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# Abstracts of Scientific Documents Submitted to the Commission for the 2007 Annual Meeting

by

**NPAFC Secretariat**

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

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# Abstracts of Scientific Documents Submitted to the Commission for the 2007 Annual Meeting

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

This document compiles abstracts of scientific research documents submitted to the Commission from the adjournment of the 2006 Annual Meeting to October 2007. A total of 47 documents (3 from Canada, 16 from Japan, 5 from Korea, 8 from Russia, 13 from the United States, and 2 from the Committee on Scientific Research and Statistics) were 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

### 1029 Proposed Thermal Marks for Salmon from British Columbia for Brood Year 2007

*J. Till*

In British Columbia thermal marking continues to play an important role for both research and for fisheries management. For 2007 nearly 65 million salmon are expected to be thermally marked encompassing 35 different thermal mark releases from 15 hatcheries. The plan is similar to that proposed for 2006. A few smaller releases have been curtailed due to operational requirements while an extra sockeye release is proposed from Shuswap River Hatchery to look at differences in survival rates from different release locations.

### 1039 Canadian Enhanced Salmonid Production during 1978-2006 (1977-2005 Brood Years)

*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 nearly 300 projects that produce chinook, coho, chum, pink, and sockeye salmon, as well as small numbers of steelhead trout 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.

### 1049 An Update on Catch Trends for Pacific Salmon in British Columbia Canada with Comments on the Ongoing Catch Estimation Review

*J.R. Irvine, R. Houtman, L. Biagini, and M. Poon*

During 2006, Canadian Pacific salmon fisheries were again managed with a strong emphasis on conservation, with the result that many of the catches were relatively modest. This document reports preliminary estimates for retained commercial catch (numbers and total weight), recreational catch (numbers only) and aboriginal catch (numbers only) for the five major salmon species caught in British Columbia (B.C.) tidal waters from 1952 (commercial), 1953 (recreational), or 1951 (aboriginal) to 2006. Catches include non-Canadian fish caught in B.C. and exclude Canadian fish caught outside B.C. Some changes from previous documents resulted from ongoing efforts to standardize estimation approaches. Work underway to finalize Canadian catch statistics is briefly described. Preliminary results comparing commercial catch numbers in one year (2004) and region (South Coast) suggest that original estimates were biased low by ~29%, although differences for other locations will probably be less.

## Japan

**969 (Rev. 1) Proposed Cruise Plans of Japanese Research Vessels for Salmon in the North Pacific Ocean in 2007**

*T. Nagasawa, M. Fukuwaka, K. Morita, and T. Azumaya*

Four Japanese salmon research vessels are tentatively scheduled to conduct the following scientific research in the North Pacific and the Bering Sea in 2007. 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 or midwater trawl to obtain information on the distribution, abundance and some biological characteristic of summering salmon in the North Pacific and Bering Sea from late June to mid August. (2) The *Oshoro maru* will conduct research with gillnets, longline and hook and line to obtain data on the distribution and ecology of salmon and other pelagic fishes in the western North Pacific in May, and in the western North Pacific, eastern Bering Sea and Chukchi Sea from early July to late August. (3) 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. (4) 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 early July to early August.

**1017 Cruise Plans of Japanese Research Vessels Involving Incidental Takes of Anadromous Fish in the North Pacific Ocean in 2007/2008 Fiscal Year**

*Fisheries Agency of Japan*

Five cruises of Japanese research vessels are tentatively scheduled to conduct the following scientific research for pelagic fishes in the North Pacific in 2007/2008 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.

**1018 (Rev. 1) Proposed Otolith Marks for Brood Year 2007 Salmon in Japan**

*M. Takahashi and T. Tojima*

The proposed otolith marks for the 2007 brood year salmon include 50 discrete thermal patterns and some ALC (alizarin complexone) patterns. Japan plans to mark approximately 143 million chum, 29.1 million pink, 3.2 million masu, and 30 thousand sockeye salmon at 21 hatcheries. 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. The ALC marks will be used for chum and pink salmon surveys by Hokkaido Fish Hatchery.

**1019 Update of Mitochondrial DNA Baseline for Stock Identification of Chum Salmon**

*S. Sato, Y. Moongeum, S. Abe, and S. Urawa*

The baseline of mitochondrial (mt) DNA frequencies covering the entire range of chum salmon was developed and evaluated for its resolution to estimate stock of origin of Asian, Russian, and North American chum salmon in complex mixtures. Tissue samples of chum salmon were collected from adult chum salmon in 107 populations around the Pacific Rim, and up to now the mtDNA haplotypes of 88 populations were detected by direct sequence analysis or DNA microarray. Simulation studies using the present baseline indicated that the accuracy of estimates was reliable for the Japanese (94.6%) and North American (92.8%) stocks, and 80.1% for Russian stock.

**1020 Incidental Catches of Anadromous Fish by Japanese Research Vessel in the North Pacific Ocean in**

**2006**

*Fisheries Research Agency*

R/V *Tomi maru No.58*, which conducted the experimental towing of the surface and mid water trawl gear to develop the commercial fishery on neon flying squid, Pacific pomfret from 6 June to 6 September 2005, caught 1,153 chum, 38 chinook, one coho, and one steelhead. Four chum salmon, 83 pink salmon, 4 coho salmon, and one chinook salmon were caught by gill net survey for Pacific saury in July 2006 (R/V *Hokushin maru*). A total of 116 salmon including 63 chum, 38 pink, 13 coho, and 2 chinook salmon were caught by surface trawl net operations or Pacific saury survey in June and July 2006 (R/V *Hokko maru*). A total of 65 salmon including 55 chum, 5 chinnok, 4 pink, and one coho salmon were caught by surface trawl net operations for Pacific saury in June 2006 (R/V *Oumi maru*). A total of 249 salmon including 192 pink, 52 chum, 4 coho, and one chinook salmon were caugut by surface trawl net operations for Pacific saury in June and July 2006 (R/V *Hokuho maru*). A total of 46 salmon including 38 chum, 5 sockeye, and 3 chinook salmon were caught by surface trawl operations for young pelagic fish survey in September 2006 (R/V *Hokuho maru*).

**1021 Results of 2006 Salmon Research Cruise of the *Oshoro maru***

*Meguro, T., Y. Kajiwara, S. Takagi, Y. Kamei, K. Sakaoka, and J. Kimura*

In order to continue to collect oceanographic and biological data included for salmonids, oceanographic observations and mainly gillnet surveys were conducted along 155ºE, 165ºE, and 165ºW in the northern North Pacific Ocean. Each survey was conducted during Cruise #168 (May), and Cruise #169 (June-July) in 2006. In May along 155ºE, the Polar Front occurred near at 43.5ºN and the Subarctic Boundary occurred near at 40.3ºN. In early June along 165ºE, the Polar Front occurred near at 45.5ºN. In early July along 165ºW, the Polar Front did not observe clearly along 165ºW line. Gillnet survey was conducted at five stations along 155ºE in May during Cruise #168. Three gillnet surveys were conducted along 165ºE in early June, and one survey was conducted at 50ºN, 165ºW in early July during Cruise #169. In May along 155ºE, a total of 2 sockeye, 38 chum, 154 pink, and one chinook salmon was collected. Chum salmon was most abundant at 41ºN, but pink salmon was most abundant at 42.5ºN. This distribution pattern about chum salmon and pink salmon was also observed in 2002, 2003, 2004 and 2005. In early June along 165ºE, a total of 500 sockeye, 223 chum, 275 pink, 32 coho, and five chinook salmon was collected. Sockeye salmon was the most abundant at 47.5ºN among all stations. Pink salmon was abundant at 47.5ºN and 49ºN. Chum salmon was most abundant at 44.5ºN. In early July along 165ºW, the only one drift gillnet survey was conducted at 50ºN owing to the bad weather. 89 sockeye, 28 chum, 24 pink, 56 coho, 4 chinook salmon and fourteen steelhead were collected. Fork length frequency distribution of sockeye salmon collected at 165ºE line in early June were divided into two size groups. Immature fish were dominant collected along 165ºE in early June, but mature fish were dominant collected at 50ºN, 165ºW in early July. Chum salmon collected in May along 155ºE were all maturing fish ranged between 500-620mm F.L.. Chum salmon collected along 165ºE in early June ranged between 340-680mm F.L., and 77% of them were matured. Chum salmon collected at 50ºN, 165ºW in early July widely ranged between 280-660mm F.L., and 92% of them were immature. Fork length frequency distributions of pink salmon were different among three research areas as sampling season advances.

**1040 Seasonal Changes in the Total Lipid Contents of Chum and Pink Salmon in the North Pacific Ocean and Bering Sea during the Spring and Summer of 2005-2006**

*T. Kaga, S. Sato, K. Morita, M. Fukuwaka, T. Chiba, and D. Takasaki*

This document reports total lipid content (TL) of chum and pink salmon caught in the North Pacific Ocean and Bering Sea in the summer (June-July) of 2005, spring (April-June) and summer (June-July) of 2006. TL extracted from the white muscle of 1,105 chum and 725 pink salmon using chloroform and methanol was

measured gravimetrically. The TL of ocean age-1 chum salmon caught in the Bering Sea did not increased during the spring and summer of 2006. Ocean age-1 chum salmon might take priority for their growth over lipid storage during the spring-summer feeding season. The TL of immature chum salmon (ocean age 2-4) caught in the Bering Sea increased from the spring to the summer. It might reflect the environmental condition in the Bering Sea such as food availability and prey consumption rate. Between 2000 to 2006, the TL of immature chum salmon showed similar annual fluctuation pattern among all age groups: it was highest in 2001 and decreased gradually until 2004. The past and current studies suggested that the trophic status of high-seas salmon should be variable depending on the conditions of their ocean habitats related with ocean climate changes. Thus long-term trophic monitoring of high-seas salmon may be valuable to understand the relationship between fish growth and mortality.

**1041 Early Marine Growth of Chum Salmon (*Oncorhynchus keta*) in Coastal Waters off Shari, Eastern Hokkaido, Japan, in Relation to Sea Temperature**

*T. Saito, T. Kaga, and E. Hasegawa*

Early marine growth of thermal marked juvenile chum salmon was estimated using their otolith growth increments. Fish were collected from coastal waters off Shari, eastern Hokkaido, Japan, during May and June 2006. Of 974 fish examined, 315 were identified as one of the three marked groups released from the Shari Field Station of National Salmon Resources Center. Estimated daily growth rates for fish of each marked group showed increasing trends as the season progressed. The trend of the growth rates for each marked group was strongly associated with daily sea temperatures measured at 3 m depth in the study area ($R^2$ = 0.66-0.80), suggesting that variability in the early marine growth of juveniles is likely regulated by the ambient sea temperature. Within each marked group, large outmigrants tended to show higher daily growth rates than small ones at the beginning of the costal residency, but the difference in the growth rates became obscure as the time passed. Based on this finding, a hypothesized mechanism to regulate the timing of offshore migration was discussed.

**1042 Recoveries of High-Seas Tags in 2006-2007, and Tag Releases and Recoveries of Fin-Clipped Salmon in 2007 from Japanese Research Vessel Surveys in the North Pacific Ocean**

*M. Fukuwaka, S. Sato, S. Imai, N.D. Davis, K.W. Myers, R.V. Walker, J.M. Murphy, K. Cieciel, J. Moss, V.I. Karpenko, A.V. Bugaev, and S.F. Zolotukhin*

High seas tags from 6 salmon in Japan, from 11 salmon in the United States, and from 23 salmon in Russia were recovered in 2003-2007. Recoveries included 10 LTD and 1 CTD archival tags. The tag recovery rate for chum salmon released and recovered in 2006 (0.9%) was much lower than recovery rates since 1995 (1.6-8.8%). From June to July 2007, a Japanese research vessel, Wakatake maru, conducted 29 longline (870 hachi) operations to attach archival and disk tags on salmonids. A total of 211 salmonids (9 sockeye, 143 chum, 19 pink, 30 coho, and 2 chinook salmon and 8 steelhead trout) in the central North Pacific and 849 salmonids (51 sockeye, 339 chum, 449 pink, and 10 chinook salmon) in the Bering Sea were tagged and released. These releases include four steelhead trout released in the central North Pacific and two chinook salmon released in the Bering Sea with a LTD. Eighteen fin-clipped steelhead trout and one fin-clipped chum salmon were recaptured by Japanese salmon research vessels.

**1043 Preliminary 2006 Salmon Enhancement Production in Japan**

*M. Takahashi, and F. Itoh*

A total of 2,016 million juveniles and smolts were released from Japanese hatcheries in 2006. Approximately 1,858 million chum salmon fry were released in the spring of 2006, the almost same level as in the previous year.

Japanese hatcheries also released 147 million pink salmon fry, 10,687 thousand juveniles and smolts of masu salmon, and 312 thousand juveniles and smolts of sockeye salmon. In 2006, a total of 7,497 thousand adult salmon were captured in rivers along the Japanese coasts. Chum and pink salmon accounted for 87.5 % and 12.3 % of the total river catches, respectively. Within Hokkaido, the number of adult returns was 14,043 fishes for anadromous masu salmon, and 1,002 fishes for anadromous sockeye salmon.

**1044 The 2007 Summer Japanese Salmon Research Cruise of the R/V *Hokko maru***

*K. Morita, S. Sato, M. Kagagaya, Y. Katayama, Y. Goda, T. Chiba, and K. Makino*

A summer high-seas research cruise to investigate biology of Pacific salmon was conducted in the Bering Sea from 25 June to 17 July (first leg) and from 20 July to 9 August (second leg) onboard the Japanese research vessel Hokko maru. Research cruise activities included the collection of data on oceanography, zooplankton, micronekton, salmonid fishes, and other organisms. A total of 8,041 salmonids were caught by trawl and angling: 3,415 fishes in the first leg and 4,626 fishes in the second leg. In the first leg, chum salmon was the most abundant species (82.8%), followed by pink (11.3%), chinook (3.2%), and sockeye salmon (2.9%). In the second leg, chum salmon was the most abundant species (84.1%), followed by sockeye (12.4%), chinook (3.1%), pink (0.3%), and coho salmon (0.02%). Salmonids were measured for fork length, body and gonad weight, lipid content by fat meter, sexed, and removed scales for age determination. Isotope, genetic, otolith, stomach contents, lipid samples were obtained for future studies.

**1045 Salmon Stock Assessment in the North Pacific Ocean, 2007**

*T. Nagasawa, M. Fukuwaka, K. Morita, and T. Azumaya*

Results of annual research cruises on salmon stock assessment conducted by Japan in the summer of 2007 were summarized. Three Japanese salmon research vessels (*Oshoro maru*, *Kaiun maru* and *Wakatake maru*) conducted oceanographic observations, 45 gillnet (2,200 tans) , 34 longline (920 hachi) and 10 hook and lines fishing operations in the western, central, eastern North Pacific, and the central Bering Sea from May to early August. Mean sea surface temperature and abundance of Pacific salmon in 2007 are compared to those from 1992 to 2006. Mean sea surface temperature at gillnet research stations in 2007 were close to the mean SST of 1992-2006. A total of 14,882 salmonids was caught using drift gillnets, longlines, hook and line, and trawl including 10,350 pink (69.7%), 2,940 chum (19.7%), 951 sockeye 6.4%), 545 coho (3.7 %), 57 chinook salmon (0.4%), and 39 steelhead trout (0.3%). Mean CPUE of sockeye salmon in the summer of 2007 was lower than previous two years, but middle level in 1992-2007. Mean CPUE of chum salmon in 2007 was also middle level in the 1992-2007 odd years in the Bering Sea. Mean CPUE of pink salmon in 2007 was rather high level for odd-years in 1992-2007.

**1046 International Salmon Research Aboard the R/V *Wakatake maru* in the Central North Pacific Ocean and Bering Sea during the Summer of 2007**

*M. Fukuwaka, N. Davis, M. Kuwaki, S. Imai, and K. Toge*

An annual high-seas salmonid research cruise was conducted in the central North Pacific Ocean and Bering Sea from June 6 to July 18, 2007 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 temperatures in the central North Pacific Ocean in 2007 were 0.5°C cooler than in 2006. The Subarctic Boundary was located between 40°N (St. 2) and 41°N (St. 3), which was similar to the location in previous years. In the central Bering Sea, sea surface temperatures in 2007 were 0.2°C warmer than in 2006. At 29 experimental fishing stations, a total of 14,265 salmonids was caught by longline and gillnet: 1,166 fish in the central North Pacific and 13,099 fish in the

central Bering Sea. In the central North Pacific, chum salmon was the most abundant species (43.9% of the salmonid catch), followed by coho (41.3%), pink (9.8%), steelhead (3.1%), sockeye (1.3%), and chinook salmon (0.7%). In the Bering Sea, pink salmon was the most abundant species (75.3% of the salmonid catch), followed by chum (17.3%), sockeye (7.1%), chinook (0.3%), coho (0.02%), and steelhead (0.01%). Twelve snouts from adipose-fin clipped steelhead were collected for later potential retrieval of coded-wire tags. Four adipose-fin clipped steelhead were double-tagged with disk tags and released. A total of 1,053 disk tags were placed on salmonids during the survey, which included 9 sockeye, 142 chum, 19 pink, 30 coho, and 2 chinook salmon, and 4 steelhead released in the central North Pacific and 51 sockeye, 339 chum, 449 pink, and 8 chinook salmon released in the Bering Sea. Other sampling and salmonid research activities conducted by onboard researchers included collection of otoliths (chum salmon), stomach content analysis (all salmonids), lipid levels (chum and pink), genetics (steelhead, chinook), persistent organic pollutants (steelhead), stable isotopes (steelhead), zooplankton sampling, and seabird collection and observation.

**1047 Origins and Distribution of Chum Salmon in the Western North Pacific Ocean during the Spring of 2006**

*S. Sato, T. Kaga, T. Chiba, D. Takasaki, K Morita, H. Nagoya, and S. Urawa*

Stock origins of chum salmon caught in the western North Pacific Ocean (41-49°N, 155°E-180° lines) during spring 2006 were estimated by mitochondrial DNA marker. Chum salmon were most abundant in the central water (175°E and 180° lines) within the survey areas. Ocean age 2-4 chum salmon were dominant (84%), and young fish (ocean age 1) were relatively abundant in 180° line. The estimated stock composition of chum salmon was 14.5% Japanese, 65.0% Russian, and 20.5% North American stocks. The Japanese stock contribution was 4.4-11.1% in 165°E-175°E lines, while it was 27.6% in 180° line.

**1048 Salmon Catch by Species and Region in 2006**

*Fisheries Agency of Japan*

Japan reported total commercial catches of Pacific salmon by coastal and offshore areas in 2006 by number and weight. The total catches in coastal and offshore areas of Japan includes 61.5 million (210.1 thousand tons) chum and 6.9 million (9.6 thousand tons) pink salmon.

**1059 Otolith-Marked Salmon Released from Japan in the Fall of 2006 and Spring of 2007**

*M. Takahashi, M. Iida, Y. Katayama, T. Ohnuki, S. Kitatsuki, M. Fukuhara, H. Tokuda, and K. Hirasawa*

This document provided information of Japanese otolith mark releases, including release site, date, number, and mark patterns with images. In the spring of 2007, approximately 149.7 million chum, 15.0 million pink, 2.5 million masu, and 180 thousand sockeye salmon fry (2006 brood year) with thermal marks or ALC (alizarin complexone) patterns were released from 21 hatcheries in Japan. In addition, 379 thousand masu salmon smolts (2005 brood year) were released in the spring of 2007 after thermally marked. In the fall of 2006, 486 thousand juveniles of otolith-marked masu salmon (2005 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 and pink 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).

## Republic of Korea

**1050 Korean Salmon Catch Statistics and Hatchery Releases in 2006 and 2007**

*Yeongdong Inland Fisheries Research Institute*

The catch of chum salmon in 2006 was increased in Korea. Total catch of chum salmon was 45,482 fish or 102 metric tons. The total number of chum salmon fry released from Korea was 13,750 thousand fish in 2007 (2006 brood). Six thousands of juvenile cherry salmon were released to Namdae-cheon (stream) in May.

**1053 Releases and Recoveries of Coded Wire Tag for Chum Salmon in Korea in 2006 and 2007**

*National Fisheries Research and Development Institute*

Korea has released CWT tagged juvenile chum salmon since 2003 and ninety-two CWT chum salmon were recovered at Yangyang hatchery during the spawning seasons in 2006. Among 92 chum salmon, 43 salmon were male and 49 were female. Most salmon sampled were age 3 (44 %) and age 4 (50%), which were released in 2004 and 2003. The return rate of chum salmon released in mid or late March was apparently higher (65 %) than that (35 %) in February or early March.

**1054 Korean Research Plan for Salmon in 2008**

*C.S. Lee, S. Kang, K.B. Seong, and C.H. Lee*

Salmon are political resources due to the characteristics of transboundary distribution and economic importance. The interest in chum salmon biology in Korea was much increased since the establishment of the Yangyang Inland Hatchery of the 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. 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 juvenile salmon and wild juvenile salmon, and
(5) Investigation on the optimal releasing period for juvenile salmon.

2.Climate change effects on salmon distribution, migration route, and abundance will be investigated. This research includes:
(1) Continuous monitoring activities on environmental conditions in the Korean waters and the western Pacific Ocean, and
(2)Climate change effects on the biological characteristics of chum salmon returned to the Korean waters.

3. Otolith thermal marking on Korea chum salmon will be carried out to provide information about growth, survival during the early ocean life stage, and hatchery origins from 2008 release (2007 brood).

4. For the stock identification, we will study on the parasitic fauna as a biological tag for the returned chum salmon to Namdae-cheon (stream). Also, genetic variations through mitochondrial DNA control region sequence analysis and microsatellite DNA analysis will be continued to reveal the relationship between Korean and other countries chum salmon.

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

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

**1055 Biochemical Characteristics of Three Migrated Populations of Chum Salmon, *Oncorhynchus keta* for the Spawning in Korea**

*S.K. Kim, K.B. Seong, and C.S. Lee*

Chum salmon is a species distributing widely in the North Pacific Ocean from the East Sea (Sea of Japan) as an estimated south limit to Gulf of Alaska via Bering Sea as an upper limit. The extensive geographic distributions, long-distance migrations, anadromous and semelparous life histories, and strong homing behaviours of Pacific salmon are major determinants of the highly subdivided population structures of these fish. The study focuses on the evaluation of spawning potential of the three chum salmon populations by determining some of biochemical and serological indicators, including AST and R/D ratio.

**1056 Otolith Thermal Mark for Brook Year 2006 and Proposed Thermal Marks for Brood Year 2007 Chum Salmon in Korea**

*C.S. Lee, S. Kang, K.B. Seong, and C.H. Lee*

Korea released 2.2 million and 5.0 million thermal marked chum salmon in March 2006 and 2007, respectively. The marks were 3,3nH for 2006 and 3,1,2H for 2007. Approximately 2.3 million chum salmon will be marked in 2008, which covers about 50% of release of BY 2007 chum salmon at Namdae-cheon (river). Chum salmon will be marked at Yeongdong Inland Fisheries Research Institute using only one thermal mark (3n,2H).

## Russia

### 1022 Proposed Otolith Marks for Brood Year 2007 Salmon in Russia

*E. Akinicheva*

In Russia, otolith marks are used for estimating hatchery salmon returns and efficiency. Detections of marked salmon in the early ocean period allow us to determine distribution and migration route of different origin salmon. This will provide an opportunity to recognize salmon from different reproduction areas (Kamchatka, Sakhalin, Magadanskiy and Khabarovskiy regions). Proposed otolith marks for 2007 brood year salmon include 18 discrete dry patterns and 3 discrete thermal patterns which will be used at 17 hatcheries for marking 5 salmon species. In 2007 Russia plans to mark approximately 55 million chum, 5 million pink, 100 thousand masu, 7 million coho, 1 million chinook and 10 million sockeye salmon. All rings of dry marks are induced by drainages of incubatory boxes.

### 1025 Trawl Survey Plans for Pacific Salmon Marine Life Period Studies in the Far Eastern Seas in 2007 by Russia

Trawl survey of R/V *TINRO* in summer-autumn period of 2007 on Pacific salmon abundance and ecology in the Bering Sea and North Pacific waters off Kuril Isalnds is planned in accordance with comprehensive ecosystem research plans of Russia. The major purpose of these studies is the detection and interpretation of environmental variation and density-dependence mechanisms, which influence salmon carrying capacity in the North Pacific and Bering Sea and their relevance for conservation and rational exploitation of salmon stocks.

The conduction of summer-autumn of 2007 trawl by RV “Professor Kaganovsky” on salmon abundance and ecology in the southern Okhotsk Sea and Pacific waters off Kuril Islands is planned in the baseline of the comprehensive ecosystem research of the Far Eastern Seas and North Pacific ecosystems status monitoring. The major purpose is to conduct standard ecosystem upper epipelagic trawl survey in order to study maturing, immature and juvenile Pacific salmon abundance, distribution, food selectivity, composition of plankton and nekton communities, changes of biological condition of salmon during the anadromous and catadromous migrations, salmon spatial differentiation, structure of stocks contributing to the mixture and the influence of abiotic environment upon the salmon quantitative allocation and migrations.

In 2007, SakhNIRO intends to proceed the study on Pacific salmon juveniles distribution, biology, environmental conditions influencing the year-class abundance formation during the stage of offshore migrations from the Sakhalin Island coast. The study objectives are 1) Definition of migration timetable of young salmon from the coast, 2) Estimation of distribution and numbers of juvenile Pacific salmon, and 3) Estimation of the biological parameters of the captured juvenile Pacific salmon by the regions and periods of observation.

The purpose KamchatNIRO research is the analysis of distribution, abundance and biological characteristics of juvenile Pacific salmon in the Okhotsk Sea. Environmental, feeding, and food competition data will be collected September-October of 2007.

### 1063 Biostatistical Information on Salmon Catches and Escapement in Russia in 2006

*Anonymous*

In 2006, coastal catches of Pacific salmon in the Russian Far East totaled 276,357 tonnes, or 169.048 million fish. The main species were pink salmon (199,754 tonnes), followed by chum (49,456 tonnes), sockeye (24,924

tonnes), coho (1461 tonnes), and chinook salmon (752 tonnes).

**1064 Spatial Distribution and Abundance of Pacific Salmon in Southern Okhotsk Sea during Autumn of 2006 (Results of 2006 Research Cruise of RV "*Professor Kaganovsky*")**

*O.S. Temnykh, A.N. Starovoytov, A.Y. Efimkin, G.V. Khen, V.V. Sviridov, and E.V. Kurenkova*

The document summarizes results of RV "Professor Kaganovsky" trawl survey of upper epipelagic layer in the southern Okhotsk Sea during October-early November 2006. New information on nekton species (and Pacific salmon, in particular) composition, distribution, biological parameters, trophic interactions, forage base and oceanographic environment is reviewed. Estimates of nekton and jellyfish species abundance and biomass are provided. The autumn 2006 estimates of juvenile pink salmon abundance in the southern Okhotsk Sea were highest among respective estimates during last decade. Abundance of juvenile and immature chum salmon was also rather high compared to previous years of research.

**1065 Cruise Report of the R/V *TINRO* Survey in the Western Bering Sea, August-October 2006**

*O.S. Temnykh, I.I. Glebov, V.V. Sviridov, S.V. Loboda, A.L. Figurkin, N.A. Kuznetsova, and A.M. Slabinskii*

The present document reviews results of complex epipelagic trawl survey of the western Bering Sea by RV *TINRO* during August-October 2006. Data on oceanological conditions, distribution and abundance of major zooplankton groups and quantitative distribution of nekton species are provided. The estimates of total quantity and biomass of fishes and cephalopods are provided for epipelagic layer of the western Bering Sea and adjacent Pacific waters. The distributions of different species of Pacific salmon are described in detail. Data on Pacific salmon feeding behavior are provided fir different regions of the western Bering Sea. The brief analysis of the contemporary status of plankton and nekton communities of the epipelagic layer of the western Bering Sea is provided.

**1066 Pacific Salmon Enhancement by Russia in 2006**

*Anonymous*

Russian hatcheries released approximately 690 million Pacific salmon fry and smolts in 2006, including 329.8 million pink, 344.3 million chum, 5.7 million sockeye, 6.8 million coho, 2.5 million cherry, and 0.8 million chinook salmon.

**1069 Russian Research Plan for Salmon in 2008**

*P. V. Shuntov*

The present document reviews Russian Research Plan for Salmon in 2008. The brief outline of anticipated research activities is given. The preliminary scope of research methods, goals and objectives is outlined.

**1070 Result of Trawl Counting Juvenile Salmon and Attendant Fish Species along the Southern Sakhalin Coast (South-western Part of the Okhotsk Sea) in July-August 2005 during the *R/V* "Dmitry Peskov" Survey**

*A.O. Shubin, L.V. Koryakovtsev, T.A. Malinyak, D.Yu. Stominok, D.V. Baginsskiy, I.N. Moukhametov, D.G. Davidov*

Since July 6 through August 18, 2005, distribution and habitat conditions of juvenile salmon have been studied in three phases in Aniva Bay and La Perouse Strait (southwestern part of the Okhotsk Sea). A midwater rope trawl (54.4/192 m) was used to count juveniles. A total of 88 trawl operations were performed according to the elaborated map of stations. Dense aggregations of juvenile pink salmon were found at the first phase of survey.

Juvenile chum salmon were rare in catches. At the second phase of survey, a density of juvenile salmon aggregations was characterized by low indices. At the third phase of survey, juvenile salmon were not observed. In total, 31 fish species from 19 families entered the ichthyocenosis composition of the upper epipelagial of Aniva Bay, La Perouse Strait and adjoining waters in summer 2005. Immature capelin, arabesque greenling fingerlings, juvenile Bering wolffish, sea raven, rockfish and others were the most abundant. The thermohaline characteristic of the study regions, maps of catch distribution of juvenile salmon and attendant fish species and data on their size-weight indices were given.

## United States

**1015 Southeast Alaska Coastal Monitoring (SECM) Cruise Plan for 2007**

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

In 2007, SECM research is scheduled to be conducted at four intervals from late May to late August at up to 13 core stations in the northern region, and at eight stations in the southern region in June and July. This sampling schedule is similar to what was done in 2005 and 2006. One additional component will involve an inter vessel calibration of CPUE with the NOAA ship *John N. Cobb* and the RV *Medeia* in July.

**1016 (Rev. 1) Proposed Thermal Marks for Brood Year 2007 Salmon in Alaska**

*R. Josephson, D. Oxman, and B. Agler*

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 2007, approximately 55 million sockeye, 730 million pink salmon, 565 million chum, 7 million coho, and 7 million chinook salmon will be marked at 22 different hatcheries using 82 thermal marks.

**1023 United States National Cruise Plan for the NOAA Ship Oscar Dyson in the Chukchi Sea and Eastern Bering Sea Shelf, September, 2007**

*Auke Bay Laboratory, Alaska Fisheries Science Center*

Scientists from the National Marine Fisheries Service (NMFS), Ocean Carrying Capacity (OCC) program will conduct a survey during Fall 2007 within the Chukchi Sea and eastern Bering Sea to provide key ecological data on the pelagic ecosystem and salmon stocks during their juvenile and immature life-history stage. Primary objectives of the survey will be to: 1) collect biological information on salmon and other ecologically important species, 2) describe the physical environment of the Chukchi Sea and eastern Bering Sea waters, 3) conduct diel trawling experiments, and 4) tag salmon with data storage tags.

**1024 United States National Cruise Plan for BASIS Research, August to October, 2007**

*Auke Bay Laboratory, Alaska Fisheries Science Center*

Scientists from the National Marine Fisheries Service (NMFS), Ocean Carrying Capacity (OCC) program will conduct a survey during Fall 2007 over the eastern Bering Sea shelf to provide key ecological data of the eastern Bering Sea salmon stocks during their juvenile life-history stage. The survey is part of an international effort to study the epipelagic ecosystem of the Bering Sea (Bering-Aleutian Salmon International Survey – BASIS). Primary objectives of the survey will be to: 1) determine the extent of offshore migrations of juvenile salmon from rivers draining into the eastern Bering Sea, 2) describe the physical environment of the eastern and northeastern Bering Sea shelf waters occupied by juvenile salmon, and 3) collect biological information on other ecologically important species. The annual OCC/BASIS survey will be conducted at stations located over the eastern Bering Sea shelf. During fall 2007, the survey will begin in Dutch Harbor, Alaska about August 12 and end in Dutch Harbor about October 10. The cruise will be conducted aboard the chartered fishing vessel *Sea Storm*.

**1026 Data Formats and Codes for the INPFC/NPAFC All-Agency High Seas Salmon and Steelhead Tag Recovery Computer Data File (1956-2005)**

*K.W. Myers and R.V. Walker*

This document lists the formats and codes used since 1971 for the all-agency INPFC-NPAFC high seas salmon

and steelhead tag recovery computer data file (1956-2005). A brief overview and history of the computer data file is provided.

**1027 A Plan for a Range-wide Genetic Baseline for Steelhead (*Oncorhynchus mykiss*)**

*S. Young, H. Bartlett, D. Hawkins, and K. Warheit*

Steelhead trout are listed as either threatened or endangered under the United States Endangered Species Act in 11 of 15 Distinct Population Segments in the western United States south of Canada. Despite recovery efforts in freshwater habitats returns of adults from the North Pacific have remained low. This is a plan for developing a range-wide genetic baseline of steelhead encountered in the surveys in the North Pacific Ocean. We will use existing microsatellite markers and develop new nuclear and mitochondrial single nucleotide polymorphism (SNP) assays to characterize populations throughout the Pacific Rim and develop the ability to identify the stock-of-origin of steelhead in the North Pacific Ocean.

**1036 Incidental Catches of Salmonids by U.S. Groundfish Fisheries in the Bering Sea/Aleutian Islands and the Gulf of Alaska, 1990-2007**

*J.D. Berger*

Incidental catches of Pacific salmonids in U.S. groundfish fisheries off Alaska are presented for 1977 through August 11, 2007. Estimated numbers of salmonids caught incidentally in these fisheries in the Bering Sea/Aleutian Islands were 30,501 in 1990; 79,142 in 1991; 83,405 in 1992; 289,284 in 1993; 138,369 in 1994; 45,311 in 1995; 141,265 in 1996; 117,524 in 1997; 121,128 in 1998; 61,833 in 1999; 67,550 in 2000; 101,278 in 2001; 122,167 in 2002; 248,744 in 2003: 520,416 in 2004; 786,914 in 2005; and 414,255 in 2006. In the Gulf of Alaska, incidental catches were 21,085 in 1990; 53,848 in 1991; 28,010 in 1992; 80,853 in 1993; 50,839 in 1994; 79,439 in 1995; 19,937 in 1996; 18,539 in 1997; 30,528 in 1998; 38,129 in 1999; 37,700 in 2000; 21,167 in 2001; 16,139 in 2002; 26,408 in 2003; 23,965 in 2004; 38,692 in 2005; and 23,657 in 2006. Through August 11, 2007, the incidental catches were 107,577 salmon in the Bering Sea/Aleutian Islands and 36,523 salmon in the Gulf of Alaska. The last joint venture operations took place in 1990 in the Bering Sea/Aleutian Islands, with an incidental catch of 152 salmon.

**1038 Releases of High-Seas Salmon Tags by U.S. Vessels in 2006**

*J.M. Murphy, R.V. Walker, J.H. Moss, K. Cieciel, N.D. Davis, K.W. Myers, M. Fukuwaka, and S. Urawa.*

This document reports information on all high-seas salmon tags released aboard United States (U.S.) research vessels in 2006. Petersen disk tags and data storage tags were released as part of salmon tagging research aboard the NOAA Ship Miller Freeman in the eastern Bering Sea during August 29-30, 2006. Data storage tags were placed on 2 chum salmon, and Petersen disk tags (n = 44) were placed on 31 chum, 7 sockeye, 5 pink, and 1 coho salmon.

**1052 Washington, Oregon, Idaho and California Salmon Hatchery Releases, Commercial Fishery Catch Statistics, and Sport Fishery Harvest Statistics for 2006 Season**

*H.R. Bartlett*

In 2006 hatcheries in Washington, Oregon, California, and Idaho released 289.3 million Pacific salmon juveniles and smolts, including 21.6 million sockeye, 37.6 million chum, 42.1 million coho, 171 million chinook salmon, and 19.5 million steelhead trout.

Ocean salmon fisheries conducted off the coasts of Washington, Oregon, and California are directed toward and harvest primarily chinook and coho salmon. Small numbers of pink salmon are harvested in odd numbered years. West Coast fisheries in the Pacific Fishery Management Council-managed waters occur from 0 to 200 nautical miles offshore between the U.S./Canada border and the U.S./Mexico border. The non-Indian commercial Chinook harvest (120,500 fish) declined by 81% compared to 2005, and is historically the lowest Chinook harvest on record. The number of Chinook harvested was 84% below the long-term average of 771,400 fish (1976 – 2005). Coho catch deceased by 34% (2,700 versus 4,100 in 2005). Average weight per Chinook increased by 20% in 2006 from the 2005 average recorded weight. Coho average weight increased by 17% giving the highest average weight recorded for coho between 1980 and 2005.

**1057 Annual Survey of Juvenile Salmon and Ecologically Related Species and Environmental Factors in the Marine Waters of Southeastern Alaska, May-August 2006**

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

Juvenile Pacific salmon, ecologically-related species, and associated biophysical data were collected along primary marine migration corridors in the northern and southern regions of southeastern Alaska in 2006. Up to 21 stations were sampled over four time periods (39 sampling days) from May to August. This survey marks 10 consecutive years of systematic monitoring on how juvenile salmon interact in marine ecosystems, and was implemented to identify the relationships among biophysical parameters that influence the habitat use, marine growth, predation, stock interactions, and year-class strength of salmon. Typically, at each station, fish, zooplankton, surface water samples, and physical profile data were collected using a surface rope trawl, conical and bongo nets, water sampler, and a conductivity-temperature-depth profiler during daylight. Surface (3-m) temperatures and salinities ranged from 7.1 to 15.4 ºC and 15.1 to 32.0 PSU from May to August. A total of 10,641 fish and squid, representing 20 taxa, were captured in 94 rope trawl hauls from June to August. Juvenile salmon comprised about 98% of the total fish and squid catch in each region. Juvenile salmon occurred frequently in the trawl hauls, with pink, chum, sockeye, and coho salmon occurring in 52-100% of the trawls in both regions, whereas, juvenile Chinook salmon occurred in 25% and 28% of the hauls in the southern and northern regions. Of the 10,451 salmonids caught, over 99% were juveniles. In both regions, only two non-salmonid species represented catches of >27 individuals: walleye pollock (*Theragra chalcogramma*) in the southern region and Pacific herring (*Clupea pallasi*) in the northern region. Temporal and spatial differences were observed in the catch rates, size, condition, and stock of origin of juvenile salmon species. Catch rates of juvenile salmon in both regions were generally highest in June for all species except Chinook, which had the highest catch rates in July. Size of juvenile salmon increased from June and July; mean fork lengths were: 102 and 121 mm for pink; 112 and 138 mm for chum; 110 and 131 mm for sockeye; 168 and 200 mm for coho; and 202 and 223 mm for Chinook salmon. Coded-wire tags were recovered from 13 juvenile coho salmon, two juvenile and one immature Chinook salmon; all but two were from hatchery and wild stocks of southeastern Alaska origin. The non-Alaska stocks were juvenile Chinook salmon originating from the Similkameen River and the Wells Hatchery within the Columbia River Basin. Alaska enhanced stocks were also identified by thermal otolith marks from 77% of the chum and 15% of the sockeye salmon. Onboard stomach analysis of 95 potential predators, representing 12 species, revealed one predation incident on juvenile salmon by an adult coho salmon. This research suggests that in southeastern Alaska, juvenile salmon exhibit seasonal patterns of habitat use and display species- and stock-dependent migration patterns. Long-term monitoring of key stocks of juvenile salmon, on both intra- and interannual bases, will enable researchers to understand how growth, abundance, and ecological interactions affect year-class strength and to better understand the role salmon play in North Pacific marine ecosystems.

**1058 High Seas Salmonid Coded-Wire Tag Recovery Data, 2007**

*A.G. Celewycz,, J.D. Berger, J. Cusick, N.D. Davis, and M. Fukuwaka*

Information on high seas recoveries of coded-wire tagged (CWT) salmonids 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 coastwide on-line CWT recovery database (http://www.rmpc.org) maintained by the Regional Mark Processing Center (RMPC) of the Pacific States Marine Fisheries Commission (PSMFC). This document lists recovery data for 63 CWT salmonids that will be reported to PSMFC/RMPC for the first time. These 63 CWTs were recovered from the 2006-2007 U.S. groundfish trawl fisheries in the eastern Bering Sea-Aleutian Islands (8 Chinook salmon) and Gulf of Alaska (8 Chinook salmon), from the 2006 Pacific hake (*Merluccius productus*) trawl fishery in the Northern Pacific Ocean off Washington/Oregon/California (WA/OR/CA, 44 Chinook salmon), and from 2005 and 2007 Japanese research vessel operations in the central North Pacific Ocean (3 steelhead trout).

**1060 The Salmon MALBEC Project: a North Pacific-Scale Study to Support Salmon Conservation Planning**

*N.J. Mantua, N.G. Taylor, G.T. Ruggerone, K.W. Myers, D. Preikshot, X. Augerot, N.D. Davis, B. Dorner, R. Hilborn, R.M. Peterman, P. Rand, D. Schindler, J. Stanford, R.V. Walker, and C.J. Walters*

The Model for Assessing Links Between Ecosystems (MALBEC) is a policy gaming tool with potential to explore the impacts of climate change, harvest policies, hatchery policies, and freshwater habitat capacity changes on salmon at the North Pacific scale. This document provides background information on the MALBEC project, methods, input data, and preliminary results pertaining to (1) hatchery versus wild salmon production in the North Pacific Ocean, (2) rearing, movement, and interactions among Pacific salmon populations in marine environments, (3) marine carrying capacities, density-dependent growth, and survival in Pacific salmon stocks, and (4) climate impacts on productivity in salmon habitat domains across the North Pacific. The basic modeling strategy underlying MALBEC follows the full life-cycle of salmon and allows for density-dependence at multiple life stages, and it includes spatially explicit ecosystem considerations for both freshwater and marine habitat. The model is supported by a data base including annual run-sizes, catches, spawning escapements, and hatchery releases for 146 regional stock groups of hatchery and wild pink, chum, and sockeye salmon around the North Pacific for the period 1952-2000. These data show that hatchery salmon contribute significantly to overall abundance of salmon in some regions and that hatchery chum salmon abundance has exceed that of wild chum salmon since the early 1980s. For this historical period, various hypotheses about density dependent interactions in the marine environment are evaluated based on the goodness of fit between simulated and observed annual run-sizes. While the model does not reproduce the observed data for some specific stock groups, it does predict the same overall production pattern that was observed by reconstructing run sizes with catch and escapement data alone. Our preliminary results indicate that simulations that include density-dependent interactions in the ocean yield better fits to the observed run-size data than those simulations without density-dependent interactions in the ocean. This suggests that for any level of ocean productivity, the ocean will only support a certain biomass of fish but that this biomass could consist of different combinations of stocks, stock numbers and individual fish size. MALBEC simulations illustrate this point by showing that under scenarios of Pacific-wide reduced hatchery production the total wild number of Alaskan chum salmon increases, and that such increases are large where density-dependent effects on survival are large and small where they are not. Under scenarios with reduced freshwater carrying capacities for wild stocks, the impacts of density-dependent interactions also lead to relative increases in ocean survival and growth rates for stocks using ocean habitats where density-dependence is large. While much progress has been made in the Salmon MALBEC project, this effort is

still evolving and aims to tackle several important issues in the near future, including analyses of scenarios for climate change impacts on freshwater and marine carrying capacities, using results from the remote-sensing based Pacific Rim River Typology Project to better estimate habitat-defined freshwater carrying capacity for salmon, and ultimately to use MALBEC to test the outcomes of various policy decisions in the face of climate, habitat, and management uncertainty.

### 1062 Alaska Salmon Hatchery Releases, Commercial Fishery Catch Statistics, and Sport Fishery Catch Statistics for 2005 Season

*R.P. Josephson*

In 2006 there were 27 private nonprofit, 2 federal, and 2 state hatcheries operating in Alaska. Most of these facilities (18) are located in southeast Alaska. The Cook Inlet Prince William Sound region has 11 hatcheries and the Kodiak region has 2 hatcheries. Alaskan hatcheries released approximately 1.44 billion fish. Of the fish released 56% were pink salmon and 38% were chum salmon. Hatcheries in Prince William Sound and Cook Inlet contributed 56% and hatcheries in Southeast Alaska contributed 34 % of the fish released.

At this time last year, department biologists were expecting an all-species commercial catch of 161 million for the 2006 season. As it turned out, the all-species catch reached 141 million. While the 2006 catch was below forecast it still ranked as the 15th largest salmon catch for the State of Alaska. In 2006, the overall catch of pink salmon was 73 million compared to the preseason projection of 108 million. Lower than expected pink salmon catch in 2006 was due to a very weak pink salmon run to Southeast Alaska. The overall chum salmon catch was 21.1 million compared to the preseason projection of 17.6 million. The 2006 ex-vessel value of the commercial harvest showed a slight decrease over the value of the catch in 2005. The preliminary estimate for the total value of Alaska's 2006 harvest is $308 million and below the $334 million in 2005, but above the $272 million for 2004, and $212 million for 2003. In-season harvest information, postseason statistics, and other information about salmon in Alaska can be found at http://www.adfg.state.ak.us.

## The Committee on Scientific Research and Statistics (CSRS)

**1009 Annual Report of the Bering-Aleutian Salmon International Survey (BASIS), 2005**
BASIS Working Group

This document summarizes the preliminary results of BASIS field research in 2005. As in previous years, funding for BASIS field research in 2005 was insufficient to carry out the original survey design. As a part of national commitments to NPAFC-coordinated research, however, three trawl vessels were used for BASIS research in 2005. The Russian research vessel *TINRO* was used to survey the entire western Bering Sea inside the Russian 200-mile zone in summer (June 11-July 21) and the vessel SRTM-K "*Pankara*" was used to survey the southwestern Bering Sea during fall (September 23 to October 31). The Japanese scientists did not conduct BASIS research during 2005. The U.S.-chartered fishing vessel Sea Storm was used to survey the eastern Bering Sea shelf inside the U.S. 200-mile zone in late summer and fall (August 12 to October 10). To sample salmon and other pelagic nekton, the three trawl vessels used pelagic rope trawls that were towed with the headrope at the surface.

As in previous years, oceanographic conditions across the entire Bering Sea in summer and fall 2005 were characteristic of a warm year, despite a significant decrease in mixed layer (surface water) temperatures over deep water areas as compared with 2003. This indicates that cooling during winter has been moderate during all four years of BASIS surveys (2002-2005). In 2005, similar to fall 2002 and 2004, there was a cold pool (T< 2ºC) over the Bering Sea shelf south of St. Lawrence Island in mid September. Density stratification and water column stability were strongest in northern and central Bristol Bay and weakest on the central shelf west of Nunivak I. These variations in water column stability can impact nutrient supply and primary productivity, which in turn, affect the abundance and growth of zooplankton and fish.

Copepods were the dominant zooplankton species for all size fractions of zooplankton (small, medium, and large) during summer 2005 in the western Bering Sea. In fall 2005, as in 2003 and 2004, upwelling through Unimak Pass provided nitrate that fueled surface phytoplankton growth in coastal waters near Amak I., south of Bristol Bay. Surface (5 m) chlorophyll *a* concentrations were generally higher in 2005 than in 2003 and 2004 in the eastern Bering Sea, possibly due to the early occurrence of fall storms increasing the availability of nutrients to surface phytoplankton.

Ship time and funding for BASIS research in 2005 were not sufficient for joint operations at sea to compare fishing gear used by the three trawl vessels. Because gear calibration research and development of standard procedures for synthesizing BASIS trawl catch data across the entire survey area have been delayed, the 2005 trawl catch results in this document are summarized separately by area (vessel), i.e., western Bering Sea (R/V *TINRO* and SRTM-K"*Pankara*") and eastern Bering Sea shelf (F/V *Sea Storm*). The R/V *TINRO* survey data were used to estimate the overall abundance of nekton and megaplankton (jellyfishes) during June through July of 2005 in the upper epipelagic layer of the western Bering Sea and North Pacific waters off Kamchatka (1.59·106 t). This corresponds to an estimated total of 122.9 billion individuals, primarily fishes (30.0%) and squids (65.1%). As in past surveys (2002-2004), Pacific salmon were the dominant fish species in the epipelagic zone of the western Bering Sea. Chum salmon was the most dominant fish species in the upper epipelagic layer. Maturing pink salmon were the second most dominant salmon species in the catch, followed by immature and maturing sockeye salmon and immature and maturing chinook salmon. The 2002 through 2005 summer surveys indicated that abundance of Pacific salmon was fairly stable in this region. The abundance of Atka mackerel (*Pleurogrammus monopterygius*) was lower than in previous years. This result could have been due to the earlier

survey timing. In the eastern Bering Sea in late summer and fall 2005, F/V Sea Storm catches were dominated by juvenile sockeye (69.8% of total) and chum (14.9%) salmon. Maps included in this report show the relative distribution of juvenile salmon species across the eastern Bering Sea shelf. In general, juvenile coho and chinook salmon were distributed in near shore habitats, and juvenile sockeye, pink, and chum salmon seemed to prefer offshore habitats.

The diets of salmon caught in the western Bering Sea in summer 2005 varied by species and body size group. The smaller size groups of immature chum salmon fed primarily on pteropods while the larger size groups of immature chum fed primarily on euphausiids. Sockeye salmon (all size groups combined) fed primarily on euphausiids and pteropods. Chinook salmon fed on nekton (squid and fish). Pink salmon had a broad food spectra including euphausiids, pteropods, squids, fishes, and to a lesser extent, copepods, amphipods, and Decapoda larvae. Preliminary results of diet studies in the eastern Bering Sea indicated that greater than 75% (percent body weight) of the prey items found in juvenile salmon stomachs consisted of larval and juvenile fish (i.e., age-0 pollock) with the exception of juvenile pink and chum salmon (approximately 53% and 67% larval and juvenile fish respectively).

**1028 (Rev. 1) Report of the Research Planning and Coordinating Meeting**

The Research Planning and Coordinating Meeting (RPCM) was held on April 25-27, 2007 at the Sheraton Moana Surfrider Hotel, Honolulu, USA. The RPCM, including 26 participants from five member countries, was presided over by V. Karpenko, the chairman of the Committee on Scientific Research and Statistics (CSRS).

The Parties presented their national research and cruise plans in 2007. The Japanese cruise plans comprised summer trawl survey in the Bering Sea and North Pacific Ocean by *Hokko maru*, traditional salmon monitoring by *Wakatake maru*, and the Chukchi Sea survey by *Oshoro maru*. Russia described its plans for Pacific salmon marine life researches in the western Bering Sea, North Pacific Ocean, and the southern Okhotsk Sea by using TINRO-Center research vessels *TINRO* and *Professor Kaganovsky*. In addition, SakhNIRO will conduct juvenile salmon surveys in the south-western Okhotsk Sea, and KamNIRO will carry out trawl surveys in the northern Okhotsk Sea to predict the life style and behaviour of juvenile salmon. The United States presented cruise plans for coastal monitoring of juvenile salmon in Southeast Alaska and BASIS research in the eastern Bering Sea. The new US vessel *Oscar Dyson* will be used to experiment dial tagging of salmon using live box. Exchanges of personnel and samples were coordinated for cooperative marine salmon researches.

The Science Sub-Committee supported the Canadian proposal to produce a comprehensive synthesis of information relating to the factors that regulate Pacific salmon abundance in the marine environment. The results of this research would be used to identify long-term, integrated research and monitoring required for the understanding of impacts of future climate and ocean changes on the population dynamics of Pacific salmon throughout their distribution. Funding is available from the Moore Foundation.

The Working Group on Stock Assessment discussed the status of Pacific salmon requested by The North Pacific Marine Science Organization (PICES). The working group co-chairman (J. Irvine) will give a presentation at 2007 PICES Annual Meeting. The working group also conversed on presentations by NPAFC scientists at the special session (salmon at seas) of 2007 North Atlantic Salmon Conservation Organization (NASCO) Annual Meeting.

The Working Group on Salmon Marking discussed the status of the NPAFC Otolith Mark Database, marking plans for brood year 2007 salmon, and the success of designating thermal mark patterns for specific countries. Based on the submitted marks for brood year 2007, primary conflicts are between Alaska and Russia, and the marking coordinators are working to avoid those mark duplications.

The *Ad hoc* Working Group on Stock Identification discussed progress on review of status of chum salmon baselines. Japan submitted a document on update of mitochondrial DNA baseline reviewing their progress to date on 107 populations. The US Party explained the status of SNP markers. Japan requested other countries report the status of their baselines following the format of their document in order to summarize and report the baseline survey information. The working group also reviewed baseline development for other species including steelhead trout, and discussed data sharing, archiving and web access.

The BASIS Working Group had a lively discussion regarding the development of the BASIS Phase II research plan, based on a draft plan written by Russia and the United States. All Parties recognize that the Bering Sea is an important area for salmon research as this region provides nursery grounds for juvenile salmon and feeding grounds for immature and maturing salmon. However, the draft plan was not adopted, since the review of the current BASIS is uncompleted. The group discussed the 2008 BASIS Symposium, and the symposium steering committee developed the work plan including topics. The BASIS symposium will be held in Seattle on November 23-25, 2008.

At the NPAFC 2006 Annual Meeting the CSRS formed a group to discuss the issue of management and coordination of the INPFC-NPAFC high-seas salmon tagging database. Japan proposed to create under the CSRS a Working Group on Salmon Tagging to manage the ongoing high-seas salmon tagging database and related matters in cooperation with the NPAFC Secretariat. The Japanese draft proposal reviewed task the new Working Group and the Secretariat would be responsible for under a procedures format outlined for tagging database management. The Japanese proposal includes development of two databases: one for release information and another for recovery data to be housed on the NPAFC web site. Japan, Russia, and the U. S. supported the proposal to create a new Working Group, but the decision on this matter and related issues was postponed until the 2007 Annual Meeting.