Salmon are very important living resources for the people of the North Pacific Rim countries in many aspects: food source, economy, culture, heritage, etc. Annual average commercial catch of Pacific salmon is around 850 thousand metric tones.

Considerable and valuable efforts are being made by the people living in the area in order to maintain the precious resources for generations to come. Approximately 5 billion salmon juveniles are released from hatcheries of North Pacific Rim countries every year.

**Annual average commercial catch of Pacific salmon is around 850 thousand metric tonnes.**
NPAFC Activities at a glance

The North Pacific Anadromous Fish Commission (NPAFC) was established under the Convention for the Conservation of Anadromous Stocks in the North Pacific Ocean, signed on February 11, 1992 and entered into force on February 16, 1993. Contracting Parties include Canada, Japan, Republic of Korea, the Russian Federation, and the United States. NPAFC promotes the conservation of anadromous stocks in the Convention Area: the North Pacific Ocean and its adjacent seas, north of 33 degrees North Latitude beyond 200-mile zones of the coastal states.

The anadromous fish covered by the Convention are as follows:

- Chum salmon *Oncorhynchus keta*,
- Coho salmon *Oncorhynchus kisutch*,
- Pink salmon *Oncorhynchus gorbuscha*,
- Sockeye salmon *Oncorhynchus nerka*,
- Chinook salmon *Oncorhynchus tshawytscha*,
- Cherry salmon *Oncorhynchus masou*,
- Steelhead trout *Oncorhynchus mykiss*.

Conservation measures under the Convention:

1. Prohibition of directed fishing for anadromous fish in the Convention Area.
2. Minimization to the maximum extent of the incidental taking of anadromous fish by gill net, bycatch of the retention on board a fishing vessel of anadromous fish taken as an incidental catch during fishing for non-anadromous fish.

Scientific Research

The Convention authorizes taking anadromous fish in the Convention Area for scientific research purposes under national and joint research programs approved by the Commission. It is understood that such taking of anadromous fish for scientific research purposes must be consistent with the needs of a program and with the provisions of the Convention and should be reported to the Commission.

The Parties to the Convention cooperate in the conduct of scientific research under the NPAFC Science Plan, which may include, as appropriate, research on other ecologically related species. The Parties also cooperate in collecting, reporting and exchanging biostatistical information, fisheries data, including catch and fishing effort statistics, biological samples and other relevant data pertinent to the purposes of the Convention. The Parties upon the Commission's request provide catch, enhancement and related species. The Parties also cooperate in collecting, reporting and exchanging biostatistical information, fisheries data, including catch and fishing effort statistics, biological samples and other relevant data pertinent to the purposes of the Convention. The Parties upon the Commission's request provide catch, enhancement and related species. The Parties also cooperate in exchanging biostatistical information, fisheries data, including catch and fishing effort statistics, biological samples and other relevant data pertinent to the purposes of the Convention. The Parties upon the Commission's request provide catch, enhancement and related species. The Parties also cooperate in exchanging biostatistical information, fisheries data, including catch and fishing effort statistics, biological samples and other relevant data pertinent to the purposes of the Convention. The Parties upon the Commission's request provide catch, enhancement and related species. The Parties also cooperate in exchanging biostatistical information, fisheries data, including catch and fishing effort statistics, biological samples and other relevant data pertinent to the purposes of the Convention. The Parties upon the Commission's request provide catch, enhancement and related species. The Parties also cooperate in exchanging biostatistical information, fisheries data, including catch and fishing effort statistics, biological samples and other relevant data pertinent to the purposes of the Convention. The Parties upon the Commission's request provide catch, enhancement and related species. The Parties also cooperate in exchanging biostatistical information, fisheries data, including catch and fishing effort statistics, biological samples and other relevant data pertinent to the purposes of the Convention. The Parties upon the Commission's request provide catch, enhancement and related species. The Parties also cooperate in exchanging biostatistical information, fisheries data, including catch and fishing effort statistics, biological samples and other relevant data pertinent to the purposes of the Convention.

Enforcement

All necessary measures are taken by each Party to ensure its nationals and fishing vessels flying its flag comply with the provisions of the Convention. Each Party has the authority to board, inspect and detain fishing vessels of the other Parties found operating in violation of the Convention. Article V of the Convention gives the details of the enforcement mechanism and provides that only the authorities of the Party to which the violating person or vessel belongs may try the offense and impose penalties. It is also stipulated that imposed penalties are commensurate with the serious nature of the infractions.

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NPAFC Activities

What is NPAFC?
The North Pacific Anadromous Fish Commission (NPAFC) is an international governmental organization established under the Convention for the Conservation of Anadromous Stocks in the North Pacific Ocean, signed on February 11, 1992 and entered into force on February 16, 1993. The Original Parties to the Convention are Canada, Japan, the Russian Federation, and the United States of America. The Republic of Korea acceded to the Convention in May 2003. The Convention is based on the following recognitions:

1. What is “anadromous stocks”? Anadromous fish are migratory fish which are born in fresh water, grow down to the ocean to grow into adults, and then return to fresh water to spawn. For the purpose of the Convention, seven salmonid species are designated as anadromous fish; those are chum salmon (Oncorhynchus keta), coho salmon (Oncorhynchus kisutch), pink salmon (Oncorhynchus gorbuscha), sockeye salmon (Oncorhynchus nerka), chinook salmon (Oncorhynchus tshawytscha), cherry salmon (Oncorhynchus masou), steelhead trout (Oncorhynchus mykiss). “Anadromous stocks” means the stocks of these species.

2. NPAFC Convention Area The area to which the Convention applies is waters of the North Pacific Ocean and its adjacent seas, north of 33 degrees North Latitude beyond 200 nautical mile zones of the coastal States. However, for scientific purposes, activities under the Convention may extend further southward. (see fig.1)

3. Conservation Measures The Convention provides three direct regulations in the Convention Area as the conservation measures:

- Prohibition of directed fishing for anadromous fish;
- Minimization to the maximum extent of incidental taking of anadromous fish; and
- Prohibition of retention on board of fishing vessel of anadromous fish taken as an incidental taking in a fishing activity directed at non-anadromous fish (any such anadromous fish shall be returned immediately to the sea.).

4. Enforcement Activities

In order to carry out the enforcement activities efficiently, it has become quite important for the Parties to share information related to their enforcement activities. Since the establishment of the NPAFC, the Parties have cooperated on the exchange of information regarding violation of the provisions of the Convention and on the exchange of enforcement plans and actions. Cooperation and coordination of such enforcement efforts among the Parties have been one of the two major activities of NPAFC. The Committee on Enforcement (ENFO), a subordinate body of the Commission which is responsible for this task, holds its meetings during the Commission’s Annual Meetings in autumn, and a planning group meets earlier in the year.

In the years of 1993-2005, the cooperative enforcement efforts resulted in the detection of 40 vessels being involved in activities contrary to the Convention (table 1). Of these vessels, 15 were apprehended. The Parties’ coordinated enforcement activities under the ENFO framework attributed to the decrease in number of the detected/apprehended vessels in recent years.

<table>
<thead>
<tr>
<th>Year</th>
<th>1993</th>
<th>94</th>
<th>95</th>
<th>96</th>
<th>97</th>
<th>98</th>
<th>99</th>
<th>2000</th>
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<th>05</th>
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<tbody>
<tr>
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<td>1</td>
<td>3</td>
<td>1</td>
<td>6</td>
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<td>0</td>
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<td>1</td>
<td>1</td>
<td>15</td>
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<tr>
<td>Apprehended</td>
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<td>0</td>
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<td>2</td>
<td>4</td>
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<td>15</td>
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(fig.1) NPAFC Convention Area

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<td>0</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>15</td>
</tr>
</tbody>
</table>
NPAFC Activities

5. Scientific Research Activities

Because the Parties recognize the importance of scientific research for the conservation of anadromous stocks in the North Pacific Ocean, the Convention authorizes taking of anadromous fish in the Convention Area for scientific purposes approved by the Commission. Through various national and joint research programs under national and joint research programs approved by the Commission. Through:

5.1. Committee on Scientific Research and Statistics (CSRS)

Various scientific research programs on Pacific salmon are being carried out by related institutions of the Parties including:

- Pacific Biological Station, Fisheries and Oceanography (BASIS), U.S.A.; and
- University of Washington, School of Aquatic and Fishery Sciences, U.S.A.

The Committee on Scientific Research and Statistics (CSRS), a subordinate body of the Commission, serves as a forum for cooperation and coordination of scientific research activities among the Parties.

Responsibilities of CSRS include:

- to review and coordinate the collection and exchange of scientific data and collection of specimens of anadromous species;
- to coordinate and assess scientific studies to ensure the identification of the location of origin of anadromous stocks migrating in the Convention Area and areas adjacent to it;
- to ensure the availability of scientific information and views on ecologically-related species, including the impact of by-catches in related fisheries of related species, including the impact of by-catches in related fisheries of species of concern designated by the Commission;
- to coordinate scientific exchanges, seminars, workshops, field research, and data analysis;
- to fulfill its responsibilities, CSRS holds its meetings during the Commission’s Annual Meetings in autumn and a Research Planning and Coordinating Group (RPCG) meets between the Annual Meetings, usually in spring.

There are five subordinate bodies working for particular issues under CSRS.

5.1. a) Science Sub-Committee

The Science Sub-Committee was established in 1995, and its main responsibility is to develop NPAFC Science Plans, which are long term plans for cooperative scientific research. The Sub-Committee also coordinates cooperation with other international organizations, such as PICES (North Pacific Marine Science Organization) and NASCO (North Atlantic Salmon Conservation Organization).

5.1. b) Working Group on Stock Assessment

The Working Group on Stock Assessment started its work in 1996 to coordinate the development of catch and escapement database, to produce accurate and timely estimates of hatchery production, and to study ways of developing methods for measuring the abundance of wild salmon.

5.1. c) Working Group on Stock Identification

The Working Group on Stock Identification was established in 1998 on ad hoc basis and was changed to a permanent working group in 2000. It discusses coordination of salmon marks to minimize duplication among the Parties and development of a common database for mark releases. The mark database is currently housed at the Alaska Department of Fish and Game and accessible from the NPAFC website (http://www.npafc.org).

5.1. d) Ad hoc Working Group on Stock Identification

The Ad hoc Working Group on Stock Identification was established in 2000. Its goals are to develop, standardize and disseminate genetic and other database among the Parties, to encourage the development of new genetic technologies, and to facilitate the dissemination of statistical techniques.

5.1. e) BASIS Working Group

The BASIS (Bering-Aleutian Salmon International Survey) Working Group was established in 2001. Specific terms of reference for the group are:

- to coordinate individual national research plans;
- to assess and draft an annual implementation plan for joint BASIS research;
- to assess and draft an annual report to summarize BASIS results; and
- to prepare proposals for external funding.

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- to coordinate individual national research plans;
- to draft an annual implementation plan for joint BASIS research;
- to draft an annual report to summarize BASIS results; and
- to prepare proposals for external funding.
NPAFC Activities

5.2. Bering-Aleutian Salmon International Survey (BASIS)

The Bering-Aleutian Salmon International Survey (BASIS) was born as a result of the NPAFC Science Plan 1993-2000 as well as from research by other international organizations and independent scientists, was that “there is a strong relation between climate and climate change and subsequent changes in marine productivity and survival of anadromous stocks in the ocean”.

In 2000 the NPAFC adopted a new five-year science plan (2001-2005) that focused cooperative research efforts on major gaps in our understanding of the marine life history of salmon with respect to marine ecosystem processes that affect the abundance and biomass of anadromous stocks. The plan emphasized cooperative science activities in three areas where there were significant gaps in scientific information: (1) Bering Sea salmon research, (2) juvenile salmon research, and (3) winter salmon research. An important aspect of work in all three areas was to investigate the stock-specific abundance, distribution, growth, and other biological characteristics of Asian and North American salmon with respect to variation in marine environmental conditions and ecosystem processes.

5.3. NPAFC Science Plans

The NPAFC Science Plans are long term comprehensive plans for its cooperative scientific research.

5.3. a) NPAFC Science Plans for 1993-2000

The development of the first NPAFC Science Plan began in 1993. The identification of scientific issues for cooperative research under this plan was closely coordinated with the North Pacific Marine Science Organization (PICES). The overarching goal of this plan was to investigate the effects of changes in the productivity of the North Pacific Ocean on Pacific salmon, including two critical issues: (1) factors affecting current trends in ocean productivity and effects on carrying capacity, and (2) factors affecting changes in biological characteristics of salmon (growth, size and age at maturity, oceanic distribution, survival, and abundance). In 1995 the Commission approved a science plan that consisted of three research components: (1) salmonid life history, (2) salmonid population dynamics, and (3) salmonid habitat and ecosystem. This science plan was reviewed and updated by the Science Sub-Committee and CSRS every two years through 2000.

5.3. b) NPAFC Science Plan 2001-2005

The overarching hypothesis that emerged from the results of scientific research under the NPAFC Science Plan 1993-2000, as well as from research by other international organizations and independent scientists, was that “there is a strong relation between climate and climate change and subsequent changes in marine productivity and survival of anadromous stocks in the ocean”.

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In the face of global climate change, the Bering Sea may become the most important marine ecosystem for production of Asian and North American anadromous stocks.

NPAFC Science Plan 2006-2010

The goals of NPAFC scientific research programs are to further an ecosystem-based approach to conservation of North Pacific anadromous stocks and to contribute substantial new scientific information to the marine ecosystem research, fishery management, and conservation activities planned by relevant organizations. To satisfy such goals, two broad scientific questions were identified.

Question 1
a) What are the current status and trends in marine production of anadromous stocks?
b) How are these trends related to population structure (spatial and temporal) and diversity of anadromous stocks in marine ecosystems of the North Pacific?

Question 2
How will climate and climate change affect anadromous stocks, ecologically related species, and their North Pacific marine ecosystems?
1. Research Theme: Status and Trends in Production of Salmon Stocks in Ocean Ecosystems

To provide necessary focus to cooperative research under the 5-year science plan, three major research components are identified under a comprehensive research theme, “Status and Trends in Production of Anadromous Stocks in Ocean Ecosystems.”

- Component 1: Juvenile Anadromous Stocks in the Ocean Ecosystems
  In at least some species of anadromous stocks (e.g., pink and chum salmon), variation in adult returns may depend more on marine survival than on reproductive efficiency during the freshwater period. A common hypothesis is that the initial period after migration to sea is the most critical phase with respect to ocean survival of anadromous stocks. Recent cooperative and national research on juvenile salmon suggests considerable interannual variation in abundance, growth, and survival rates of juvenile salmon in the ocean. These variations may be related to climate-induced changes in habitat environments that operate at regional and local scales. To a greater or lesser extent, these processes are monitored annually in marine survey areas along the coasts of Asia and North America. A better understanding of these processes is needed for conservation and management of anadromous stocks.

- Component 2: Anadromous Stocks in the Bering Sea Ecosystem
  The centerpiece of NPAFC’s marine ecosystem research to date is BASIS. Under the Science Plan 2001-2005, BASIS research has progressed and evolved to more complex research issues, and has become an integral part of ecosystem research planned by other international, national, and regional conservation, management, and research organizations (e.g., PICES, North Pacific Research Board). In the face of global climate change, the Bering Sea may become the most important marine ecosystem for production of Asian and North American anadromous stocks. The results of cooperative BASIS ecosystem monitoring research in 2002-2004 indicated a very high density of

Cooperative research may focus on the following issues:

- Seasonal distribution and migration route/timing of juvenile salmon
- Hydrological characteristics, primary production, and prey resources in the habitats
- Trophic linkages, growth rates and predation rates of juvenile salmon
- Population size, survival rate and survival mechanism of juvenile salmon

Cooperative research may focus on the following critical issues:

- Distribution, migration route/timing, production, and health of anadromous stocks and ecologically related species,
- Multi-year trends (regimes) in physical and biological factors that influence long-term changes in Bering Sea food production and fluctuations in salmon production and growth rates,
- Hydrological characteristics, primary production, and prey resources in the habitats,
- Trophic linkages, growth changes, and predation rate of juvenile salmon
- Population size, survival rate and survival mechanism of juvenile salmon
- Interactions between species, between stocks, and between life-history stages
- Changes in carrying capacity of anadromous stocks

- Component 3: Anadromous Stocks in the Western Subarctic Gyre and Gulf of Alaska Ecosystems
  Cooperative research may focus on the following issues:

NPAFC Science Plan 2006-2010
Component 3: Anadromous Stocks in the Western Subarctic Gyre and Gulf of Alaska Ecosystems

Anadromous stocks play a very important role in the Western Subarctic Gyre and Gulf of Alaska ecosystems. Immature and maturing salmon originating from Asia and North America intermingle in both of these ecosystems. Recent research vessel surveys by Canada, Japan, Russia, and the USA have collected a considerable amount of new data on anadromous stocks, ecologically related species, and environmental conditions in the Western Subarctic Gyre and Gulf of Alaska ecosystems. In particular, three species - pink, chum, and sockeye salmon - occur in high abundance in Western Subarctic Gyre and Gulf of Alaska ecosystems during all seasons. Anadromous stocks consume a substantial quantity and biomass of prey organisms in these ecosystems, and play an important role as a higher trophic level predator. Changes in marine trophic relations in these ecosystems influence the productivity of salmon populations returning to different reproduction regions in Asia and North America.

Both ecosystems provide major wintering habitats for various anadromous stocks. While previous research has identified this as a critical period that defines the biological characteristics and biomass of anadromous stocks, open ocean field research and monitoring programs have typically been carried out only during the late spring to early fall period. Better information on the status and trends in production and condition of Pacific salmon during the late fall to early spring period is needed for conservation and management of salmon resources.

Cooperative research may focus on the following issues:
- Seasonal distribution, production, and health of anadromous stocks and ecologically related species,
- Seasonal changes in feeding, growth, and habitat condition,
- Winter survival strategies of anadromous stocks,
- Effects of climate change on population size and survival rate,
- Multi-year trends (regimes) in physical and biological factors that influence long-term changes in food production and fluctuations in salmon production and growth rates,
- Interactions between species, between stocks, and between life-history stages,
- Changes in carrying capacity of anadromous stocks

2. Cooperative Research Approaches and Implementation of the Science Plan

Relevant approaches to cooperative research under the Science Plan 2006-2010 will include collection and synthesis of existing data and metadata to generate and test specific hypotheses, integrated ecological monitoring research (research vessels, remote sensing), conceptual and quantitative modeling, process-oriented field and laboratory studies, and retrospective analyses. Scientific results from cooperative studies using these approaches will progressively fill in major gaps in scientific knowledge with respect to the research theme, components, and issues, as well as contribute new scientific information to climate-change/ecosystem research being carried out by other relevant programs (e.g., PICES, North Pacific Research Board). NPAFC workshops and symposia serve an important purpose in the rapid exchange of significant new research results. The timely publication by NPAFC of research results presented at workshops and symposia is an important part of this process.

As in the case of the BASIS research plan for 2001-2006, specific proposals and approaches for new cooperative research under the NPAFC Science Plan will be developed at the CSRS working-group level, and will be subject to approval by the CSRS and the Commission. Implementation of cooperative research plans approved by the CSRS and the Commission under the Science Plan 2006-2010 will follow the same procedures that were approved by CSRS for the BASIS research program. Specific policies for cooperation, identifying and addressing user needs, data quality, management and dissemination, logistics, outreach and education, and public involvement will be developed at the working-group or sub-group level, and will be subject to approval by the CSRS and the Commission.
List of NPAFC Scientific Publications

**NPAFC Bulletin series (Proceedings of the NPAFC scientific symposia)**


**NPAFC Technical Report series (Proceedings of the NPAFC scientific workshops)**

No. 1 (1998): Workshop on Climate Change and Salmon Production (March 26-27, 1998, Vancouver, B.C., Canada)

No. 2 (2001): Workshop on Factors Affecting Production of Juvenile Salmon (October 29, 2000, Tokyo, Japan)


**NPAFC Statistical Yearbook series**


References:


Photo credit:


How can you support?

In order to implement scientific research programs under the new Science Plan 2006-2010 in full capacity, the ad hoc External Funding Working Group (EFWG) of the Committee on Finance and Administration was created, which is in charge of external fund-raising. If you are interested in supporting NPAFC scientific research activities including the BASIS program, please contact the NPAFC Secretariat (secretariat@npafc.org), or the EFWG representatives in the following countries:

For Canada:
Gerry Kristianson, Sport Fishing Institute
E-mail: gerrykr@telus.net

For Japan:
Takaaki Mori, Fisheries Agency of Japan
E-mail: takaaki_mori@nm.maff.go.jp

For the Republic of Korea:
Kyu Jin Seok, Ministry of Maritime Affairs and Fisheries
E-mail: icdmomaf@chol.com

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E-mail: maksimovs@fishcom.ru

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E-mail: fcassidy@cassidyjr.com