Aleutian Islands (1 Chinook salmon), the 2009 Pacific hake (*Merluccius productus*) trawl fishery in the Northern Pacific Ocean off Washington/Oregon/California (WA/OR/CA, 39 Chinook salmon and 3 coho salmon), the 2009 limited-entry non-hake groundfish trawl off WA/OR/CA (1 Chinook salmon), and from 2010 Japanese research vessel operations in the central North Pacific Ocean (1 steelhead trout). For the first time, information on the recoveries of pseudo-tagged salmon (6 Chinook salmon) is also included in this report.

1280 Annual survey of juvenile salmon, ecologically-related species, and environmental factors in the marine waters of southeastern Alaska, May–August 2009

J.A. Orsi, E.A. Fergusson, M.V. Sturdevant, B.L. Wing, and W.R. Heard

Juvenile Pacific salmon, ecologically-related species, and associated biophysical data were collected from the marine waters of the northern and southern regions of southeastern Alaska in 2009. This annual survey marks 13 consecutive years of systematically monitoring how juvenile salmon interact in marine ecosystems, and was implemented to identify the relationships among biophysical parameters that influence habitat use, marine growth, predation, stock interactions, and year-class strength of juvenile salmon. This report also contrasts the 2009 findings with selected biophysical parameters from the prior 12 sampling years. Up to 17 stations were sampled in epipelagic waters over four time periods (20 sampling days) from May to August. Typically, at each station, fish, zooplankton, surface water samples, and physical profile data were collected during daylight using a surface rope trawl, conical and bongo nets, a water sampler, and a conductivity-temperature-depth profiler. Surface (3-m) temperatures and salinities ranged from approximately 8 to 15 ºC and 19 to 31 PSU from May to August. Nearly 11,000 fish, representing 12 taxa, were captured in 60 rope trawl hauls in July and August in the two regions. No trawling was conducted in June, in contrast to all other years. Juvenile salmon comprised about 97% of the total fish catch. Juvenile pink, chum, sockeye, and coho salmon occurred in 56-98% of the trawls, while juvenile Chinook salmon occurred in < 13% of the hauls. All juvenile salmon species occurred more frequently in northern region trawls than in southern region trawls in July. In the northern region, catch rates of juvenile pink, chum, and coho salmon were higher in July than in August, whereas catches of sockeye salmon were higher in August. Coded-wire tags were recovered from 18 juvenile coho salmon from hatchery and wild stocks originating in southeastern Alaska. Alaska enhanced stocks were also identified by thermal otolith marks from 47% of the chum and 18% of the sockeye salmon examined. Onboard stomach analysis of 108 potential predators, representing seven species, did not provide evidence of predation on juvenile salmon. Biophysical measures from 2009 differed from prior years, in many respects. Integrated (20-m) temperature anomalies were all positive and salinity anomalies were negative; in particular, the May temperature anomaly was the 2nd highest on record. Anomalies of

zooplankton total density were positive each month, a trend which has persisted for four years. In addition, size anomalies for juvenile salmon were positive, a shift from the previous two years. Condition residual anomalies were unusually high for juvenile salmon species in August. These data, in conjunction with basin-scale biophysical parameters, are currently being used to forecast pink salmon harvest in southeastern Alaska. Long-term monitoring of key stocks of juvenile salmon, on seasonal and interannual time scales, will enable researchers to understand how growth, abundance, and ecological interactions affect year-class strength of salmon and to better understand their roles in North Pacific marine ecosystems.

1288 Genetic stock identification of chum salmon from the 2006 and 2007 Bering-Aleutian Salmon International Survey

W.T. McCraney, C.M. Kondzela, J. Murphy, and J.R. Guyon.

Habitat-specific patterns in the genetic stock composition of chum salmon provide insight into migratory behavior in the eastern Bering Sea. Based upon 11 microsatellites assayed on 1625 samples collected from Bering-Aleutian International Salmon Surveys during summer and fall of 2006 and 2007, substantial differences were found in the origin of chum salmon from different ocean habitats in the northern and eastern Bering Sea. Overall, Asian stocks were dominant and stock composition was not different between collection years for continental slope and northern continental shelf habitats, but the southern continental shelf collections in the eastern Bering Sea were different between years and were dominated by North American stocks. This supports previous studies and provides evidence that stock composition of chum salmon is both non-random in some areas and dynamic in others.

The Committee on Scientific Research and Statistics (CSRS)

1243 Report of the Research Planning and Coordinating Meeting, Sakhalin, Russia, May 19-20, 2010

NPAFC Committee on Scientific Research and Statistics

The NPAFC Committee on Scientific Research and Statistics (CSRS) held its annual Research Planning and Coordinating Meeting (RPCM) on May 19-20, 2010 at the Empire Landmark Hotel in Vancouver, B.C., Canada. The group included 24 participants from all five member countries.

The Parties presented 2010 research plans and cruise activities, and reviewed exchange of biological samples, data, and personnel. Canada currently maintains two research programs to understand the processes regulating Pacific salmon production: an offshore program conducted off the west coast of British Columbia and Southeast Alaska, and an inshore program conducted in the Strait of Georgia and Puget Sound. Japan explained salmon research cruise plans by R/V *Oshoro maru*, *Wakatake maru* and *Kaiun maru* in the western and central North Pacific Ocean and Bering Sea. Russia described three research cruise plans on studies for the marine life of Pacific salmon. The TINRO-Center will continue monitoring of the state of ecosystems in the Bering Sea, Okhotsk Sea and western North Pacific Ocean by R/V *TINRO* and R/V *Professor Kaganovsky*. The United States presented cruise plans for the Southeast Alaska Coastal Monitoring and eastern Bering Sea. The NOAA ship *Oscar Dyson* will be used to collect biological information and provide descriptions of the physical and biological oceanographic conditions.

The Scientific Sub-Committee (SSC) members reviewed current 2006-2010 Science Plan, development of new Science Plan, future symposia and workshops. The Working Group on Stock Assessment (WGSA) noted that the total salmon catch in 2009 was the highest in record (approximately 1.1 million tonnes). The increase was mainly due to large pink salmon catches in Russia. The Working Group on Salmon Marking (WGSM) met via email, and submitted the report of their discussion. The status of the NPAFC Otolith Mark Database is much more complete than it was a year ago. The ad hoc Working Group on Stock Identification (WGSI) corresponded through email to report updates on projects of mutual interest to the NPAFC Parties. The Working Group on Salmon Tagging (WGST) discussed by email communication on: (1) new design of NPAFC-logo tag; (2) tagging plans in 2010; (3) donation of reward caps by the High Seas Salmon Group; and (4) updating and improvement of tagging information on the NPAFC website.

Each Party made a presentation on review of national researches in 2006-2010 and future research themes and components for new NPAFC Science Plan in 2011-2015. A draft of 2011-2015 new Science Plan will be prepared by the SSC, open for comments or suggestions, and submitted to the Commission for approval at the next Annual Meeting (November 2010). Each country will submit its National Research Plan in accordance with the approved new NPAFC Science Plan by February 2011. Jim Irvine (WGSA chairperson) reported 2009 PICES North Pacific Synthesis Workshop (Dec. 1-4, 2009 in Honolulu, USA) and Salmon Workshop on Climate Change (April 25, 2010 in Sendai, Japan).

Each Party suggested the format of future RPCM, which will be decided at the next 2010 Annual Meeting. SSC chairperson proposed to hold a workshop in conjunction with the 19th Annual Meeting in Nanaimo,

Canada in fall of 2011 or spring of 2012. The workshop topic might be "Why can pink and chum salmon keep their high biomass in the ocean?" SSC will prepare a workshop proposal in cooperation with the Secretariat for consideration at the next Annual Meeting. NPAFC will celebrate its 20th anniversary in 2012. According to the Commission's recommendation at 2009 NPAFC Annual Meeting, the editorial group proposed a publication plan for the anniversary book. The editorial group will facilitate the publication as scheduled and will report its progress at the next Annual Meeting.

1255 North Pacific Anadromous Fish Commission Science Plan 2011-2015

Science Sub-Committee (SSC)

In 2010, the Science Sub-Committee (SSC) of the North Pacific Anadromous Fish Commission (NPAFC) was charged with developing a new five-year Science Plan (2011-2015). The vision of the Convention is conservation of anadromous populations in the North Pacific Ocean. To achieve this vision, the Commission needs the best available scientific information on the condition of anadromous populations, ecologically related species, and their marine ecosystems. Thus, the Commission's mission in scientific research is to promote the acquisition, analysis, and dissemination of scientific information pertaining to anadromous populations and ecologically related species in the ocean; to coordinate efforts to conserve anadromous populations in the ocean; and to establish an effective mechanism of international cooperation to promote the conservation of anadromous populations in the ocean.

Over the past several decades, there have been significant variations in the marine production of Asian and North American salmon populations that are linked to climate change. There is a strong need for new international cooperative research that provides better scientific information on the ecological mechanisms regulating production of anadromous populations, estimates climate impact on salmon populations in North Pacific marine ecosystems, and examines the extent to which salmon populations, since they return to coastal regions, can be used as indicators of conditions in North Pacific marine ecosystems.

The goal is to be able to explain and forecast the annual variation in Pacific salmon production. To provide necessary focus to cooperative research under the 2011-2015 Science Plan, the SSC identified an overarching research theme, "Forecast of Pacific Salmon Production in the Ocean Ecosystems under Changing Climate," and five research topics:

1) Migration and Survival Mechanisms of Juvenile Salmon in the Ocean Ecosystems;
2) Climate Impacts on Pacific Salmon Production in the Bering Sea (BASIS) and Adjacent Waters;
3) Winter Survival of Pacific Salmon in the North Pacific Ocean Ecosystems;
4) Biological Monitoring of Key Salmon Populations; and
5) Development and Applications of Stock Identification Methods and Models for Management of Pacific Salmon.

Accurate forecast of returning salmon abundances is of great importance for population managements in all countries. Precision monitoring of abundance and biomass in the ocean may be the most reliable method for predicting changes in production of anadromous populations. Accurate stock identification methods such as genetic and otolith mark analyses are necessary to monitor stock specific ocean distributions and abundance. Cooperative research that improves understanding of common mechanisms

that regulate Pacific salmon production will increase the accuracy of forecasting. Finally we need models to explain how Pacific salmon production will change in the ocean ecosystems affected by changing climate.

1268 Recoveries of high-seas tags in 2009 and tag releases in 2010 from high-seas research vessel surveys in the North Pacific Ocean

Working Group on Salmon Tagging

In 2009, high seas tags were recovered from five chum salmon in Japan, and 16 pink, one chum, and one sockeye salmon in Russia. A chum salmon recaptured in Japan also carried a data storage tag. In 2010, tagging operations were conducted by the research vessel, *Wakaktake maru*, which conducted, 24 longline (720 hachi) operations from June to July for the purpose of placing disk tags on salmonids. From these operations, a total 235 salmonids (18 sockeye, 102 chum, 21 pink, 84 coho, and one Chinook salmon, and nine steelhead trout) in the central North Pacific and 1,166 salmonids (74 sockeye, 1,067 chum, 14 pink, and 11 Chinook salmon) in the Bering Sea were tagged and released.