NORTH PACIFIC ANADROMOUS FISH COMMISSION

Established by Convention for the Conservation of Anadromous Stocks in the North Pacific Ocean.

ANNUAL REPORT 1998

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LETTER OF TRANSMITTAL

In compliance with Rule 17(f) of the Rules of Procedure, it is my pleasure as President of the North Pacific Anadromous Fish Commission to present my compliments to the Parties and their Representatives and to transmit herewith the Sixth Annual Report of the North Pacific Anadromous Fish Commission.

DAVID BEVAN
PRESIDENT
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I. INTRODUCTION

The North Pacific Anadromous Fish Commission (the Commission) was established under the provisions of Article VIII of the Convention for the Conservation of Anadromous Stocks in the North Pacific Ocean, signed at Moscow on February 11, 1992 by Canada, Japan, the Russian Federation and the United States of America (original Parties). The Convention entered into force on February 16, 1993. The States which negotiated and signed the Convention are the major States of origin for salmon stocks in the North Pacific Ocean.

1. SHORT INTERPRETATION OF THE CONVENTION

(1) Foundation and Goals of the Convention

The Convention is based on the recognition that anadromous stocks intermingle extensively during their migrations on the high seas of the North Pacific; that the States of origin have the primary interest in and responsibility for such stocks; that the fisheries for anadromous stocks should be conducted only in waters within the 200-mile zones and that the States of origin make expenditures and forego economic development opportunities to establish favourable conditions to conserve and manage these stocks.

The Convention also recognizes the importance of scientific research for the conservation of anadromous stocks in the North Pacific Ocean and the desire of the major States of origin to promote the acquisition, analysis and dissemination of scientific information pertaining to anadromous stocks and ecologically related species in the North Pacific Ocean as well as to coordinate efforts and to establish an effective mechanism of international cooperation for their conservation.

The goal of conservation is consolidated by such measures as: (a) prohibition of directed fishing for anadromous fish in the Convention Area; (b) minimization to the maximum extent of the incidental taking of anadromous fish; and (c) prohibition of the retention on board a fishing vessel of anadromous fish taken as an incidental catch during fishing for non-anadromous fish.


(2) Convention Area

The area to which the Convention applies is the waters of the North Pacific Ocean and its adjacent seas, north of 33° N.Lat. beyond the 200-mile zones of the coastal States. For scientific purposes the activities under the Convention may extend farther southward in the North Pacific Ocean beyond the 200-mile zones.

(3) Species

The anadromous fish covered by the Convention are as follows: chum salmon, coho salmon, pink salmon, sockeye salmon, chinook salmon, cherry salmon, steelhead trout.

(4) Scientific Approach

The Convention authorizes fishing for 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 in the Convention Area, 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 other technical information and materials pertaining to areas adjacent to the Convention Area from which anadromous stocks migrate into the Convention Area. The Convention provides for the development of cooperative programs, including observer programs, to collect fishing information in the Convention Area for the purpose of scientific research. The Convention also provides for cooperation in scientific exchanges such as seminars, workshops, and exchanges of scientific personnel.

(5) Measures to Promote Compliance with the Convention by Non-Members

The Parties invite the attention of any State or entity not party to the Convention to any matter relating to their fishing activity which could negatively affect the conservation of anadromous stocks within the Convention Area and agree to encourage them to adopt laws and regulations consistent with the provisions of the Convention.

The Parties shall not transfer the registration of the vessels registered under their respective laws and regulations for the purpose of avoiding compliance with the provisions of the Convention.

The Parties take actions individually or collectively in accordance with international and their respective domestic laws to prevent unauthorized fishing activities by any State or entity not party to the Convention and trafficking in illegally harvested anadromous fish.

(6) Enforcement

All necessary measures shall be 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 shall be commensurate with the serious nature of the infractions.

The Parties cooperate in exchange of information on any violation of the provisions of the Convention and on enforcement action. The Parties exchange their enforcement plans.

(7) Accession to the Convention

Other States may accede to the Convention at the invitation of the Original Parties by unanimous agreement. The Convention shall become effective for any such other State on the date of deposit of that State's instrument of accession.
(8) **Withdrawal**

Any Party may withdraw from the Convention 12 months after the date on which it formally notifies the Depositary of its intention to withdraw.

(9) **Depositary**

The Government of the Russian Federation is the Depositary.

2. **SHORT DESCRIPTION OF THE COMMISSION**

(1) **Objective**

The objective of the Commission is to promote the conservation of anadromous stocks in the Convention Area. The Commission may also consider matters related to the conservation of ecologically related species in the Convention Area.

(2) **Authority**

The Commission has the authority to:

2.1 **Conservation**

Recommend to the Parties measures for the conservation of anadromous stocks and ecologically related species in the Convention Area.

2.2 **Exchange of Information**

Promote the exchange of information on any activities contrary to the provisions of the Convention, especially with respect to fishing for and trafficking in anadromous fish, as well as on responsive action taken by the Parties and, as appropriate, by any State or entity not party to the Convention.

2.3 **Schedules of Penalties**

Consider and make proposals to the Parties for the enactment of schedules of equivalent penalties for activities contrary to the provisions of the Convention.

2.4 **Relief of Damages**

Consider possible means to relieve the damage which may be suffered by a State of origin as a result of fishing in violation of the Convention and, for that purpose, develop methods to identify the origin of fish which may be taken in violation of the Convention.

2.5 **Enforcement**

Review, evaluate actions taken, and recommend additional action to be taken by the Parties to ensure effective and diligent enforcement of the provisions of this Convention.
2.6 **Scientific Research**

Promote the exchange of catch and effort information in respect of activities of Parties and, as appropriate, any State or entity not party to the Convention for conducting scientific research and for coordinating the collection, exchange and analysis of scientific data regarding anadromous stocks and ecologically related species, including data to identify the location of origin of anadromous stocks, and provide a forum for cooperation among the Parties with respect to such anadromous stocks and ecologically related species.

2.7 **Certificates of Origin**

Consider and make proposals to the Parties for the enactment of a program for certificates of origin attesting that products of anadromous fish are from fish which were lawfully harvested.

2.8 **Cooperation with International Organizations**

Cooperate, as appropriate, with relevant international organizations, *inter alia*, to obtain the best available information, including scientific advice, to further the attainment of the objectives of the Convention.

2.9 **Cooperation with Other States and Entities**

Where appropriate, invite any State or entity not party to the Convention to consult with the Commission with respect to matters relating to the conservation of anadromous stocks and ecologically related species in the Convention Area.

2.10 **Incidental Taking of Anadromous Fish**

Recommend measures to avoid or reduce incidental taking of anadromous fish in the Convention Area.

2.11 **Other Measures**

Recommend to the Parties any measures needed to further the attainment of the objectives of the Convention.

2.12 **Amendments**

Recommend amendments to this Convention and to the Annex to the Convention.

(3) **Status**

The Commission has legal personality and such legal capacity in its relations with other international organizations and in the territories of the Parties as may be necessary to perform its functions and achieve its ends. The immunities and privileges which the Commission and its officers enjoy in
Canada are subject to the Headquarters Agreement between the Commission and the Government of Canada.

(4) **Headquarters**

The Headquarters of the Commission is located at Vancouver, Canada. The mailing address is:

Suite 502, 889 West Pender Street
Vancouver, B.C. V6C 3B2
Canada
Phone: (604) 775-5550
Fax: (604) 775-5577
e-mail: npafc@interchange.ubc.ca
Web site: http://www.npafc.org

(5) **Secretariat**

The Commission established a Secretariat composed of Executive Director, Deputy Director, Administrative Assistant and Secretary.

(6) **Languages**

The Commission has three official languages: English, Japanese, and Russian. All regular meetings of the Commission are provided with simultaneous translation into the above official languages. The Annual Report of the Commission is produced in three official languages.

(7) **Representation**

Each Party is a member of the Commission and may appoint to the Commission not more than three representatives, who may be accompanied at the meetings of the Commission by experts and advisers.

(8) **Structure**

The Commission may establish such subordinate bodies as it deems necessary. The Commission has established three Committees: Scientific Research and Statistics (CSRS), Enforcement (ENFO), Finance and Administration (F&A). There were further established the Science Sub-Committee and several working groups under CSRS and ENFO umbrellas.

(9) **Votes**

Each Party has one vote in the Commission. All important matters shall be decided by consensus among all Parties that are States of origin of anadromous stocks which migrate into the Convention Area. A matter shall be deemed to be important if any Party that is a State of origin of anadromous stocks which migrate into the Convention Area considers it to be important.
(10) Officers

The Commission elects a President and a Vice-President for a two-year term. They shall not be representatives of the same Party.

(11) Meetings

The Commission meets at least once annually. Any meeting of the Commission other than the regular annual meeting may be called by the President at such time and place as the President may determine, upon the request of a Party with the concurrence of another Party, provided that at least one of these two parties is one of the original Parties.

(12) Rules


(13) Budget

The budget of the Commission is divided equally among the Parties. Each Party pays the expenses incurred by its representatives, experts and advisers. The Parties conduct scientific and enforcement activities in the Convention Area at their own expense.

(14) Publications

The Commission publishes an Annual Report, and a Statistical Yearbook. In addition, the Commission shall publish such reports from time to time as it may deem desirable.


The Inaugural Meeting of the Commission was held in Ottawa, Canada, on February 24, 1993.

The Meeting of Sub-Committee on Enforcement was held in Vancouver, Canada, on April 27-29, 1993.

The Inaugural Meeting of the Committee on Scientific Research and Statistics was held in Vladivostok, Russia, on June 22-24, 1993.

The First Annual Meeting of the Commission was held in Vancouver, Canada, on November 1-5, 1993.

The Second Annual Meeting was held in Vladivostok, Russia, on October 10-15, 1994.

A Research Planning and Coordinating Meeting was held in Seattle, U.S.A., on March 6-10, 1995.

The Third Annual Meeting of the Commission was held in Seattle, U.S.A., on November 5-10, 1995.

The Fourth Annual Meeting of the Commission was held in Tokyo, Japan, on October 21-25, 1996.
An International Symposium on Assessment and Status of Pacific Rim Salmon Stocks was held in Sapporo, Japan, on October 28-29, 1996.

A Research Planning and Coordinating Meeting was held in Vancouver, Canada on March 4-6, 1997.

The Fifth Annual Meeting of the Commission was held in Victoria, Canada on October 27-31, 1997.

A Research Planning and Coordinating Meeting was held in Vancouver, Canada, on March 24-25, 1998.

A Workshop “Climate Change and Salmon Production” was held in Vancouver, Canada, on March 26-27, 1998.

The Sixth Annual Meeting of the Commission was held in Moscow, Russia, on November 1-6, 1998.

4. THE COMMISSION’S PUBLICATIONS FOR THE PERIOD 1993 - FEBRUARY 1999


NPAFC Newsletters Vol. 1(1,2), Vol. 2(1,2), Vol. 3(1)

NPAFC Scientific Bulletin #1, 1997

Technical Report of the Workshop on Climate Change and Salmon Production, 1998
The Annual Report summarizes the activities of the Commission in 1998. The Report includes all major discussions, which took place at the Research Planning and Coordinating Meeting in Vancouver, Canada (March 24-25, 1998) and at the Sixth Annual Meeting in Moscow, Russia (November 1-6, 1998).

The 1998 Annual Report is printed in English, Japanese and Russian.
II. RESEARCH PLANNING & COORDINATING MEETING

1. TIME AND PLACE OF MEETING

The Research Planning & Coordinating Meeting (RPCM) was held from March 24 to 25, 1998 at the Landmark Hotel in Vancouver, B.C., Canada.

2. PARTICIPANTS

_NPAFC Research Planning & Coordinating Group (RPCG)_

Canada: Richard Beamish  
Gerry Kristianson  
Skip McKinnell  
David Meerborg  
Donald Noakes  
David Welch  

United States: Richard Carlson  
Nancy Davis  
Douglas Eggers  
Hal Geiger  
John Helle  
Steve Ignell  
Loh-Lee Low  

Japan: Tomonori Azumaya  
Masa-aki Fukuwaka  
Yukimasa Ishida  
Masahide Kaeriyama  
Satoshi Kuwahara  
Kazuya Nagasawa  
Shigehiko Urawa  
Kiyoshi Wakabayashi  

Russia: Oleg Gritsenko  
Vladimir Karpenko  
Vladimir Radchenko  

_PICES_

Alexander Bychkov  
Paul LeBlond  
Douglas McKone

_Secretariat_

Irina Shestakova  
Hiroko Omori  
Wakako Morris  
Denise McGrann

_Interpreters_

Ikumi Graham  
Almira Safarova-Downey

Dr. Oleg Gritsenko of Russia served as Chairperson.

3. AGENDA

The following agenda was adopted:

(1) Opening Remarks & Introduction  
(2) Appointment of a Chairperson  
(3) Adoption of Agenda  
(4) Meeting procedures
(5) The 1998 CSRS Work Plan
   (a) Review Work Plan Activities
   (b) Coordinate Research
(6) Cruise Activities
   (a) Review of Objectives and Plans, including Schedules
   (b) Coordination of Participation of Scientists
(7) Exchange of Biological Samples, Data, and Personnel
(8) Working Groups' Discussions
   (a) Science Plan
   (b) Methodology Standardization
   (c) Stock Assessment
(9) Consideration of Proposals on Joint Projects to be Funded by the Commission
(10) Other Business and Future Meetings
(11) Summary Report

4. Procedures

A summary report was drafted by the Secretariat and reviewed, revised and approved by the Research Planning and Coordinating Group. An editorial Committee was established: D. Noakes for Canada; Y. Ishida for Japan; V. Radchenko for Russia; and K. Myers for the U.S.A. K. Myers also served as Rapporteur.

5. The 1998 CSRS Work Plan

The Work Plan approved at the 1997 Annual Meeting was reviewed and updated.

6. Cruise Activities

(a) Review of Objectives and Plans, including Schedules

Each member country described its research cruises for 1998.

Canada

i) Ocean distribution and migration of juvenile salmonids from northern Vancouver Island to southeast Alaska, using the W.E. Ricker, during July 18-31, August 17-early September, and September 28-October 18, 1998. Canada indicated that scientists from other Parties can be accommodated during these surveys.

ii) Inshore salmon research (climate effect on salmonid resources)

Inshore cruises in southern British Columbia waters and Puget Sound will be conducted several times in the 1998 fiscal year, starting with a cruise in the first week of April 1998 (April, mid-June to mid-July, September, November, and February). These research cruises are still subject to formal approval.

Japan

Among the six cruises in 1998, the Wakatake maru and Oshoro maru cruises are Japan-U.S. cooperative.
Russia

Russian cruise plans are part of the far-eastern regional program on the marine life of Pacific salmon, 1997-2000. This scientific program was developed to improve the organization of surveys.

The program for 1998 includes three sea expeditions: in the Okhotsk and Bering Seas, and northwest Pacific waters.

The Russian Party indicated that the cruise of the R/V Professor Levanidov would be able to accommodate one scientist from other Party.

United States

i) Three offshore cruises (March to August 1998) will be conducted in the Gulf of Alaska and North Pacific Ocean in 1998. The objects of survey are juvenile and immature salmon.

ii) Inshore monitoring program includes six cruises conducted from May to October 1998 along the inside waters of southeast Alaska and coastal waters of the Gulf of Alaska. The United States noted that this monitoring program was related to the U.S. GLOBEC Northeast Pacific research program.

(b) Coordination of Participation of Scientists

Participation of scientists on research cruises of other Parties was planned as follows:

<table>
<thead>
<tr>
<th>Country</th>
<th>Vessel</th>
<th>Scientist(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Canada</td>
<td>Oshoro maru</td>
<td>one scientist (zooplankton sampling)</td>
</tr>
<tr>
<td>U.S.A.</td>
<td>Oshoro maru</td>
<td>Kerim Aydin, Robert Walker</td>
</tr>
<tr>
<td></td>
<td>Wakatake maru</td>
<td>Nancy Davis</td>
</tr>
</tbody>
</table>

These arrangements were to be finalized by correspondence between the countries concerned.

7. Exchange of Biological Samples, Data, and Personnel

Exchanges of samples and data have been made informally between scientists and have worked well. The RPCG confirmed that this practice will be continued.

The United States expressed the desire to obtain additional samples and data from Russia, as they have a shorter history of exchanges. Russia stated that requests can be made through correspondence, and named two points of contact: O. Gritsenko for statistics and V. Karpenko for scientific data.

8. Working Groups' Discussions

(a) Science Plan

It was agreed that the first draft of the 1999/2000 Science Plan would be submitted to CSRS at the next Annual Meeting, and finalized at the RPCM 1999. It was also agreed that each Party would provide a document at the next Annual Meeting containing abstracts of research results completed in accordance with the existing Science Plan.

(b) Methodology Standardization

The Working Group met and discussed submission of a revised document for CSRS consideration at the Sixth Annual Meeting.
(c) **Stock Assessment**

The Working Group met to discuss their concerns on incompletion of the catch statistics presented at the Annual Meetings; duplication in reporting of information on catches; necessity for highlighting trends and identifying any special characteristics observed in the fisheries. It was agreed that each Party would update the 1997 catch information and that D. Noakes would prepare a draft report for the 1998 Annual Meeting.

(d) **Ad Hoc Working Group on Salmon Marking**

The Working Group met to discussed the types of marks being used to identify salmonids and the numbers of marked salmonids being released. The group agreed to produce a report for the 1998 Annual Meeting on the number and diversity of thermal marks, beginning with the 1996 release year.

(e) **Ad Hoc Working Group on Archival Tags**

The Working Group was formed of D. Welch (Chairman, Canada), P. Eveson (Canada); Y. Ueno and M. Fukuwaka (Japan); V. Karpenko (Russia); and J. Helle and K. Myers (USA).

9. **CONSIDERATION OF PROPOSALS ON JOINT PROJECTS TO BE Funded BY THE COMMISSION**

Japan proposed that the CSRS recommend to the Commission at the next Annual Meeting that participation of scientists in future scientific symposia be partly financed.

The United States proposed that the CSRS recommend to the Commission that a symposium be held in conjunction with the 1999 Annual Meeting in the United States. The RPCG agreed with the above proposals and formed a Steering Committee for development of topics and preparations for the symposium. The following membership of the Steering Committee was approved: D. Noakes of Canada, Y. Ishida of Japan, and V. Radchenko of Russia. It was agreed that the Committee would be chaired by the U.S. representative, to be named by the U.S. Party later.

10. **OTHER BUSINESS**

The RPCG discussed 1996 preliminary catches and 1997 run forecasts of salmon for each country.

a) P. LeBlond, representative of PICES, proposed that PICES, NPAFC, and several other international marine science organizations co-host a symposium on the 1997-98 El Niño event, and that NPAFC send its representative to the symposium Steering Committee. RPCG made no recommendation to CSRS on the above issue.

b) The RPCG recommended to the CSRS that the time and place of next RPCM be discussed at the 1998 Annual Meeting.

11. **ADJOURNMENT**

The meeting adjourned at 4:00 p.m., March 25, 1998.
III. SIXTH ANNUAL MEETING - 1998

1. TIME AND PLACE OF MEETING

The Sixth Annual Meeting of the Commission was held at the Russian Academy for Public Service under the President of the Russian Federation in Moscow, Russia, from November 1 to 6, 1998. Plenary sessions were held under the chairmanship of Mr. David Bevan (President of the Commission); the first session on November 4, and the second (final) session on November 6.

The Committee on Enforcement (ENFO) met on November 2 and 3, with Mr. D. Brock of Canada as Chairman.

The Committee on Scientific Research and Statistics (CSRS) met from November 1 to November 5, with Dr. Oleg Gritsenko of Russia as Chairman.

The Committee on Finance and Administration (F&A) met on November 4 and 5 with Mr. S. Ishida of Japan as Chairman.

2. PARTICIPANTS

(Top row, Left to Right) Vladimir Pautov, Vladimir Fedorenko, Paul Sprout, David Bevan, Gerry Kristianson, Guy McMinds, Douglas Eggers
(Bottom row, Left to Right) Shuji Ishida, Vladimir Izmailov, Hiroko Omori, Irina Shestakova, Koji Imamura, William Hines
Persons participating in the meeting were as follows:

**CANADA**  
*Representatives*  
David Bevan  
Paul Sprout  
Gerry Kristianson  
*Advisers and Experts*  
Richard Beamish  
Dennis Brock  
Robert Martinolich  
Robert Steinbock  
David Welch

**OBSERVERS**  
Richard Beamish  
(North Pacific Marine Science Organization, PICES)  
Hak-Haing Cho  
(Republic of Korea)  
Peter Hutchinson  
(North Atlantic Salmon Conservation Organization, NASCO)  
Malcolm Windsor  
(North Atlantic Salmon Conservation Organization, NASCO)

**JAPAN**  
*Representatives*  
Shuji Ishida  
(Koichi Imamura)  
Ichiro Kanto  
Masatake Kato  
Hiroshi Mitsuya  
Norihito Sone  
Taku Sasaki  
Shigehiko Urawa

**RUSSIA**  
*Representatives*  
Vladimir Izmailov  
(Vladimir Fedorenko)  
Vladimir Pautov  
*Advisers and Experts*  
Valentin Artyomov

**UNITED STATES**  
*Representatives*  
William Hines  
(Douglas Eggers)  
Guy McIndoe  
*Advisers and Experts*  
Alvin Burch  
Harold Geiger  
David Hanson  
John Helle  
Bernard Link  
Loh-Lee Low  
Dwight Mathers  
Katherine Myers  
Paul Niemeier  
Vincent O'Shea  
Randall Schneider  
Steven Springer  
Robert Walker  
Evelyn Wheeler  
Natalya Dobrovolskaya

**SECRETARIAT**  
Irina Shestakova  
(Executive Director)  
Hiroko Omori  
(Deputy Director)  
Wakako Morris  
(Administrative Assistant)  
Denise McGrann  
(Secretary)  
Tamara Severnaya  
(Temporary Assistant)

**INTERPRETERS**  
*Russian-Japanese*  
Alexander Kozlov  
Savely Laskov  
Etery Sakontikova  
Olga Zhilina

*Russian-English*  
Alexandre Chklikov-Fanfani  
Eugene Osmolovski  
Sergey Shmakov  
Vadim Sternik
3. **AGENDA**

(1) Opening by the President of NPAFC, Mr. David Bevan
(2) Opening addresses, introduction and report on delegation memberships
(3) Introduction of observers
(4) Adoption of agenda
(5) Meeting procedures
   a. Attendance at meetings
   b. Schedule of sessions
   c. Press policy
   d. Minutes
(6) Executive Director's report
(7) Consideration of enforcement
   a. Exchange of information on activities contrary to provisions of the Convention (Article IX 2.)
   b. Review and evaluation of enforcement actions (Article IX 5.)
   c. Parties' report on progress of supporting the Convention by non-members through alternative mechanisms
   d. Invitations to State or entity (Article IX 10.)
   e. Cooperation with relevant international organizations (Article IX 9.)
   f. Review of Parties' proposals on joint projects to be financed by the Commission
   g. Review of NPAFC homepage on Internet
   h. Adoption of ENFO Report
(8) Consideration of scientific research and statistics
   a. Review of 1998 Workplan
   b. Review of scientific research activities (Article IX 6.)
   c. Coordination of scientific research activities (Article IX 6. and 8.)
   d. Statistical Yearbook (Rules of Procedure 19 (k))
   e. Other publications (Rules of Procedures 25)
   f. Cooperation with relevant international organizations (Article IX 9.)
   g. Development of 1999 Workplan
   h. Invitations to State or entity (Article IX 10.)
   i. Adoption of CSRS Report
(9) Administrative and fiscal matters
   a. Consideration of Auditors' Report and selection of an auditor
   b. Financial situation in current fiscal year
   c. Budget estimate for fiscal year beginning July 1, 1999
   d. Budget forecast for fiscal year beginning July 1, 2000
   e. Administrative report for 1998
   f. Administrative matters
   g. Review of ENFO and CSRS recommendations on joint projects to be financed by the Commission
   h. Review of NPAFC homepage on internet
   i. Year 2000 (Y2K) computer challenge
   j. Schedule of future Annual meetings
   k. Other business
   l. Adoption of F&A Report
(10) Review of status of development of Memorandum of Understanding (MOU) between NPAFC and PICES
(11) Process to recommend that certain other states of origin be invited to accede to the Convention (Article XVIII)
(12) Process to select a candidate for position of Executive Director
(13) Nomination of Executive Director
(14) Other business
(15) Place and time of the Seventh Annual Meeting
(16) Closing remarks
4. **OPENING REMARKS**

At the First Plenary Session, there were addresses of welcome, and statements by Canada, Japan, the United States, and Russia:

**Mr. David Bevan, President**, addressed the meeting as follows:

*Distinguished Representatives, delegates, ladies and gentlemen, I wish to extend a cordial welcome to all of you.*

*As we open this Sixth Annual Meeting, I want to take the opportunity to provide some brief opening remarks.*

*I want to begin by saying it is a pleasure to work in an organization where the member countries are striving to achieve the same essential goal. We know that this is not the case in many other international fisheries commissions.*

*The strengths of this Commission lie in the shared purpose and active efforts of the Contracting Parties to ensure the conservation and sustainable utilization of North Pacific salmon resources for the benefit of domestic fishermen in their respective waters. As a result, the Commission in its brief history has become a model of positive and successful international cooperation.*

*While membership in the NPAFC brings benefits in terms of conservation of salmon resources, it also involves obligations including compliance with the prohibition on fishing salmon on the high seas of the North Pacific and responsible fishing practices consistent with the United Nations moratorium on large-scale pelagic driftnet fishing.*

*The NPAFC Parties each contribute to the considerable task of surveillance of the North Pacific and the scientific research efforts to understand the biological aspects of North Pacific anadromous stocks. In my time with the Commission, I have been impressed by the remarkable degree of cooperation and coordination which I have found among fisheries managers and scientists of the NPAFC member countries in these endeavours.*

*During this meeting, we will also be looking for someone to see this Organization into the new millennium. During the week we will select a successor for the position of Executive Director of the Commission. I think I express the hope of all present that this process will be achieved amicably, by consensus and the best qualified candidate will be selected.*

*With your support, I will do my best to continue the path of cooperation to achieve the effective conservation and sustainable utilization of North Pacific salmon resources. Let us build on our strengths to realize this goal.*

**Mr. Paul Sprout, Alternate, Head of Canadian delegation**, addressed the meeting as follows:

*Mr. Chairman, distinguished Representatives, ladies and gentlemen, it is a pleasure for Canada to participate at this year’s NPAFC Annual Meeting in Moscow, one of the great capital cities of the world.*

*On behalf of the entire Canadian delegation, I wish to thank the Russian authorities for their warm hospitality and the excellent facilities they have provided for hosting this annual meeting. We would also like to thank the Secretariat staff for all its hard work in ensuring smooth arrangements for this meeting.*
Canada would like to welcome the observer from the Republic of Korea and also Dr. Windsor, the Secretary of the North Atlantic Salmon Conservation Organization. Canada hopes that the Republic of Korea will accede to the Convention in the near future.

1998 has marked the International Year of the Ocean. This has placed a special focus on the global importance of our oceans and the need for responsible fishing practices to ensure sustainable fisheries.

Canada is pleased with the cooperative efforts of the Parties to develop and implement effective enforcement and surveillance programs to ensure compliance with the Convention. During 1998 the Contracting Parties continued to coordinate enforcement strategies and actions against the threat of salmon poaching on the high seas of the North Pacific Ocean. The success of the program was demonstrated again this year with the pursuit and apprehension of several high seas driftnet vessels in the Convention Area during the summer. The cooperative enforcement efforts have succeeded in deterring unauthorized fishing this year. We hope that the Parties will continue to cooperate to maintain similar levels of enforcement effort during 1999.

The joint enforcement efforts highlight the continuing problem of unauthorized salmon fishing by non-member states on the high seas of the North Pacific. We continue to believe that it is important for the Parties to encourage non-member States to become party to the 1993 FAO Agreement to Promote Compliance with International Conservation and Management Measures by Fishing Vessels on the High Seas. Under the Compliance Agreement, flag states may not permit any of their vessels from fishing on the high seas unless they are able to prevent the vessel from undermining agreed high seas conservation rules. We believe that ratification of the Compliance Agreement will be helpful to broaden non-member States' support for the Convention's objectives.

The North Pacific Anadromous Stocks Convention was a milestone on the road toward enhanced international cooperation to ensure that high seas fishing activities are conducted in a rational, sustainable and responsible manner.

I am also encouraged by the new international agreements that have been signed or adopted in recent years, including the United National Agreement on Straddling and Highly Migratory Fish Stocks, the FAO Compliance Agreement, and the FAO Code of Conduct for Responsible Fishing.

Canada applauds those governments that have already ratified the UN Fish Agreement. Legislation has been introduced in the Canadian Parliament to bring our laws into line with the Agreement. Canada will then be able to ratify this Agreement. We encourage all NPAFC members who have not already done so to ratify the Agreement with a view to expediting its entry into force.

Canada is pleased with the results of the March 1998 workshop on the impacts of climate change on salmon populations. The phenomenon of global climate change has broad ranging implications for many industries. It is crucial that we understand its effects on the distribution of salmon and other marine resources in the North Pacific Ocean.

In this regard, collaboration with other international organizations concerned with marine science should be encouraged. At its recent annual meeting, PICES agreed on a draft Memorandum of Understanding between NPAFC and PICES on enhanced cooperation between the two organizations in marine scientific research in the North Pacific Ocean. We would like to see the NPAFC approve the MOU at this meeting to formalize the increasing dialogue and cooperation on scientific research between these two bodies.
As you have noted, Mr. Chairman, the Commission will select a new Executive Director during the course of this week and he will take office in the spring of 1999. We would like to recognize and thank Dr. Shestakova for her capable stewardship through the first five years of the Commission.

Mr. Chairman, we look forward to engaging in constructive and positive dialogue at this session which will help advance the interests of the Commission and all its members. Thank you.

I would now like to introduce the Canadian delegation.

Mr. Shuji Ishida, Head of Japanese delegation, addressed the meeting as follows:

Thank you Mr. Chairman. I am Shuji Ishida, Head of the Japanese Delegation.

The Convention for the Conservation of Anadromous Stocks in the North Pacific Ocean has been in effect for six years. The Government of each Contracting Party has led its fishermen in the right direction and conducted enforcement activities in collaboration with other Parties. As a result, we have not found any violations to the Convention by the Parties' vessels. This shows evidence of compliance with the Convention by the Parties and effective functioning of the Convention.

However, salmon driftnet vessels of non-Contracting Parties were sighted in the Convention Area again this year. For such fishing activities, cooperative enforcement activities by the Parties' authorities resulted in the detection of several vessels, which were delivered to their flag countries. It is with great regret that an unfortunate incident occurred. One of the vessels did not comply with instructions by an inspection vessel of the Party; consequently, the vessel was shot, and two crew members were killed. In order to fulfill the objective of the Convention and to avoid such an unfortunate incident, I believe that it is necessary to eliminate driftnet salmon fishing activities by non-Contracting Parties' vessels as soon as possible. It is also important to promote accession to the Convention by the non-Contracting Parties.

With regard to the trends of salmon resources in the North Pacific Ocean, we have observed large changes in salmon runs, which were most likely affected by global ocean environmental changes. At last year's fifth Annual Meeting, the Commission decided to hold Workshop on Climate Change and Salmon Production. The causes of salmon production changes have been studied and should be clarified soon. Japan hopes that activities by scientists in the CSRS will promote clarification of the causes.

In other business matters, we are selecting the next Executive Director of the NPAFC Secretariat at this Annual Meeting. Dr. Irina Shestakova will continue her duty until the new Executive Director takes office. I would like to take this opportunity to express my sincere appreciation to Dr. Shestakova for her efforts during her term as the Executive Director.

Now let me introduce the members of the Japanese Delegation.

In closing, I would like to thank the Russian Government and its staff, Dr. Irina Shestakova, her Secretariat staff, and interpreters, for hosting and preparing this meeting. I hope this meeting will be fruitful.

Thank you.
Mr. William Hines, Alternate, Head of the U.S. delegation, addressed the meeting as follows:

Mr. Chairman, distinguished representatives, ladies and gentlemen, on behalf of the United States delegation, I wish to take this opportunity to express our pleasure to be here in Moscow to participate in the Sixth Annual Meeting of the Commission. I bring the sincere regrets from Mr. Steve Pennoyer and Lt. Governor Fran Ulmer of Alaska, who were unable to attend because of other responsibilities. I bring also their expression of best wishes for the success of this meeting. I would also like to express our appreciation to the Russian Government for hosting this meeting and the Secretariat staff for their hard work in ensuring the smooth operation of this conference. We recognize Dr. Irina Shestakova for her leadership these past several years in guiding the Commission and wish her well. Thank you Irina.

The United States would like to welcome Mr. Hak-Haing Cho of the Embassy of the Republic of Korea. We remain optimistic that the Republic of Korea will join in our collective efforts to ensure the protection, research and long-term sustainability of anadromous fish in the North Pacific Ocean. Additionally we would like to welcome Dr. Malcolm Windsor and Dr. Peter Hutchinson from NASCO and we would like to recognize Dr. Richard Beamish representing PICES.

The United States is pleased to note the high level of enforcement cooperation between the contracting Parties. This cooperation includes the exchange of sighting information, joint aircraft patrols, and combined surface efforts to intercept vessels fishing illegally. The increase in vessels seized documented the need to continue our vigilance in deterring unauthorized fishing in the Convention Area. We are pleased the Parties will continue to cooperate to maintain similar levels of enforcement during 1999.

The CSRS has been meeting the past few days and we are pleased to note that the Committee has served well as the rallying point to bring together research and fishery information about our salmon resources and their interactions with the environment. We are encouraged that the Parties are implementing the NPAFC Science Plan to study the life history, population dynamics, fresh water habitat, and marine ecosystems of our salmonid resources. This is evident from the number of research cruises that were conducted over the past year in the North Pacific Ocean. The submission of sixty-nine scientific papers that reported on new research and discussed the implication of past research highlight this intense effort of cooperation.

The total salmon catch for 1997 from all areas of the North Pacific Ocean totaled approximately 840,000 metric tons. Although overall catches have not declined significantly in recent years, there has been wide variation in the production of various salmon stocks throughout the North Pacific Rim. For the second year in a row Alaska has experienced disastrous returns of salmon to various fisheries. While many of the CSRS discussion papers addressed large scale environmental events and regime shifts of marine ecosystems for causing some of these changes, the effects of weather and fishing on the various stocks are complex factors. Thus, we look to all Parties here to continue pooling our research resources and expertise to plan and carry out focused research to better explain and predict production of salmon stocks. It is crucial that we understand the changes in the marine environment and their effects on the distribution, abundance and catches of salmon stocks in the North Pacific.

To carry out this investigation, the Commission will need to establish a cooperative framework with other relevant organizations. This will help ensure that a multi disciplinary approach will advance knowledge of the ocean environment, especially related to weather and climate change, ecosystems and living resources, and impacts on human activities. In this regard, we
Mr. Vladimir Izmailov, Head of Russian delegation, addressed the meeting as follows:

Mr. Chairman, distinguished representatives of the Parties, ladies and gentlemen.

It is an honour to host the Sixth meeting of NPAFC this year. May I welcome all the participants.

I hope that our work in Moscow, this ancient and beautiful city of our country, will be successful.

I also hope that the participants could make some sightseeing of Moscow already, despite weather.

The Russian Party welcomes the observers from the Republic of Korea, Mr. Hak-Haing Cho, First Secretary of the Embassy of the Republic of Korea in Russia, and from the North Atlantic Salmon Conservation Organization Dr. Malcolm Windsor and Dr. Peter Hutchinson, as well as the candidates for the position of Executive Secretary of the Commission nominated by the Parties, and present here.

Russia is satisfied with the work of the Commission, and believes that our cooperation is strengthening from year to year.

Joint research by our scientists, exchange of information, search for new scientific approaches to getting knowledge of both the sea and freshwater periods of life of salmon, allow us to expand our idea of these unique species of fish.

Joint effort of scientific organizations of the Parties to the Convention resulted in creating uniform methods which permit to forecast the approach of salmon to spawning grounds, hence, possible catches, with a large degree of confidence.

Joint effort to establish enforcement in the Convention Area, and continuous exchange of information among, the enforcement agencies make it possible to cut short driftnet poaching.

Meanwhile, the activities of the Commission in general are aimed at conserving the stocks of Far Eastern salmon, and at ensuring conditions for their feeding on the high seas in the North Pacific, in order to provide for sustainable catches by fishermen of our nations in their inshore waters.

The Russian delegation is positive as regards fruitfulness of our work at this meeting.

May I once again welcome all the participants of the meeting. I am sure that you will have a pleasant stay in Moscow.

Thank you. May I introduce members of our delegation.
Mr. Bevan introduced the observers from the Republic of Korea (Mr. Hak-Haing Cho); PICES (Dr. Richard Beamish); and NASCO (Dr. Malcolm Windsor and Mr. Peter Hutchinson).

Mr. Hak-Haing Cho, observer of the Republic of Korea, addressed the meeting as follows:

Mr. Chairman and distinguished guests,

Please allow me to introduce myself to you. My name is Hak-Haing Cho, Fishery Attache at the Korean Embassy in Moscow.

I would like to express my appreciation to you for inviting the Republic of Korea as an observer to the 6th Annual Meeting of the North Pacific Anadromous Fish Commission. It is my pleasure to attend this meeting as representative of the Republic of Korea.

Let me make a few comments on the topics of our discussions. As for the conservation of Anadromous stocks, I would like to point out that Korea has been sincerely co-operating within the framework of the stipulation in both the United nations Convention on the Law of the Sea pertaining to Anadromous stocks and the Convention for the Conservation of Anadromous stocks in the North Pacific Ocean. The Korean government has also been strictly guiding Korean fishing vessels not to catch any anadromous fish illegally and to avoid incidental taking of this species on the high seas as well.

Mr. Chairman,

Taking this opportunity, I would like to explain to you Korean Government’s plan for the development of Anadromous stocks.

As one of the States of Origin for this fish, Korea has been implementing projects for artificial hatching and releasing chum salmon along its river since the 1960’s in order to enrich fisheries resources.

Until now, we have released roughly 184 million salmon fingerlings into Korean rivers at an increasing annual rate; 16 million in 1996, 17 million in 1997 and 18 million this year. And we also plan to increase the annual release significantly over then next three years; 18.4 million in 1999, 34 million in 2000 and 48 million in 2001.

In parallel with the increasing release, the rate of return has risen. In 1994 the rate of return was 1.14%. It rose to 1.43% in 1995, 1.47% in 1996 and 1.37% in 1997.

Regarding Korea’s accession to the Convention to become a full member of NPAFC, we are now considering this issue from a positive position. But due to some issues to be further considered and internal procedures to be taken, the accession has been delayed.

Thank you Mr. Chairman and I wish you a very successful meeting.

Dr. Richard Beamish, observer of PICES, addressed the meeting as follows:

I am representing PICES at this meeting. I think that everyone here is generally familiar with the PICES organisation. The major activity of PICES has been to study the impact of climate and climate change on the physical and biological processes of the ecosystems of the subarctic Pacific. The activities of PICES are important to NPAFC because we now realize that in order to manage our salmon fisheries we must be able to distinguish the impacts of fishing
from the impacts of the environment and associated species. There is an urgency to acquiring this information because our Pacific salmon catches are beginning to decline from the historic high catches of the early 1990s.

It is interesting that there is a synchrony in the trends in catches throughout the Pacific and perhaps even with salmon in the Atlantic. It is not clear why the changes occur but it is clear that we need to co-ordinate and integrate our research efforts. This is why it is important to have a MOU between PICES and NPAFC so that there is recognition that we must find ways to use all of our science to become good stewards of our marine resources.

Dr. Malcolm Windsor, observer of NASCO, addressed the meeting as follows:

Mr. President, Distinguished Representatives, Ladies and Gentlemen, on behalf of NASCO, I would like to thank you for your very kind invitation to attend your 6th Annual Meeting as observer. I was privileged to attend your 4th Annual Meeting in Tokyo and the very useful and interesting Symposium in Sapporo. I suppose that our two organizations might be considered to be sisters and we have followed your progress with interest.

I would like to thank our Russian hosts, you, Mr. President and Dr. Shestakova, the Executive Director for excellent facilities and preparation. I would also like to introduce my colleague, Dr. Peter Hutchinson, the Assistant Secretary of NASCO. As you know our Headquarters is in Edinburgh, Scotland.

Apart from being here to observe part of your meeting, we are here today in the hope that we can build bridges between our two organizations. Indeed, we would like to build a solid bridge with three bases, because the International Baltic Sea Fishery Commission (IBSFC) is also keen to join us in the proposal. Our thinking is that NPAFC, NASCO and IBSFC:

- all are international inter-governmental bodies;
- all have, as their objectives, conservation and restoration of salmon stocks;
- all face similar problems of abundance of these stocks;
- all are involved in enforcement operations;
- all are involved in salmon aquaculture and its impacts;
- all need the best scientific advice and co-operation;
- all need to plan for the future

In the light of the adoption by international agencies of the Precautionary Approach, we are also very involved in putting that into practice not just internationally, but by the Contracting Parties individually, too.

With all this in mind, and after some informal contacts between our two Secretariats and scientists, we believe that we should consider holding a joint meeting which might last no more than two days. We have circulated a draft outline for this proposed meeting.

Mr. President, we believe that each of our three organizations is working to understand and protect the salmon stocks and that only good can come from closer co-operation on issues of mutual interest. Future generations will judge us by how we succeed in conserving the various salmon species and we need all the wisdom and knowledge that we can get. The proposed meeting will provide a forum for exchange of information between our organizations.

Mr. President, I bring greetings from all your colleagues in the North Atlantic and wish you every success in this your Sixth Annual Meeting.
5. CONSIDERATION OF ENFORCEMENT

At the First Plenary Session, this item (agenda item 7) was referred to the Committee on Enforcement (ENFO) for consideration and report at the Second Plenary Session.

The Committee reviewed agenda item 7 and submitted its report for the Commission’s consideration and adoption. The Commission adopted the ENFO Report including all its recommendations. Discussions and recommendations on this agenda item are summarized below:

1) Review of Terms of Reference

The Committee reviewed the Terms of Reference and made no comments with respect to possible changes or additions.

2) Exchange of Information on Activities Contrary to Provisions of the Convention

The Committee reviewed unauthorized fishing activities in 1998 on the basis of information provided by Canada, Japan, the U.S. and Russia.

Canada informed that in 1998, the Conservation and Protection Program of the Canadian Department of Fisheries and Oceans conducted four of six scheduled aerial surveillance patrols dedicated to enforcing the prohibition on high seas driftnet fishing in the North Pacific, utilizing the Department of National Defence CP 140 Aurora aircraft. To provide maximum on scene patrol coverage in areas where high seas driftnetters are most likely to be present, Canada recommends that patrols be staged out of Japan or Kamchatka.

Japan informed that during the fishing season of 1998 it conducted enforcement activities for 432 days at sea using 11 patrol vessels and using an aircraft and a helicopter for 129 hours.

Japan informed that its patrol vessel tracked the Chinese vessel JI SHUN, which was suspected of fishing for salmon using driftnets in the Convention Area.

The United States informed that during 1998 Coast Guard vessels patrolled the High Seas Driftnet (HSDN) high threat areas or were in position to respond for 1392 hours. Additionally, U.S. Coast Guard aircraft flew 619 surveillance hours. These levels were consistent with and even exceeded numbers of previous years. Meanwhile, National Marine Fisheries Service special agents flew on the Canadian surveillance flights this year.

There were seven vessels detected conducting illegal fishing operations during the above period, made in cooperation with Japan and Russia. Of those seven vessels, the U.S. apprehended two and two were referred to Russia for their prosecution.

The United States expressed its appreciation of Japan’s patrol efforts and Japan’s communications with non-member countries concerning their compliance with the provisions of the Convention. Also the U.S. delegation expressed its appreciation of the opportunity to use communication channels provided by Japan.

The United States also informed that since 1997 it has been requesting all U.S. commercial ships passing areas of potential illegal driftnet activities to inform the U.S. enforcement authorities of any sightings of suspicious fishing activities, fishing gear or marks. The same notification will be issued for 1999.
Russia explained that 1998 was a very difficult year for its enforcement activities because of restructuring of the Service. It was a period of transition of the Enforcement Service from the Fisheries Department to the Border Guard of the Russian Federation. They expect improvement in enforcement activities in the near future.

Russia expressed its appreciation for the cooperation with the U.S. enforcement agencies during 1998 and explained its actions concerning pursuing four Chinese vessels and seizure of one of them – ZHONG XIN 37. Russia also appreciated Japan’s cooperation in sighting and informing the Russian authorities of Chinese vessels illegally fishing in the Convention Area, but unfortunately they could not be apprehended by the Russian patrol at that time because they were pursuing the ZHONG XIN 37.

Russia noted that coordination of the Parties’ efforts is very important, and suggested the next step in improvement of enforcement activity should be development of joint projects partly financed by the Commission. Russia also proposed that the Commission draw China’s attention to the necessity to take appropriate measures against violations of the Convention by Chinese fishers.

All Parties provided detailed reports which contain a description of their enforcement activities, including discovery of the above mentioned violations of the provisions of the Convention. Japan provided information on its import and export of salmon and trout.

(3) Review and Evaluation of Enforcement Actions

Each Party agreed to the usefulness and continuation of pre-season enforcement planning. The Committee reviewed 1998 enforcement activities of each country.

1998 enforcement activities indicate high seas driftnet fishing continues in the Convention Area. Therefore, it is important that the enforcement efforts of the Parties be maintained to ensure there is sufficient enforcement presence in the Convention Area to serve as an effective deterrence to driftnet fishing operations.

The Committee reviewed information from the Secretariat on the status of requests for lists of former commercial driftnet vessels.

The Committee recommended that a request for a list of former commercial driftnet vessels again be sent to North Korea.

(4) Cooperation with Relevant International Organizations

The Committee recommended that the Commission cooperate with NASCO by exchanging information on enforcement activities and by inviting NASCO to send an observer to the Commission’s meetings.

(5) Invitations to State or Entity

With regard to observers at the Commission’s 1999 Annual Meeting, the Committee recommended that an invitation be extended to the People’s Republic of China and the Republic of Korea to attend in an observer capacity the Fifth Annual Meeting if either state has not acceded to the Convention by that time. The Committee also recommended that countries which are not salmon producers but which may be involved in Pacific salmon trade (Thailand, Malaysia) be invited to send
representatives to act as observers and to provide information on their measures to curtail possible illegal trade.

The United States described their efforts to encourage China to accede to the Convention. The United States noted that the US-China Bilateral Boarding/Shiprider Agreement greatly increased cooperation in enforcement activities on the high seas and may be very useful for facilitating future accession of China to the Convention. During the two U.S. high seas driftnet seizures in 1998, the Government of China cooperated fully with the U.S. via a PRC shiprider on board the U.S. Coast Guard enforcement vessel. China also indicated it would prosecute the vessels to the fullest extent of Chinese law.

Russia submitted a short report on their recent bilateral negotiations on fisheries with China with respect to the issue of China's future accession to the Convention. Russia pointed out the need for each of the Parties during their bilateral meetings of identifying positive reasons to encourage China to accede to the Convention.

The Committee recommended that the Parties used all available instruments of their bilateral relations with the Republic of Korea and China to facilitate their accession to the Convention.

(6) Review of Parties’ Proposals on Joint Projects to be Financed by the Commission

The Committee reviewed the proposals made by Russia and the United States on Future enforcement projects.

The Committee recommended that the Commission allocated $50,000 (Canadian funds) to finance a joint enforcement symposium with participation of 2 representatives from each party, proposed by the U.S. Party, in March 1999.

The Committee also recommended to extend invitations to the Republic of Korea and China to send their enforcement officials to partake in the enforcement symposium in Juneau at the Commission expense, as part of proposed appropriation.

(7) Review of NPAFC Homepage on Internet

The Parties expressed their appreciation of the content of the NPAFC Homepage on Internet and agreed to continue to contribute information on enforcement in order to keep it updated.

(8) Other Business

The Parties expressed their appreciation of the demonstration of a videotape produced by a San Francisco television news station of the U.S. Coast Guard interdiction of the TAI SHENG in May and June 1998. The videotape included footage provided by the U.S. Coast Guard and highlighted the difficulty and potential danger inherent in the interdiction of these vessels conducting illegal HSDN fishing.

6. CONSIDERATION OF SCIENTIFIC RESEARCH AND STATISTICS

At the First Plenary Session, this item (agenda item 8) was referred to the Committee on Scientific Research and Statistics (CSRS) for consideration and report at the Second (Final) Plenary Session.
The Committee reviewed agenda item 8, and submitted its report for the Commission's consideration and adoption. The Commission adopted the CSRS Report including all its recommendations. Discussions and recommendations on this agenda item are summarized below.

(1) **Review of Terms of Reference**

The interim Terms of Reference for the Committee adopted by the Commission at the Commission's Inaugural Meeting in February 1993 were reviewed. The Committee recommended to keep the interim Terms of Reference.

(2) **Review of 1998 Workplan**

The Committee reviewed the 1998 Workplan.

(3) **Scientific Research**

3.1 **Canada**

(i) **A Proposal for an International Salmon Research Program Using Archival Tags**

The International North Pacific Archival Tag Evaluation Working Group (INPATE) has evaluated the potential accuracy of archival (data storage) tags for estimating the daily position of tagged free-ranging animals such as salmon. INPATE has also developed new algorithms to improve the accuracy of the tags. The archival tags INPATE has tested are sufficiently accurate to justify an international effort to mount a cooperative high seas salmon tagging program. This working paper summarizes the results of INPATE investigations, efforts to evaluate the best tag attachment methodology, and some of the issues that an archival tag research program on Pacific salmon can address. INPATE proposes that the North Pacific Anadromous Fish Commission (NPAFC) now strike a formal working group charged with planning a large scale field program to use these archival tags. A tentative budget to cover the cost of travel for the working group members and some of the remaining developmental costs is included in the document. INPATE proposes that the NPAFC cover the initial costs of operating funds (including a small scale field program) for the working group out of existing financial resources, while the working group coordinates with each government and develops the specifications for a full scientific program. The initial tasks for the working group will be to: (1) determine the primary scientific objectives to be addressed by the program, (2) identify the species to be tagged and the tagging locations, (3) develop a full budget including an estimate of the number of tags required, (4) establish a timetable, (5) obtain agreement for the full field program from the member governments, and (6) identify funding for the purchase of archival tags and ship time.

(ii) **CCGS W.E. Ricker Gulf of Alaska Salmon Survey, November-December, 1997**

The Canadian Department of Fisheries and Oceans conducted a survey of the fall distribution of juvenile salmon from November 1 - December 12, 1997 in the eastern North Pacific Ocean. This survey demonstrated that: (1) juvenile salmon are still confined to the continental shelf of the Gulf of Alaska in November-December, consistent with previous fall and summer surveys; (2) juvenile salmon have vacated Southeast Alaskan shelf waters by November, and are still migrating rapidly along the continental shelf around the Gulf of Alaska towards the Aleutian archipelago, and (3) contrary to previous hypotheses, juvenile salmon do not move from the continental shelf regions of the Gulf of Alaska into the offshore. Instead, the results show that North American juvenile salmon migrate in a strongly directed fashion along the continental shelf at least as far as the start of the
Aleutian archipelago, and have not yet begun their migration to the offshore Gulf of Alaska by early December. It is unclear from the current surveys when they move into the open ocean, or why they migrate en masse to the Aleutians in winter.

(iii) **Influence of the 1990 Ocean Climate Shift on British Columbia Steelhead (Oncorhynchus mykiss) and Coho (O. kisutch) Populations**

British Columbia steelhead trout populations showed coherent patterns of adult recruitment until the 1990s, when recruitment trends diverged between northern and southern British Columbia rivers. These changes are related to the 1977 regime shift and a possible 1990 regime shift. From 1963 until 1990 the pattern of temporal change in adult steelhead recruitment was coherent in all regions of British Columbia, with a major increase in recruitment occurring after 1977. Subsequently, an out of phase response occurred after 1990, indicating that the effect of the 1990 regime shift had both temporal and geographical structure. Steelhead entering northern regions had increasing recruitment, while steelhead entering southern BC coastal regions had sharply decreasing recruitment. The available evidence clearly indicates that the overall recruitment response since 1977 was primarily shaped by changes in marine (not freshwater) survival. Similar sudden changes also appear to be occurring for other species of Pacific salmon in BC and Oregon such as coho salmon, which also appear to occur suddenly and show considerable persistence. A possible explanation for the change is that ocean productivity declined in coastal regions of southern BC after 1990, reducing the marine growth of juvenile salmon. The Bakun upwelling index shows a pattern of geographic coherence along the west coast of North America that could in principle explain the observed pattern of changes in recruitment. However, no evidence for a temporal shift in this index occurring around 1977 and 1990 is evident. The reason for the sudden and persistent decline in survival is therefore uncertain.

(iv) **General Circulation of the Atmosphere Over the North Pacific and Its Relationship to the Aleutian Low**

The atmospheric processes over the North Pacific are categorized for 1900-1997 into zonal (Z), meridional (M1) and easterly (M2). The zonal (Z) circulation process has dominated since 1972 with above average annual anomalies while the annual frequencies of easterly (M2) and meridional (M1) processes have been below average. The easterly (M2) circulation process was below average to average from 1900-1935, above average 1935-1947, below average 1948-1962 and above average again from 1963-1971. Zonal (Z) processes were generally below average from 1900-1971 with notable prolonged above average periods from 1902-1908 and from 1953-1961 while the meridional (M1) circulation process was generally above average. An index of the general Pacific atmospheric circulation (PCI) in the winter (December-March) was in agreement with an index of the Aleutian Low Pressure System (ALPI) from 1898 to 1998 with changes in trends occurring around the regime shifts of 1925, 1947, 1977, and 1989. Generally, regimes with weak Aleutian Lows experienced average or above average meridional (M1) processes in winter (e.g., 1900-1925 and 1947-1976). Conversely, regimes with intense Aleutian Lows experienced below average meridional (M1) processes (e.g., 1926-1946 and 1977-1988). The regime of 1989-1998 experienced Aleutian Lows with average intensity and average meridional (M1) processes. Because the winter PCI does reflect the regime shifts denoted by ALPI and represents an energy transfer mechanism from the atmosphere to the ocean, it is suggested that PCI is a useful indicator of regimes and that PCI can be developed as an index associated to ocean productivity.
(v) **Natural Regulation of the Abundance of Coho and Other Species of Pacific Salmon According to the Critical Size and Critical Period Hypothesis**

The research proposes that the marine carrying capacity for coho salmon and other Pacific salmon species is regulated naturally by the requirement to grow at a critical rate and thus achieve a critical size range by a critical period. Regulation occurs in two major stages. In the first stage, marine mortality is predation based and occurs immediately after entry into salt water. Mortality at this stage is partly related to the size as well as to the density of smolts and the density and type of predators. The second period of major mortality occurs in the fall and winter when juveniles that are not at a critical size are unable to maintain minimum metabolic requirements, and enter a growth trajectory that leads to death. Both density-dependent and density-independent factors interact through these mortality stages to establish the abundance after the first winter in the ocean. Shifts in the mean carrying capacity occur when there are regime shifts in the climate-ocean environment, despite the high levels of ocean mortality. Interannual variability in abundances at the stock level fluctuates around these trends in a mean carrying capacity.

According to this hypothesis, the freshwater stage of Pacific salmon is a period of relatively safe refuge for reproduction that results in the production of a large number of young with diverse genetic traits. The large number of young greatly exceeds the available ocean habitat resulting in large marine mortalities. The diverse genetic traits and a two-stage process of marine mortality ensure that a few offspring always survive the variable ocean environment, despite the high levels of ocean mortality.

(vi) **The Use of the Pacific Atmospheric Classification System as an Indicator of Future Long-Term Climate Impacts on the Early Life History of Salmon from the Fraser River**

The Pacific Atmospheric Circulation classification incorporates three types of atmospheric circulation. The classification is based on the concepts of Russian meteorologists and classifies circulation into three types, Z, M1, and M2. The winter frequency of the M1 (northwesterly meridional flow) type was found to be a general indicator of the long-term pattern of Fraser River flows in this century. Above average northwesterly circulation (M1) is associated with increased winter precipitation and deeper snow pack in the Fraser River drainage. In general, the dominant periods correspond to periods of above average flows from the Fraser River. The M1 processes were dominant during the early 1900s, 1948-1973, and possibly beginning in the mid-1990s. The switch from dominant to non-dominant circulation patterns generally corresponded to the published regime shifts of 1925, 1947, 1977, and 1989. Fraser River salmon production accounts for approximately 40% of salmon production in British Columbia waters. Fraser River flows may affect salmon production during spawning, freshwater rearing and in the early marine period in the Strait of Georgia through the estuarine circulation. Changing flows, increased freshwater temperatures, and changing ecosystem dynamics within the Strait of Georgia affect Pacific salmon production. Understanding when changes occur in the persistence of trends in atmospheric wind patterns will assist in the understanding of climate impacts on salmon produced in the Fraser River, including global warming.

(vii) **Evidence of a New Regime Starting in 1996 and the Relation to Pacific Salmon Catches**

Changes in climate trends in the Pacific have been reported about 1890, 1925, 1947, 1977, and 1989. Indices of northern Hemisphere climate, changed in approximately 1996, possibly indicating a new shift in climate/ocean ecosystems. If we are in a new regime, it may be characterized by greater variability in association with a general warming trend. There has been a decrease in the
length of day, indicating speeding up of the Earth's rotation. In the winter of 1998, there was an intense Aleutian Low. The Southern Oscillation Index has oscillated between a La Niña in 1995/96, an El Niño in 1997 and a La Niña in 1998. The dominant wind direction in the Pacific changed from the Z-type, or westerly type, to the M1-type, or the northwesterly type. In the Atlantic, there was a dramatic drop in the North Atlantic Oscillation Index in 1996. In British Columbia, Fraser River flows have fluctuated from the second highest this century in 1977 to the lowest in 1998. All this is occurring while sea surface temperatures off North America are continuing to warm.

Declines in total Pacific salmon catch started about 1996 and continued through 1997 and 1998. Declines off Canada have been most dramatic since 1995 and when lagged to account for life history timings, the decline is associated with a 1989/90 regime shift. In Canada, coho stocks have experienced increases in marine mortality that have been associated with shifts in climate, resulting in management measures that in combination with naturally low abundances of wild coho may result in the 1998 total salmon catches being the lowest in this century. In 1998 there was an intense Aleutian Low. If the intense lows persist, the productivity of Pacific salmon stocks in the subarctic Pacific may improve, but it is important to understand the nature of the new regime, if it is real, before forecasting the impact on Pacific salmon abundance trends.

(viii) Estimating the Relative Abundance of Juvenile Coho Salmon in the Strait of Georgia Using Trawls

A fixed survey design with a randomized depth component and a rope trawl fished at a speed of approximately 5 knots was used to establish the relative abundance of juvenile coho in the Strait of Georgia. The estimate of 3.6 million juvenile coho in September 1996 was larger than the estimate of 2.8 million in September 1997. The mean standardized catches in September 1997 were significantly smaller than in September 1996. These relative abundances were considered to be comparable among surveys as the catchability of the net was considered to be constant. The abundance estimates are probably higher as the catchability of the net was probably lower than used in this analysis. The minimal estimate of 3.6 million in September 1996 compares with an estimated total return of less than 500,000 in 1997. This indicates that the amount of fall/winter marine mortality is an important component of the total marine mortality that determines the final carrying capacity for the brood year. The use of surveys for juvenile coho can provide managers with measures of relative abundance, seasonal movement, and distribution and percentages of wild and hatchery fish up to a year in advance of any fishery.

(ix) Thermal Marks on Chinook and Chum Salmon Released from B.C. Hatcheries for Brood Years 1992-1998

Large-scale thermal marking of hatchery chinook salmon started with the 1992 brood year at the Robertson Cr. and Nitinat hatcheries. Mean annual releases of thermally marked chinook at Robertson Cr. are 8.0 million, at Nitinat 5.2 million, at Sarita R. 163 thousand, at Comuna R. 434 thousand, at Chilliwack 1.6 million, and at Quinsam R. 3.2 million. Chum salmon were thermally marked at the Nitinat hatchery beginning with the 1993 brood year. The average number of thermally marked chum salmon released from the Nitinat hatchery is 30.1 million. The thermal patterns for each release are reported.

3.2 Japan

(i) Stock Abundance and Fish Size of Pacific Salmon in the North Pacific Ocean, 1998

This research summarizes the results of salmon stock assessment conducted by Japan in 1998. Mean sea surface temperatures, stock abundance, and body size of salmonids in 1998 are compared to those
from 1991 to 1997. Four Japanese salmon research vessels (Oshoro maru, Hokusei maru, Hokko maru, and Wakatake maru) conducted oceanographic observations, 75 gillnet fishing operations (3,332 tans), and 44 longline fishing operations (997 hachi) in the western and eastern North Pacific and Bering Sea from June to August 1998. Mean sea surface temperature in 1998 was 11.4°C in the western North Pacific, 7.51°C in the Bering Sea, and 9.97°C in the eastern North Pacific, which was comparable with the previous seven-year means. A total of 18,315 salmonids was caught by fishing operations, including 8,579 chum (47%), 4,918 pink (27%), 2,179 sockeye (12%), 1,849 coho (10%), and 473 chinook (3%) salmon, and 231 steelhead trout (1%) and 86 Dolly Varden (0.5%). Sockeye salmon abundance in 1998 was 42% higher in the western North Pacific, 13% lower in the Bering Sea, and 6% higher in the eastern North Pacific than the past seven-year means. Chum salmon abundance was 11%, 31%, and 54% higher in the respective areas. Pink salmon abundance was 45% higher in the western North Pacific, 46% lower in the Bering Sea, and more than two times higher in the eastern North Pacific compared to the past even-year means. Coho salmon abundance in 1998 was 64% and 25% higher than the past means in the western and eastern North Pacific. Chinook salmon abundance in the Bering Sea was very high (about eight times higher than the past mean). Steelhead trout abundance was 58% and 89% higher in the western and eastern North Pacific compared to the past means. As a whole, stock abundance of Pacific salmon in 1998 was higher than the past mean. Body size of ocean age-.1 sockeye in the eastern North Pacific was smaller than that in past years. Body sizes of ocean age-.2 immature chum salmon in the western North Pacific and Bering Sea were smaller than the past means. Also ocean age-.3 immature chum salmon in the western North Pacific were smaller than in the past. Body sizes of pink were smaller in the western North Pacific and Bering Sea compared to the past means. Body size of coho in the western North Pacific was smaller as in 1997, but body size in the eastern North Pacific was larger than the past mean. The reduction in body size of ocean age-.2 chum and age-.1 pink salmon in the western North Pacific and Bering Sea suggest that growth conditions in these areas in 1998 were not as good as in past years.

(ii) Salmon Tagging Experiments and Recovery of Salmon Lacking Adipose Fin Collected by Japanese Salmon Research Vessels in the North Pacific Ocean, 1998

Two Japanese salmon research vessels conducted 44 longline operations in the North Pacific Ocean and its marginal seas in 1998. A total of 756 salmonids (9 sockeye, 734 chum, 4 pink, and 9 chinook salmon) in the Bering Sea, 28 salmonids (3 sockeye, 7 chum, 13 pink, and 4 coho salmon, and 1 steelhead) in the Gulf of Alaska, and 178 salmonids (15 sockeye, 115 chum, 9 pink, 25 coho, 1 chinook salmon, and 13 steelhead trout) in the central North Pacific Ocean, were tagged and released, respectively. Fish were tagged with two disk tags: one issued by the Fisheries Agency of Japan and a second disk tag issued by the University of Washington, School of Fisheries, Fisheries Research Institute. Both disk tags were placed on one plastic cinch strap and applied to the fish anterior to the dorsal fin. A subset of the disk-tagged fish was released with an externally attached the temperature-recording archival tag, including 12 large steelhead and one sockeye released in the central North Pacific Ocean, 3 sockeye, 1 chum, 4 pink, 3 coho, and 1 steelhead released in the Gulf of Alaska, and 23 chum salmon released in the central Bering Sea. Another subset of 25 disk-tagged chum salmon was released in the Bering Sea with an internally inserted temperature, depth, and location recording archival tag. Four Japanese salmon research vessels conducted a survey for salmonids lacking fins, and 2 sockeye, 3 chum, 6 coho, 1 chinook salmon, and 68 steelhead trout lacking the adipose fin and/or other fins were recovered. The percentage of steelhead trout lacking the adipose fin in 1998 (29.4% = 68/231; steelhead trout lacking adipose fin/the total steelhead trout catch) was lower than in 1994-1997 (21.9% in 1992; 26.1% in 1993; 30.5% in 1994; 37.1% in 1995; 46.1% in 1996; 44.0% in 1997).
(iii) Outline of Oceanographic Conditions in the Northwestern Pacific During the Summer of 1998

Oceanographic conditions in the Northwestern Pacific during the summer of 1998 are described using data obtained by salmon research vessels. The extent of the dichothermal structure (subsurface temperature minimum at around 100-200 m depth) was narrow in the Pacific region, which was the same condition observed in 1997. Sea surface temperature anomalies were negative in June, and slightly positive in July.

(iv) Japan-U.S. Cooperative High-Seas Salmonid Research Aboard the R/V Wakatake Maru from June 9 to July 25, 1998

An annual Japan-U.S. cooperative high-seas salmonid research cruise, initiated in 1991, was conducted in the central North Pacific Ocean and Bering Sea from June 11 to July 25, 1998, on board 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. Results of oceanographic data indicated that the average sea surface temperature (SST) in the central North Pacific was 9.1°C (0.4°C cooler in 1998 than in this region in 1997) and the average SST in July in the Bering Sea was 8.2°C (1.1°C cooler than in 1997).

A total of 8,635 salmonids (Oncorhynchus spp. and Salvelinus malma) was caught by longline and gillnet. In the North Pacific Ocean, coho salmon was the most abundant salmon (57% of the salmonid catch), followed by chum salmon (25%), steelhead (8%), sockeye (5%), pink (3%), and chinook salmon (2%). One masu salmon was collected at 46°00'N and 180°00', which may be the eastern-most recorded catch of this species. In the Bering Sea, chum salmon was the most abundant salmon (84% of the salmonid catch), followed by sockeye (9%), chinook (5%), pink (1%), and Dolly Varden (1%). Stomach contents from 893 salmonids (123 sockeye, 421 chum, 43 pink, 95 coho, 105 chinook salmon, 20 steelhead, and 86 Dolly Varden) were examined. Tissue samples were collected from 800 chum salmon for genetic stock identification.

A total of 884 salmonids was double-tagged with disk tags and released to the sea. Most of these fish were chum salmon (809); however, sockeye, coho, steelhead, chinook, and pink salmon were also tagged and released. A subset of the disk-tagged fish was released with an externally attached temperature-recording archival tag, including 12 large steelhead released in the central North Pacific Ocean and 23 chum salmon released in the central Bering Sea. Another subset of 25 disk-tagged chum salmon was released in the Bering Sea with an internally inserted temperature, depth, and location recording archival tag. A dummy tag (similar in size and shape to the archival tag, but without the electronic sensors) was surgically inserted into seven coho, six sockeye, and four chum salmon. These fish were reared in a tank on deck and observed to evaluate the influence of the surgical operation on their survival. All salmon died within 16 days.

(v) Stock Identification of Chum Salmon, Oncorhynchus keta, Based on Scale Character Analysis

Scale characters of chum salmon collected from Japanese and Russian local stocks (river and coastal areas) were compared to establish a stock identification technique and baseline data on scale characters. Scale samples were collected at seven sites in Japan in 1994 and 16 sites in Russia in 1993 and 1994. Five scale characters were measured and analyzed. The analysis showed that widths and circuli counts in the first-year zone of Japanese local stocks were larger than those of Russian local stocks, and widths and circuli counts in the second-year zone of Japanese local stocks were fewer than those of Russian local stocks. These results suggest that there was a considerable
difference in scale characters between Japanese and Russian local stocks. However, a serious difference in scale characters between age-0.2 and age-0.3 fish was also observed. A cluster analysis of the scale characters by age was used to examine the relation among local stocks by age. The cluster analysis for age-0.2 fish showed no geographical affinity among local stocks in each cluster. In contrast, the cluster analysis for the age-0.3 fish showed good geographical affinity among local stocks in each cluster. These results demonstrated that scale characters used in this study were effective for stock identification of age-0.3 (mature) fish, and were not sufficient for stock identification of age-0.2 (mature) fish. This suggests that other new characters suitable for identifying origins of age-0.2 fish are needed.

(vi) Chum Salmon Feeding Habits in Relation to Growth Reduction

Feeding ecology of chum salmon was examined and related to their growth reduction in the third year of ocean life. Analysis of chum salmon stomach contents by age group indicated that age-0.1 fish contained a relatively high proportion of amphipods as compared to the other age groups. However, prey composition was similar among older chum salmon (age 0.2 to 0.3). Captured food weight, an index of the amount of food consumed, of immature age-0.2 chum salmon was the highest, followed by maturing age-0.3, immature age-0.3, and immature age-0.1. Growth reduction of chum salmon in the third year of ocean life may be partly due to a requirement of immature age-0.2 chum salmon to consume a large amount of prey.

(vii) Japan-Russia-U.S. Cooperative Survey on Overwintering Salmonids in the Western and Central North Pacific Ocean and Bering Sea aboard the Kaiyo Maru, 3 February-2 March, 1998

A Japan-Russia-U.S. cooperative overwintering salmonid survey was conducted on board the Japanese research vessel Kaiyo maru in the western (165°E) and central (180°) North Pacific Ocean and Bering Sea (180°) from 3 February to 2 March 1998, to clarify information on the offshore distribution of Pacific salmon and the relation of oceanographic conditions and salmonid distributions. This was the third overwintering salmonid survey conducted on board the Kaiyo maru. The first two surveys were trans-Pacific cruises (Nov.-Dec. 1992 and Jan. 1996); however, this cruise was the first wintertime salmon research cruise in the central Bering Sea since 1963. Salmon were caught at 14 of 19 trawl stations. A total of 2,383 salmonids was collected. Chum salmon were the most abundant (N=1,436, 60.3%), followed by pink (N=843, 35.4%), sockeye (N=49, 2.1%), chinook (N=31, 1.3%), and coho salmon (N=24, 1.0%). No steelhead were caught. The majority of the catch (66%) occurred at one station in the western North Pacific Ocean, where there were relatively large catches of chum and pink salmon. Most of the salmon catch in February 1998 was distributed in a narrow band from 42°-45°N in the western North Pacific Ocean (at 165°E), where sea surface temperatures were 3.9°-5.0°C, and from 43°-46°N in the central North Pacific Ocean (at 180°), where sea surface temperatures were 5.2-6.7°C. Chinook salmon was the only species caught in the Bering Sea. The narrow band of salmon distribution in the western and central North Pacific may be limited to the Subarctic Boundary in the south and to the northern extent of the transition domain in the north.

(viii) The Long-term Mean Spatial and Temporal Distribution of CPUE for Pink Salmon (Oncorhynchus gorbuscha) and Chum Salmon (O. keta) in the North Pacific Ocean

The long-term mean spatial and temporal distribution of pink salmon and chum salmon in offshore waters of the North Pacific Ocean was investigated using the data collected on board Japanese salmon research vessels from 1972 to 1992. Pink salmon were distributed in a wide zonal band between 40°N and 50°N, and the area of higher catch per unit effort (CPUE) shifted westward as
the season progressed. On the other hand, the CPUE of chum salmon was one order of magnitude lower than that of pink salmon. In spring, chum salmon were more widely distributed than pink salmon, with mature chum salmon distributed near coastal waters and the proportion of immature fish increasing in offshore waters as the season progressed.

The distribution of chum salmon differed between odd and even years inversely to the pattern observed for pink salmon. In the Bering Sea, the CPUE of pink salmon was higher in odd years than in even years, and the CPUE of chum salmon was lower in odd years than in even years. Also the chum salmon distribution shifted southeastward in odd years. These results suggest that the interaction between pink and chum salmon changed their distributions in the offshore waters of the North Pacific Ocean.

(ix) Trophic Relations of Juvenile Salmon (Genus Oncorhynchus) in the Okhotsk Sea and Pacific Waters Off the Kuril Islands

In order to clarify trophic relations and feeding habits among juvenile salmon and other major pelagic fishes, the stomach contents of juvenile pink salmon, chum salmon, masu salmon, sockeye salmon, chinook salmon, coho salmon, Atka mackerel (Pleurogrammus monopterygius), and arabesque greenling (P. azonus) collected in the Okhotsk Sea and adjacent Pacific waters during the autumn of 1993 were examined. The major prey of pink, chum, and sockeye salmon were planktonic Amphipoda, Themisto sp. and Primno sp. Chum and pink also fed on a variety of invertebrates such as Gastropoda, Copepoda, Euphausiacea, and Saggita spp. Masu, chinook, and coho salmon fed mainly on Cephalopoda and fishes. Prey species (diet niche) overlap was highest between pink and chum salmon, which were the most abundant species in this study. Prey species composition in their stomach contents is considered to reflect planktonic species composition in the environment. Inter-specific competition was of lesser importance in the diets of pink and chum salmon.

(x) Data Record of Japanese Salmon Research Vessel in 1997: Catch Data and Oceanographic Data

This document is a listing of salmonid catch and oceanographic data records for Japanese salmon research vessels in 1997.

(xi) Early Sea Mortality of Chum Salmon Juveniles in the Japan Sea Coast

The early mortality of juvenile chum salmon was examined to clarify population dynamics of hatchery-reared chum salmon in the Japan Sea coast. The survival rate using mark-and-recapture experiments during 10-50 days after release from the hatcheries along the Japan Sea coast of Honshu was calculated. Estimated daily survival rate during early sea life was 76.9 - approximately 100% day⁻¹. Mean survival during the whole sea life was 0.258% in 1988-1997. Early sea mortality of chum salmon accounted for 97.4% of the whole sea mortality. Results suggest that early sea mortality soon after release from hatcheries may determine the population level of returning adults of a cohort of chum salmon.

(xii) Genetic Stock Identification of Young Chum Salmon in the North Pacific Ocean and Adjacent Seas

The geographical origins of young chum salmon captured in the Okhotsk Sea, North Pacific Ocean, and Bering Sea were estimated by genetic stock identification techniques. A genetic baseline for
protein allozyme characters (19 loci) covering 77 North Pacific rim stocks was used. Among juvenile chum salmon (age-0.0) caught in the Okhotsk Sea, the Japanese regional stock was predominant (71%) in October, but its composition decreased to 36% in November. Juvenile chum salmon migrating into the adjacent Pacific waters in November were composed of 57% Japanese and 30% Russian stocks. Young chum salmon (age-0.1) caught in winter in the western North Pacific Ocean consisted of 29% Japanese and 65% Russian stocks in January and 37% Japanese and 45% Russian stocks in February. In summer, young chum salmon (age-0.1) caught in the western and central North Pacific Ocean were predominately of Russian origin (59-69%), but young chum salmon caught in the central Bering Sea (56-57°N, 179°W) were a mixture of Japanese (41%), Russian (38%), and Alaskan (20%) stocks. These results suggest that Japanese chum salmon juveniles remain in the Okhotsk Sea from summer to late autumn, over-winter in the western North Pacific Ocean, and then migrate into the Bering Sea by summer.

(xiii) The 1998 International Cooperative Salmon Research Cruise of the Oshoro Maru

Preliminary information is presented on international cooperative salmon research conducted during the June-July 1998 cruise of the Oshoro maru. An objective of cooperative high-seas salmon research conducted under the NPAFC Science Plan is salmon stock assessment through annual surveys along standard transects in the North Pacific Ocean and Bering Sea. Salmon surveys conducted aboard the Oshoro maru along 180° longitude in the central North Pacific Ocean in June since 1978 have provided a valuable time series of fisheries and oceanographic data. This was the fifth consecutive year of cooperative Japan-U.S. sampling for salmon along a 145°W-longitude transect in the central Gulf of Alaska in early July, and the first year of a new transect along 165°W. The primary objective of the 1998 cooperative research was to continue the collection of oceanographic and biological data along the 180°, 165°W, and 145°W transects. In 1998, mid-June sea surface temperatures (SSTs) at gillnet fishing stations were about the same as in 1997 at 43° and 45°N and 1.3°C cooler (5.9°C) at 47°N along the 180° transect. Late-June mean SSTs were about 8.4°C at four gillnet stations on the 165°W transect, and early July mean SSTs (10.2°C) were 2.2°C cooler along the 145°W transect than in 1997. This represents a return to cooler conditions found from 1991 to 1996 at 145°W (mean 9.8°C). Catches by gillnet totaled 3,165 salmonids, including 256 salmonids (225 in 1997) in the central North Pacific Ocean (180° transect), 645 salmonids along the 165°W transect, and 2,264 salmonids (1,811 in 1997) in the Gulf of Alaska. At longline stations, 10 salmon (11 in 1997) in the central North Pacific Ocean, 41 salmon along 165°W, and 28 salmon (28 salmon in 1997) in the Gulf of Alaska were tagged and released. Temperature-recording data tags were attached to 13 of the tagged salmon, one at 48°30'N, 165°W and 12 along 145°W. Three double-tagged salmonids carrying temperature data tags and released in the Gulf of Alaska were recovered in Alaska. A pink salmon tagged on 3 July was recovered in a commercial purse seine fishery off Afognak Island (near Kodiak Island, Alaska) on 24 July 1998. A steelhead trout released on 9 July was recovered in a commercial gillnet fishery at the delta of the Copper River, Alaska on 14 August 1998. A coho salmon tagged on 3 July was recovered in a commercial gillnet fishery in Togiak Bay, Alaska on 24 August 1998. Biological samples and data were collected for various other cooperative studies of salmon distribution, abundance, stock origins, maturity and growth, food habits, bioenergetics, and other aspects of ocean biology and ecology; results will be reported later.

3.3 Russia

(i) Feeding of Pacific Salmon During Anadromous Migrations in the Kamchatkan Waters

This report is devoted to the analysis of feeding of five species Pacific salmon — pink, chum, sockeye, chinook and coho salmon — during anadromous migrations in summer 1995-1996 in the
waters of the Pacific Ocean and western Bering Sea. The studies were undertaken to describe the current status of feeding of adult salmon and to estimate changes that may have taken place in the pre-spawning feeding period of salmon in the East Kamchatka region over the past 30 years.

The main pink and sockeye salmon food in the Pacific Ocean waters adjacent to Kamchatka consisted of euphausiids, copepods, juvenile squids and myctophids. The dominant species of euphausiids were *Thysanoessa longipes* in 1995 and *Th. inermis* in 1996. Among copepods, *Calanus cristatus* and *Eucalanus bungii* were the major prey species of pink and sockeye salmon. Pteropoda, *Limacina helicina* and *Clione limacina*, dominated in the food of chum salmon. Juvenile squids were the general food item of coho and chinook salmon in this area. Food similarity was highest between pink and sockeye salmon (70.4% in 1995 and 47.6% in 1996).

In the west part of the Bering Sea in summer 1996, the basic food of pink salmon was euphausiids, and *Th. longipes* was the dominant euphausiid prey species. Chum salmon fed mostly on Pteropoda and myctophids. Sockeye salmon food was the most variable; *C. cristatus*, juvenile squids, myctophids, and *L. helicina* were dominant items in the food spectrum of sockeye salmon. The basic food of chinook salmon was juvenile squids. Food similarity was highest between chum and sockeye salmon (34.2%).

(ii) **STR "Katunino" Eastern Sea of Okhotsk Survey, September-October 1997**

A trawl survey and a 2-day, 24-hour survey were conducted in the eastern Sea of Okhotsk (51-58°N, 148-156°E) from September 9 to October 6, 1997. In total, 52 control trawls were accomplished. The objectives of the research were to improve the method of catching juvenile salmon using a midwater rope trawl (54.4/192 m), to investigate the distribution and abundance of juvenile salmon, and to collect data characterizing biological characteristics, growth, and feeding of juvenile salmon, and biological and environmental factors affecting production of broods.

Attempts were made to differentiate the stocks of juvenile pink and chum salmon throughout the area where reproduction of these species takes place (including the North coast of the Sea of Okhotsk and Shelikhov Bay, West Kamchatka, and Sakhalin). In the region examined in 1997, juvenile salmon were, generally, found in the regular feeding areas of each species. There are three types of spatial distribution of juvenile pink salmon observed in the waters off the west coast of Kamchatka: (1) aboriginal, when these waters are mostly inhabited by western Kamchatka pink salmon, (2) immigratory, when western Kamchatkan pink stock abundance is very low, under 10%; and (3) intermediate, which is the most frequent type, where pink juveniles of Kamchatka origin rear jointly with stocks from other regions. In 1997, juvenile pink salmon distribution was of the aboriginal type. West Kamchatkan juvenile pink salmon accounted for 80% of total estimated abundance in the area investigated. The preliminary estimate of the run of West Kamchatkan pink salmon in 1998 was 110-135 million fish; actually, the 1998 run may exceed about 120 million fish (preliminary data).

(iii) **The Precision and Accuracy of Genetic Baseline Data Sets for Pink, Chum and Sockeye Salmon Stock Identification in Pacific Ocean Mixed-Fisheries Catches**

The average estimates made by simulation analysis of Pacific Rim wide genetic datasets of salmon showed that in pink salmon the main regions could be identified with a precision of about 85%. The chum salmon baseline data set was able to provide separation with a precision 90-97% for all regions except the areas inside the Kamchatka and Magadan, which could be distinguished from each other with precision about 80%-85%. The sockeye baseline data set included allelic frequencies for 8 high polymorphic loci in 61 populations from Asia and North America. The precision of this baseline is
not as good as for chum, but still it is able to identify almost all studied regions with a precision of about 80%-90%.

(iv) The Genetic Estimations of Stock Composition in Chum Salmon Catches in the Russian 200-miles Zone of the Northern Pacific Ocean in 1997

The twenty high polymorphic loci were used to identify local chum salmon stocks from North America, Japan, and Russia in mixed fisheries catches in the Russian 200-mile zone of the North Pacific Ocean in June-July 1997 using the conditional maximum likelihood Estimator (MLE). The estimate showed that there were mainly chum salmon originating from Russia (77%) in mixed-fishery catches in the Russian 200-miles zone in 1997, which included about 30% of the Magadan Coast, 11% of the Anadyr River, and 56% of the Kamchatka chum salmon populations. The local stocks from Northern America were less than 10% for each region, and Japanese populations were less or equal to 5% for each region.

(v) Chinook and Coho Salmon Feeding Habits in the Far-Eastern Seas in the Course of Yearly Migration Cycle

In this report, ocean food and feeding habits of coho and chinook salmon are characterized for different regions of the Russian EEZ. Diet spectra and rates of food consumption of these species depend on fish size and food supply structure in the areas investigated. Among zooplankton organisms, amphipods and pteropods have a significant role in the diet of coho juveniles, and euphausiids – for juveniles of both species. Among fishes, juvenile pollock, Atka mackerel, and several other fish and squid species predominate in adult coho rations. Juvenile gonatid squids contribute noticeably in immature chinook diets, and in the Bering Sea – both gonatid squids and euphausiids are important. All available data of the complex TINRO-center expeditions on coho and chinook food and feeding habits are summarized and presented in a set of tables.

(vi) Mass marking of Salmon and Identification of Hatchery Fish in Mixed Stocks

The first large scale mass marking of salmon with otolith technology was conducted at hatcheries on northern coast of the Okhotsk Sea in 1994. Some of the hatcheries in the Magadan region marked salmon by intermittent increasing of water temperature, and other hatcheries marked salmon by periodic reduction of water temperature. In total, 35 million marked salmon fry were released in 1994-1997. Otoliths of chum and pink embryos were successfully marked in incubators by shutting off the water supply, without changing water temperature. This “dry” otolith mark was obtained without any special equipment. Otolith marking is a mass marking method, and it permits more real determination of the portion of hatchery origin salmon in a mixture of stocks. Nowadays, it is possible to conduct effective, coordinated otolith-mark research and to establish a data bank of mark types.

(vii) Seasonal Dynamics of Pacific Salmon Migrations in the Southern Kuril Waters of the Pacific Ocean

Pacific salmon (chum, pink, coho, sockeye, chinook) catches in drift net fisheries were sampled to determine the biological characteristics (average length and weight, sex ration, stage of maturation) of fish in the areas of Pacific Ocean near Southern Kuril Islands during May-July of 1994-97.
The variability of all studied biological characteristics during the period of examinations suggested that different populations are migrating through the area, and their migration was determined as feed-spawning.

3.4 United States


Plans for a research cruise to examine distribution of salmon in coastal and oceanic waters of the North Pacific Ocean during April-May 1998 were submitted.


Plans for a research cruise to examine distribution of salmon in coastal and oceanic waters of the North Pacific Ocean during March-April 1998 were submitted.

(iii) Research Plan to Examine the Distribution of Salmon in the Gulf of Alaska and the North Pacific Ocean July-August 1998

Plans for a research cruise to examine distribution of salmon in coastal and oceanic waters of the North Pacific Ocean during July-August 1998 were submitted.


(v) Incidence of Thermally Marked Pink, Chum, and Sockeye Salmon in the Coastal Waters of the Gulf of Alaska, 1997

North Pacific Ocean and eastern Bering Sea research cruises conducted by the Auke Bay Laboratory Ocean Carrying Capacity program during July and August 1997 provided ocean recoveries of 180 pink, 157 chum, and 13 sockeye salmon thermally marked during incubation at Alaskan (USA) and Canadian hatcheries. The 180 otolith thermal marks for juvenile pink salmon, 101 otolith thermal
marks for juvenile chum salmon, and 8 otolith thermal marks for juvenile sockeye salmon represent 22.8%, 31.2%, and 2.5% of the samples, respectively. The 56 otolith thermal marks for immature chum and 5 otolith thermal marks for immature sockeye represent 3.7% and less than 1% of these samples, respectively. The marked juvenile (age-.0) salmon migrated westerly along the coastal waters of the North Pacific Ocean. The marked immature (age-.1+) chum salmon from southeastern Alaska and Canadian hatcheries were found in the coastal waters of the North Pacific Ocean from Prince William Sound to the eastern Aleutian Islands and also in the coastal waters of the eastern Bering Sea. The marked immature sockeye salmon from southeastern and central Alaska were found in the coastal waters of the North Pacific Ocean from the eastern Aleutian Islands to the central Aleutian Islands.

(vi) **Bristol Bay Sockeye Salmon Production: an Exploratory Analysis of the 1996 and 1997 Decline in Sockeye Salmon Returns**

Sockeye salmon forecasts developed for Egegik, Naknek, and Kvichak Rivers in Bristol Bay, Alaska contained large forecast errors across river systems for ocean age-.2 returns in 1996 and all age classes for Naknek and Kvichak in 1997. The forecast models include univariate and multivariate time series analysis models that incorporate returns (catch + escapement from 1956 to 1995), return-escapement, sibling, and smolt relationships. Marine environmental influences were included in multivariate time series models when significant cross-correlations between the residuals from the forecast models and residuals from the univariate environmental models occurred. A persistent significant relationship between sockeye salmon returns and the annual anomalies of mean (May - August) air temperatures taken at Cold Bay, Alaska (CBMAT) lagged by 1, 2, or 3 years was found. The best model and forecast statistics for ocean age-.2 sockeye salmon consisted of age class returns (1.2 and 2.2) that included CBMAT, whereas, sibling models produced the best model and forecast statistics for most of the ocean age-.3 sockeye salmon return time series. The only exceptions were for age classes 2.2 and 2.3 in Kvichak where the linear transfer function smolt model and univariate model of returns produced the best overall model and forecast statistics, respectively. Including Cold Bay, Alaska air temperatures did not improve forecast performance in 1996 or 1997. Sibling relationships improved forecast performance in 1997, particularly for ocean age-.3 sockeye salmon returning to the Egegik River.

(vii) **Survey of Salmon in the Southeastern Bering Sea, Gulf of Alaska and Northeastern Pacific Ocean--April-May, 1998**

This report summarizes the preliminary results of a survey of the ocean distribution of immature and maturing salmon in coastal waters off Alaska and Washington and the high seas of the Gulf of Alaska and central North Pacific Ocean, during April and May, 1998, by scientists from the NOAA, NMFS, Auke Bay Laboratory, Alaska Fisheries Science Center. The work is part of a cooperative international research effort, coordinated by NPAFC, to examine distribution, growth and survival of salmon during their ocean life. The survey was conducted on the F/V Great Pacific, a 38-m long stern ramp trawler. The survey focused on coastal and oceanic distribution of salmon off the eastern Aleutian Islands, Alaska Peninsula, central Gulf of Alaska from 50-55°N, and along the 145°W longitude line from the northern Gulf of Alaska (59-50°N) to the northeastern Pacific Ocean (38-49°N) and Washington coast. Sampling gear was a midwater rope trawl, towed at 5 kts at the surface, with a typical spread to 18-m depth and 52-m width. The survey included oceanographic transects at Unimak Pass (Scotch Cap), Kodiak Is. (Cape Chiniak), and north central Gulf of Alaska (Cape St. Elias). Plankton tows and CTD casts were also made in conjunction with surface trawl sampling on the high seas. Total catch of salmonids was 1,495 fish, including 14 juvenile, 869 immature and 612 maturing salmon. Juvenile (ocean age-.0) salmon were limited to 14 chinook taken in Washington coastal waters. Immature salmon included 602 sockeye, 184 chum, and 83 chinook. Maturing salmon included 322 chum, 141 sockeye, 107 pink, 6 chinook, and 36 coho.
Immature and maturing salmon were caught in both coastal and offshore areas. Most of the immature sockeye were taken in the eastern Bering Sea. Maturing chum salmon were widely distributed, taken in coastal areas of the northern Gulf of Alaska and in offshore tows. Catches of maturing salmon in offshore areas alternated between chum and sockeye (both usually present, but one species predominant, the other few or none) indicating discrete distribution of these two species. Between offshore regions sampled, maturing sockeye and chum salmon were relatively more numerous in areas off the Alaska Peninsula than in the central Gulf of Alaska and northeastern North Pacific. Noteworthy were catches that provide the first information on spring distribution of sockeye in the southeastern Bering Sea. Immature sockeye (ocean age-.1, n=470), 20-30 cm FL, were taken off Cape Cheerful, N. Unalaska Is., in late April. Catches of immature chinook (ocean age-.1, n=37), 31-35 cm FL, off Foggy Cape in SW Shelikof Strait were comparable to catches (n=53) taken in August 1996. Scale samples showed that coho salmon had extensive growth after the last annulus, most sockeye (89%) and chinook (86%) had some growth, and few chum (13%) and almost no pink salmon (< 1%) showed growth since annulus formation. Other fishes taken on the cruise included juvenile sablefish, adult and young walleye pollock, Pacific herring, Pacific mackerel, jack mackerel, and juvenile American shad. Stomach contents of 471 salmon of all species indicated interspecific and regional differences. Sea surface temperatures ranged from 3.6°C in the Bering Sea to 12.5°C in the northeastern Pacific.


This report summarizes the preliminary results of a survey of the ocean distribution of young and maturing salmon and their habitat in coastal waters off Alaska during July-August, 1998, by scientists from the Auke Bay Laboratory, Alaska Fisheries Science Center. The work is part of a cooperative international research effort coordinated by the NPAFC to examine growth and survival of salmon during their ocean life. The survey was conducted on the F/V Great Pacific, a 38-m stern ramp trawler. Twelve transects, 90-270 nmi apart were sampled by surface trawl, covering coastal waters and nearshore, continental shelf, slope, and oceanic depth zones from Cape Augustine near Dixon Entrance north and west around the Gulf of Alaska off Prince William Sound, Cook Inlet, Kodiak Island and the Alaska Peninsula, to Cape Prominence in the eastern Aleutian Islands. A total of 63 tows, each 2.5 to 5.0 nmi long, was completed, all within the U.S. 200 mile Exclusive Economic Zone. Total catches of salmon included 25,568 juveniles (ocean age-.0), 2,175 immatures (ocean age-.1 or older), and 835 maturing adults returning to spawn this year. Most juvenile salmon were taken over the shelf zone, and most immature salmon were taken over the slope. Few juvenile salmon were taken west of Mitrofania Island and few immature salmon were taken east of Cape St. Elias. The juvenile salmon consisted of 18,594 pink, 3,487 chum, 2,296 sockeye, 842 coho, and 349 chinook. Immature salmon included 1,105 chum, 1,019 sockeye, and 51 chinook. Maturing adult salmon included 541 pink, 128 chum, 28 sockeye, 120 coho, and 18 chinook. Sample numbers for all life stages and most species of salmon are sufficient for comparative growth analyses using scales, for food habit comparisons, for estimation of the incidence of otolith marked hatchery salmon, and for genetic tests of stock identity for species, life stages, and comparisons to locations previously sampled. Sea surface temperatures ranged from 12.0°C near Dixon Entrance to 14.0°C at Cape St. Elias and 10.0°C near Unimak Pass.


Twenty four stations were sampled monthly along a primary marine migration corridor in the northern region of southeastern Alaska to assess the distribution, growth, mortality, and diet of wild and hatchery stocks of juvenile (age-.0) Pacific salmon. Stations were stratified into three different habitats—inshore (Taku Inlet and near Auke Bay), strait (Chatham Strait and Icy Strait), and coastal
(Cross Sound, Icy Point, and Cape Edward)—and sampled aboard the NOAA ship John N. Cobb from May to August 1998. At each station, fish, zooplankton, temperature, and salinity data were collected during daylight with a surface rope trawl, conical nets, bongo nets, and a conductivity, temperature, and depth profiler. Surface (2-m) temperatures and salinities during the survey ranged from 7.6 to 14.2°C and 16.4 to 32.0 ppt. A total of 12,814 fish and squid were captured with the rope trawl, representing 30 taxa. All five species of juvenile Pacific salmon and steelhead were captured and comprised 85% of the total catch. Of the 10,895 salmonids caught, over 99% were juveniles, and less than 1% were immatures or adults. Non-salmonid species making up >1% of the catch included Pacific herring (Clupea harengus), capelin (Mallotus villosus), squid (Gonatidae), and sablefish (Anoplopoma fimbria). The highest frequency of occurrence (>25%) in the trawl catches was observed for chum, coho, sockeye, pink, and chinook salmon, and wolf-eels (Anarrhichthys ocellatus). Overall catch rates of juvenile salmon were highest in June and July, intermediate in August, and zero in May. Catch rates of pink and chum salmon were highest in June, whereas catch rates of sockeye, coho, and chinook salmon were highest in July. Catch rates of juvenile salmon except chinook salmon were highest in strait habitat and lowest in inshore habitat; chinook salmon catch rates were highest in inshore habitat. Overall catch rates for juvenile salmon along the offshore transect declined with distance offshore: most juveniles were captured within 25 km of shore, and only one juvenile salmon was found beyond 40 km. Mean fork lengths of juvenile salmon in June—July—August were: pink (94–127–162 mm), chum (102–134–164 mm), sockeye (112–139–153 mm), coho (166–213–253 mm), and chinook salmon (160–166–190 mm). Twenty-four juvenile and immature salmon (13 chinook and 11 coho) containing internally planted coded-wire tags were recovered; 20 originated from Alaska, 3 from the Columbia River Basin, and 1 from Washington. Recoveries of juvenile chinook salmon from the Columbia River Basin are some of the earliest documented recoveries of these stream-type stocks in Alaska during their first summer at sea. Onboard stomach analysis of potential predators of juvenile salmon indicated a low level of salmon predation by sablefish, spiny dogfish (Squalus acanthias), and adult coho salmon. Results from this study and further laboratory analysis of otolith-marked fish will be used to assess potential competitive interactions between wild and hatchery stocks and stock-specific life history characteristics.

(x) Tag Returns in 1998 - International High-Seas Salmon Tagging

Information is reported on all high-seas salmon disk tags recovered from 1 September 1997 through 15 September 1998. Seventeen Japan-U.S. tags were returned (14 chum, 1 pink, and 1 coho salmon, and 1 steelhead). All recoveries were from salmonids released during international cooperative tagging operations aboard Japanese research vessels. The chum salmon were released in the central Aleutian Islands and Bering Sea in July 1997 (12 fish) and 1998 (2 fish) and recovered in Hokkaido (13 fish) and Honshu (1 fish), Japan. Three tagged fish from releases in the central Gulf of Alaska in early July 1998 were recovered in fisheries off western (1 coho salmon) and central Alaska (1 pink salmon and 1 steelhead). The release location of the coho salmon (56°N, 145°W) is a significant northeastward extension of the known ocean range of western Alaskan coho salmon in the Gulf of Alaska. The steelhead is the first reported recovery in Alaska of a steelhead tagged with a high-seas disk tag. All five recoveries in 1998 were salmonids that had also been tagged with thermal or archival tags.

(xi) Thermal Habitat of Migrating Salmonids in the North Pacific Ocean and Bering Sea as Recorded by Temperature Data Tags in 1998

Fifty-five archival tags that record temperature data were placed on Pacific salmonids in the North Pacific Ocean and Bering Sea during three research cruises. In May six sockeye and one coho salmon were tagged in the Gulf of Alaska and eastern North Pacific. Twelve steelhead trout were tagged in June in the central North Pacific, and 23 chum salmon were tagged in July in the Bering
Thirteen salmonids (4 sockeye, 1 chum, 4 pink, 3 coho, and 1 steelhead) were tagged on transects along 165°W and 145°W in late June and early July. Six tags have been returned to date. Three salmonids, tagged in the Gulf of Alaska, were recovered in Alaska: a pink salmon at Afognak Island after 21 days of liberty; a steelhead trout at the Copper River Delta after 36 days; and a coho salmon in Togiak Bay after 52 days. Three chum salmon, tagged in the Bering Sea, were recovered in Hokkaido, on the Pacific coast after 62 days, on the Okhotsk Sea coast after 79 days, and on the Nemuro Strait coast after 85 days. These tags contain the first records of temperature data recorded from individual Pacific salmonids migrating at sea. Ambient temperature data from these tags were recorded every 7.5 minutes for the pink salmon and steelhead, every 15 minutes for the coho and one chum salmon, and every 30 minutes for two chum salmon.

The fish tagged in the Gulf of Alaska (coho, pink, and steelhead) were at warmer average temperatures (means of 9-11°C) than the chum salmon tagged in the Bering Sea (7-9°C). The chum salmon were also found at a wider range of temperatures (0-18°C vs. 5-15°C). This is probably mainly an effect of the different oceanographic regions encountered by the fish, but may also be due to species differences. Except for the coho salmon, fish generally were found at slightly higher average temperatures at night, with a lower variability (smaller temperature range and less movement between temperatures) than during the day. Steelhead trout have been assumed to be primarily in surface waters, but temperature data indicate frequent dives to cooler water during the day. Percentage of time spent by individual fish at different temperatures seemed to vary by oceanographic region and will be useful for bioenergetics and modeling studies. Temperature data from all fish showed an initial period (4-21 days) of similar day and night temperatures near those of sea surface temperatures recorded at release. This may represent a period of recovery from tagging trauma before the fish resumed normal patterns of dives to deeper, cooler water and rises to the surface. If the initial period represents anomalous behavior by tagged salmonids, temperature and vertical movement data from short-term ultrasonic and radio tag studies may not represent normal behavior of the fish. The considerable diurnal and shorter-term variation in ambient temperatures indicates that offshore ocean distribution may be more closely linked to feeding behavior (prey distribution) than to sea surface temperatures.
(xiii) **The Time of Annulus Formation in Chinook Salmon Caught in Washington Coastal Waters**

A large database (5,066 fish) of information on time of formation of the last ocean annulus on scales collected from coded-wire tagged chinook salmon recovered in Washington State coastal waters from 1988 to 1993 was analyzed. Variation in the time of formation of the last ocean annulus by year, recovery age, behavioral type, recovery season, recovery area, and stock was investigated. The most important finding was that time of annulus formation varied by freshwater age or behavioral type. Chinook salmon that migrated to the ocean in their first year (ocean-type; freshwater age-0) completed formation of the last ocean annulus in March, and chinook salmon that migrated to the ocean in their second year (stream-type; freshwater age-1) completed annulus formation in April. Many of the stream-type chinook salmon in the analysis were artificially (hatchery) produced, that is, their natural life history is ocean-type. Inter- and intra-specific differences in time of annulus formation on salmon scales may reflect differences in growth rates, regulated by feeding conditions.

(xiv) **Preliminary 1999 Acceptable Biological Catch (ABC) and Optimum Yield (OY) Recommendations for the Pacific Coast Groundfish Fishery**

Five stock assessments were completed in 1998 and reviewed at the September meeting of the Pacific Fishery Management Council: sablefish, shortspine thornyhead, blackgill rockfish, Pacific ocean perch, and chilipepper rockfish. The Council adopted a preliminary 1999 sablefish ABC of 9,692 mt, a substantial increase over the 5,200 mt ABC in place in 1998. The ABC for shortspine thornyhead will be near 1998 levels, increasing from 1,000 mt to 1,261 mt. For the first time, the ABC for Pacific ocean perch in the Vancouver and Columbia areas will be set above zero (due to adoption of the new harvest policy in Amendment 11 to the Pacific Coast Groundfish Fishery Management Plan); the preliminary ABC is 695 mt, slightly above the 1998 landed catch harvest guideline. The blackgill rockfish assessment for the Conception area is the first one prepared for this species and resulted in a preliminary ABC recommendation of 365 mt. (The ABC for “other rockfish,” which previously included blackgill rockfish, is reduced by 365 mt in the southern area.) Chilipepper rockfish was reassessed this year, and the GMT calculated ABC for the Eureka, Monterey and Conception areas to be 3,724 mt, slightly above the current 3,400 mt ABC. All other ABCs are expected to remain unchanged in 1999.

(xv) **NPAFC Sockeye Scale Aging Test**

At the March 1997 NPAFC research planning meeting in Vancouver, B.C., the Working Group on Stock Identification and Growth discussed the need to test inter-laboratory variation in scale age and growth data. In this document, sockeye salmon scale age determinations by experts at nine laboratories in Canada, Japan, Russia, and the United States are compared. The results indicate that ocean age determinations are consistent among laboratories. However, there was substantial variation among the laboratories in freshwater age determinations. The results suggest that there may be need for international review and standardization of methods and criteria used to interpret freshwater age and growth patterns on salmon scales.

(xvi) **Diel Feeding Habits and Estimates of Prey Consumption of Sockeye, Chum, and Pink Salmon in the Bering Sea in 1997**

Sockeye, chum, and pink salmon feeding habits were observed over a 24-hour period from gillnet catches in the Bering Sea to examine the diel changes in prey composition and stomach content weight. The largest catches of sockeye, pink, and chum salmon occurred during the time period immediately after sunrise. Sockeye salmon had a strong diel pattern with one peak in stomach
content weight (prey weight) during the period immediately after sunset. Pink salmon prey weight revealed two peaks in prey weight: one after sunset and another at noon. During the night, euphausiids and copepods were important prey of sockeye and pink salmon, and during the day their prey was predominantly fish, squid, and crab larvae. Chum salmon had a peak in stomach content weight that occurred in the middle to late afternoon when fish were a major component of the diet. Chum salmon diet was most diverse during the night, when they fed on gelatinous zooplankton, euphausiids, pteropods, fish and appendicularia. Chum salmon fed on gelatinous zooplankton during the day and night. Daily prey consumption (wet weight) was estimated on the basis of stomach content weight and literature values for stomach evacuation rates. At 6-8°C, daily prey consumption was estimated to range from 22 to 27 g/day (1.6-2.0% body weight (BW)/day) for sockeye, 21-26 g/day (1.7-2.1% BW/day) for pink, and 48-59 g/day (2.6-3.3% BW/day) for chum salmon at 6-8°C. The sockeye and pink salmon consumption estimates were lower than previous estimates, suggesting poor feeding conditions. Consumption by chum salmon was similar to a previous study at a sea surface temperature of 8.0°, but was slightly lower than a previous study at cooler water temperatures. Reduction of variability in digestion and consumption estimates would likely result from repetition of diel feeding studies for more than one 24-hour period, sampling in several geographical areas, intensifying the sampling during the times of the day when salmon switch from feeding on one prey type to another and change their feeding intensity, and conducting studies that reveal how salmon move in the water column in relation to their feeding behavior.

(xvii) Scale Growth Studies From 1982-97 Collections of Chum and Sockeye Salmon Scales in the Gulf of Alaska

Studies were conducted of growth on scales collected from salmon caught during high seas research cruises in the Gulf of Alaska. Measurements were made of scales from June and July 1982-1997 of ocean age-.2 chum and sockeye salmon that were also examined for stomach contents. Measurements were taken to the end of each annular mark and at the edge of the scale, and to every circulus on the scale. Scale measurements (particularly growth at the edge of the scale) were then compared to indices of stomach fullness and other measures of condition and growth. No correlations were found between three food habits variables (fullness, prey weight, and stomach content index) and edge growth variables (size, circulus spacing, and number of circuli of the last ocean zone, and size of the last circulus and last three circuli in that zone) for either sockeye or chum. Length and all edge growth variables on sockeye scales were significantly less in 1990s samples than in 1980s samples. Growth measures of the second and third ocean years on chum scales, and length, weight, and condition factor were also significantly smaller in 1990s samples. Sockeye salmon length and weight were positively correlated with growth variables in the second ocean year, while chum salmon length, weight, and condition factors were positively correlated with growth variables in all three ocean years. Sockeye salmon condition factor and edge growth variables were positively correlated with their counterparts in chum salmon. The results for sockeye salmon indicate that final size and trigger to mature may be at least partially set in the second ocean year. Successful chum salmon growth may be set relatively early, with a positive feed-forward effect of good growth leading to more good growth.

(xviii) Thermal Marking of Otoliths: the 'RBr' Coding Structure of Thermal Marks

The RBr coding structure to designate otolith thermal marks is described. The upper case R is a placeholder for the code that designates the region of the otolith where the base mark appears. The code "1" denotes base marks that appear only in the prehatch region of the otolith; the code "2" denotes the marks that appear only in the post hatch region; and the code "3" denotes marks in both regions. A thermal band is a grouping of thermal rings that have sufficient spacing between the groups to allow clear visual separation. The upper case B is a placeholder for a number that denotes the particular band being referenced. The lower case r denotes the number of thermal rings within
each band. A semicolon is used for punctuation between the R and B numbers. A coma is commonly used between the numbers that designate bands of rings. For example, a mark of six thermal bands applied prior to hatching, in two thermal bands of three rings each would be denoted 1:1.3.2.3. Graphically two bands of three rings would look like III III. The notation also includes various punctuation and embellishments that give information on spacing of features and other advanced marking concepts.

(xix) Otolith Thermal Mark Release and Mass-Processing History in Alaska (USA), 1988-1998

This survey provides a brief history of otolith thermal mass marking of hatchery salmon in Alaska. Marks are described using the RBr coding structure, as described above. Currently, thirteen hatcheries are using otolith thermal marks for hatchery evaluation studies. The main purpose of these studies is to aid in the management of hatchery-affected fisheries. Approximately one billion Alaskan hatchery salmon from the 1998 brood year are expected to receive marks before release.

(xx) The Use of Agreement Measures and Latent Class Models to Assess the Reliability of Thermally-Marked Otolith Classifications

Otolith thermal marking is an efficient method of mass marking hatchery-reared salmon, and with a careful sampling program can be used to determine the proportion of hatchery fish captured in a mixed stock fishery. However, the accuracy of the determination is dependent on a number of factors including the prominence of the thermal pattern, the methods used to prepare and view the patterns, and the training and experience level of the personnel who determine the presence or absence of a particular mark pattern. Estimating accuracy rates is problematic when no secondary marking is available and no error-free standards exist. Agreement measures, such as kappa (k), allow a relative measure of the reliability of the determinations when independent readings by two readers are available, but the magnitude of k can be influenced by the true proportion of marked fish. With the use of a third reader or when two or more groups of paired readings are examined, the use of latent class models allows estimation of the error rates of each reader. Applications of latent class models are illustrated for multiple readings of chum and sockeye salmon otoliths as part of a quality control assessment of contribution estimates of hatchery-reared salmon to several commercial fisheries openings and site-specific locations in Southeast Alaska.

(xxii) Discrimination of Thermally-Marked Otoliths from Unmarked Specimens by Machine Learning of Texture Characteristics

It is reported on a novel approach to detecting thermal marks using techniques that are being developed for texture discrimination in computer vision. This provides a more natural framework for thermal mark detection than the line detector schemes that are commonly proposed because the detection and inter-mark distance measurement are combined in a single filtering step. We decompose the image into a multi-channel representation using a bank of Gabor filters that has been previously tuned to discriminate thermal marks. The pattern of filter responses is learned by using the Expectation – Maximization algorithm of Dempster, Laird, and Rubin to fit a mixture Gaussian model to the data. We arrive at a hard classification of the data by assigning different components of the model to the data. A hard classification of the data is obtained by assigning different components of the model to foreground or background classes. The approach is evaluated by examining test samples containing a mixture of known otoliths from thermally marked hatchery and wild pink salmon fry from Prince William Sound, Alaska. The advantages and disadvantages of computer vision in this application are considered.
(xxii) Otolith Marking of Pink Salmon in Prince William Sound Hatcheries, 1997

In the fall of 1995, 1996, and 1997, base thermal marks were applied to the otoliths of all hatchery pink salmon in Prince William Sound, Alaska. Otolith marks were highly visible on voucher samples taken from hatchery fry in the spring of 1998. In 1996 and 1997, accessory thermal marks were applied after fry hatched, which allowed identification of within-hatchery treatment groups. A double-blind test was conducted to assess the ability of laboratory personnel to correctly identify otolith marks laid down in 1996. The test indicated that the probability of a successful identification was about 0.994. Catch-sampling and estimation protocols were used to estimate the contribution of hatchery fish to the Prince William Sound pink salmon commercial fisheries of 1997. Preliminary estimates of the stock composition of an area-time specific catch were available within 24 hours after a fishery closure.

(xxiii) The Application of Bar Code Symbology as Applied to Thermal Marking Programs in Washington State

The thermal marking programs currently in place in Washington State use a bar code symbology to distinguish between release groups. Each pattern is composed of six thermal rings, which define 5 spaces between the rings. Ring spacing is either narrow or wide. In any given pattern, two of the five spaces will always be one or the other, and the order of their placement produces a unique code. This code symbology is based on an underlying binary pattern, and is directly analogous to the discrete ‘2 in 5’ bar code label scheme used world-wide for product inventory control.

(4) Salmon Catches

Table 1. 1997 salmon catches in Canada, Japan, Russia, and USA.

(a) Preliminary 1997 catch in millions of fish. Japan and Alaska figures are commercial catch only.

<table>
<thead>
<tr>
<th></th>
<th>Sockeye</th>
<th>Pink</th>
<th>Chum</th>
<th>Chinook</th>
<th>Coho</th>
<th>Masu</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Canada</td>
<td>10.73</td>
<td>6.61</td>
<td>1.89</td>
<td>0.33</td>
<td>0.37</td>
<td>-</td>
<td>19.93</td>
</tr>
<tr>
<td>Japan</td>
<td>&lt;0.005</td>
<td>8.35</td>
<td>72.23</td>
<td>0.05</td>
<td>0.04</td>
<td>0.01</td>
<td>80.68</td>
</tr>
<tr>
<td>Russia</td>
<td>6.60</td>
<td>139.89</td>
<td>11.66</td>
<td>0.26</td>
<td>0.97</td>
<td>-</td>
<td>159.38</td>
</tr>
<tr>
<td>USA</td>
<td>32.47</td>
<td>73.83</td>
<td>16.63</td>
<td>1.88</td>
<td>3.56</td>
<td>-</td>
<td>128.37</td>
</tr>
<tr>
<td>Alaska</td>
<td>31.10</td>
<td>71.90</td>
<td>16.20</td>
<td>0.66</td>
<td>3.15</td>
<td>-</td>
<td>123.01</td>
</tr>
<tr>
<td>WOCI'</td>
<td>1.37</td>
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<td>1.22</td>
<td>0.41</td>
<td>-</td>
<td>5.36</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>49.80</td>
<td>228.68</td>
<td>102.41</td>
<td>2.52</td>
<td>4.94</td>
<td>0.01</td>
<td>388.36</td>
</tr>
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</table>

(b) Preliminary 1997 catch in metric tonnes. Figures are commercial catch only, except for Canada.

<table>
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<tr>
<th></th>
<th>Sockeye</th>
<th>Pink</th>
<th>Chum</th>
<th>Chinook</th>
<th>Coho</th>
<th>Masu</th>
<th>Total</th>
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<tr>
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<td>11,923</td>
<td>8,649</td>
<td>1,475</td>
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<td>253</td>
<td>101</td>
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<td>10,872</td>
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<tr>
<td>Alaska</td>
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<tr>
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<td>4,839</td>
<td>439</td>
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<td>340,248</td>
<td>11,454</td>
<td>14,099</td>
<td>991</td>
<td>838,802</td>
</tr>
</tbody>
</table>

WOCI: Washington, Oregon, California and Idaho
4.1 Canada

The 1997 salmon catch in British Columbia was 47,312 t (19.9 million fish) or roughly two thirds of the average catch of 64,911 t for the period 1952-1997. More than half the 1997 catch was composed of sockeye (24,603 t, 10.7 million fish). The sockeye catch was above the average for the period 1952-1997 but slightly below average for this cycle year since the regime shift in 1977. The 1997 pink catch of 11,923 t (6.6 million fish) was well below the long-term average catch of 20,360 t for the odd-year cycle. Chum salmon catch was 8,649 t (1.9 million fish), and was also below the long term average catch of 13,363 t. Chinook salmon production has decreased steadily since the early 1970s, and the 1997 catch of 1,475 t (327 thousand fish) was the third lowest on record and only about 30 percent of the long term average catch of 5,208 t. Coho salmon catches in 1997 were severely depressed at 663 t (369 thousand fish) and were well below the long-term average catch of 8,847 t.

Depressed levels of both coho and chinook salmon production resulted in catch restrictions in both 1997 and 1998. Conservation concerns have resulted in no directed fisheries for coho in 1998 and harvest restrictions on fisheries that intercept coho salmon. Thus, only incidental catches of coho salmon are anticipated in 1998. Catch data for 1998 are very preliminary but the expected catch is anticipated to be less than that in 1997 both as a result of decreased production as well as the curtailment of a number of fisheries as special conservation initiatives.

Total catch by weight and numbers is reported for the period 1952-97. A breakdown of salmon catch by major statistical area for 1997 by numbers and weight is also reported.

4.2 Japan

In 1997, the total commercial catch of all salmon species was approximately 81 million fish or 251,740 t (round weight). The largest catches were chum salmon (72 million fish, 237,348 t) followed by pink (8 million fish, 13,040 t). Catches of other species were relatively minor.

4.3 Russia

In 1997 catches totaled 188,390 t (136,701,600 fish) of pink, 19,432 t (5,490,200 fish) chum, 8,950 t (3,013,200 fish) sockeye, 1,884 t (681,900 fish) coho, and 601 t (78,400 fish) chinook for a total of 219,257 t (145,965,300 fish) of all species. Commercial catch was reported by region and month. The escapement by region and outmigration from major rivers were also estimated. There was also a record of the kind and amount of fishing gear used in the various regions. The average weights of pink salmon in the commercial catch ranged from 1.30 – 1.83 kg, chum from 2.94 – 3.90 kg, sockeye from 2.63 – 3.24 kg, coho from 2.41 – 4.04 kg, and chinook from 7.04 – 7.88 kg. The sport catch of all species was 689,075 salmon with pink salmon catches being the largest. The subsistence catch of all species was 2,576,327 fish. Foreign catches of all species within the Russian exclusive economic zone were 25,535 t, which included 9,150 t of sockeye.

4.4 United States

(a) Alaska

The 1997 Alaska commercial salmon harvest was 123 million salmon (281,227 t), distributed as 31.1 million sockeye (85,275 t), 16.2 million chum salmon (59,421 t), 71.9 million pink (122,470 t), 3.15 million coho (10,433 t), and 662 thousand chinook (3,824 t) salmon. The catches were generally below preseason projections. Chinook salmon catches were an exception to this rule, while coho runs
were far lower than expected in most areas. Even so, the overall level of commercial catch was still quite high by historical standards. The shortfall may be due to unobserved changes in ocean conditions.

The 1997 Bristol Bay sockeye run was considerably under forecast. The 1997 forecast was for a return of 35.8 million, with an in-bay catch of 24.8 million. The actual run was 20.1 million, with an in-Bay catch of 12.3 million. Because of this forecast error, the Alaska Department of Fish and Game reviewed its forecasting methods and looked at using additional information that might improve this year’s forecast. However, the Department could not provide a convincing explanation for last year’s shortfall, and therefore did not change their procedures for the 1998 forecast, which also turned out to be considerably above the actual 1998 run and catch levels.

(b) Washington, Oregon, California, and Idaho

Preliminary 1997 commercial catches in Washington, Oregon, and California were 4.7 million salmon (13,535 t), distributed as 1.4 million sockeye (3,143 t), 1.9 million pink (3,204 t), 0.4 million chum (1,910 t), 0.2 million coho (439 t), and 0.8 million chinook (4,839 t). There are no commercial salmon fisheries in Idaho.

(5) Salmonid Enhancement Production

Table 2. 1997 hatchery releases in Canada, Japan, Korea, Russia, and USA.

<table>
<thead>
<tr>
<th>Preliminary 1997 hatchery releases in millions of fish</th>
<th>Sockeye</th>
<th>Pink</th>
<th>Chum</th>
<th>Chinook</th>
<th>Coho</th>
<th>Masu</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Canada (target)</td>
<td>336.70</td>
<td>58.07</td>
<td>191.16</td>
<td>51.72</td>
<td>15.47</td>
<td>-</td>
<td>653.12</td>
</tr>
<tr>
<td>Japan</td>
<td>0.81</td>
<td>136.70</td>
<td>1,942.51</td>
<td>-</td>
<td>-</td>
<td>17.44</td>
<td>2,097.46</td>
</tr>
<tr>
<td>Russia</td>
<td>4.45</td>
<td>328.05</td>
<td>280.46</td>
<td>0.76</td>
<td>4.59</td>
<td>0.41</td>
<td>618.72</td>
</tr>
<tr>
<td>USA</td>
<td>91.00</td>
<td>773.27</td>
<td>520.11</td>
<td>240.44</td>
<td>78.25</td>
<td>-</td>
<td>1,703.07</td>
</tr>
<tr>
<td>Alaska</td>
<td>76.53</td>
<td>773.27</td>
<td>478.06</td>
<td>7.59</td>
<td>23.18</td>
<td>-</td>
<td>1,358.63</td>
</tr>
<tr>
<td>WOCI¹</td>
<td>14.47</td>
<td>-</td>
<td>42.05</td>
<td>232.85</td>
<td>55.07</td>
<td>-</td>
<td>344.44</td>
</tr>
<tr>
<td>Sub-total</td>
<td>432.96</td>
<td>1,296.09</td>
<td>2,934.24</td>
<td>292.92</td>
<td>98.31</td>
<td>17.85</td>
<td>5,072.37</td>
</tr>
<tr>
<td>Korea</td>
<td>-</td>
<td>-</td>
<td>17.00</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>17.00</td>
</tr>
<tr>
<td>Total</td>
<td>432.96</td>
<td>1,296.09</td>
<td>2,951.24</td>
<td>292.92</td>
<td>98.31</td>
<td>17.85</td>
<td>5,089.37</td>
</tr>
</tbody>
</table>

¹WOCI: Washington, Oregon, California and Idaho

5.1 Canada

The Salmonid Enhancement Program (SEP) in British Columbia, Canada was undertaken in 1977 to rebuild stocks and increase catch through the expanded use of enhancement technology. The program is now comprised of nearly 300 projects and produces chinook, coho, chum, pink, and sockeye salmon, as well as small numbers of steelhead 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 releasing fewer than one thousand.

This report tabulates release data for the program by species and stage as well as program contribution to commercial fisheries and recoveries by catch component. Egg and release production targets for 1997 by facility are appended. Steelhead and cutthroat data are not included, as their assessment is a provincial responsibility. Total hatchery releases of brood year 1996 salmon in
British Columbia were 481.6 million fish (52.3% sockeye, 29.1% chum, 3.1% pink, 3.6% coho, and 11.9% chinook salmon). The release production target for brood year 1997 salmon is 653.1 million fish (51.5% sockeye, 29.3% chum, 8.9% pink, 2.4% coho, and 7.9% chinook).

5.2 Japan

Four species of Pacific salmon (chum, pink, masu, and sockeye salmon) are currently enhanced in Japan. A total of 2,097 million juveniles and smolts were released from Japanese hatcheries in 1997. The annual number of releases has been almost stable since 1983. Approximately 1,942 million chum salmon fry were released in the spring of 1997, accounting for 92.6% of the total releases. Japanese hatcheries also released 136 million pink salmon fry, 17,439 thousand juveniles and smolts of masu salmon, and 807 thousand juveniles and smolts of sockeye salmon.

In 1997, 6,020 thousand adult salmon were captured in rivers along the Japanese coasts. Chum and pink salmon accounted for 91.1% and 8.7% of the total river catches, respectively. The number of adult returns was 14 thousand fishes for masu salmon, but only 273 fish for anadromous sockeye salmon.

5.3 Russia

Russian hatcheries released a total of 618,717,000 salmon including 328,053,500 pink, 280,455,700 chum, 4,449,500 sockeye, 4,590,800 coho, 757,500 chinook, and 410,000 masu.

5.4 United States

(a) Alaska

In 1997, Alaskan hatcheries released approximately 1.4 billion salmon (76.5 million sockeye, 478.1 million chum, 773.3 million pink, 23.2 million coho, and 7.6 million chinook). There were 31 private nonprofit, 3 federal (including Bureau of Indian Affairs) and 3 state salmon hatcheries operating in Alaska. Most (23) of these facilities are located in southeast Alaska. The Cook Inlet/Prince William Sound region has 11 hatcheries, Arctic/Yukon/Kuskokwim has 1 hatchery and Kodiak region has 2 hatcheries. Hatcheries in Prince William Sound and Cook Inlet contributed 54% of the fish released.

(b) Washington, Oregon, California, and Idaho

Preliminary 1997 releases of salmon by hatcheries in Washington, Oregon, California, and Idaho totaled 344.4 million fish (14.5 million sockeye, 42.0 million chum, 55.1 million coho, and 232.8 million chinook).

6 Coordination of Scientific Research Activities

6.1 Report of the Science Sub-Committee on Status of Science Plan

(i) The Science Plan

The 1999-2000 Science Plan was discussed. It will be completed by March 1999. A substantial revision will be made after 1999 Symposium based on NPAFC activities in the period of 1992-99.
(ii) Other Activities

During the Sixth Annual Meeting, a meeting of the NPAFC Science Sub-Committee was held consisting of Drs. Beamish, Ishida (Chair), Karpenko, and Myers to discuss several items of interest. Research summaries relating to the work plans of the Parties were prepared and submitted as documents by Canada, Japan, Russia, and the United States. The possibility of putting the research summaries on the NPAFC homepage was discussed. Future cooperation, including joint workshop on juvenile salmon ecology, was also discussed.

6.2 Report of the Working Group on Methodology Standardization

The Methodology Standardization Working Group (MSWG), represented by R. Beamish (on behalf of D. Mackas), Y. Ishida (on behalf of M. Fukuwaka), V. Karpenko (Chair), and R. Walker (on behalf of N. Davis), will complete collection of information on methods of measuring biological characteristics of salmon and methods of zooplankton analysis. As discussed by the CSRS, the MSWG will gather information on methods of collecting salmon food habits and bioenergetics data, and will propose a standardized format for a common NPAFC food habits database. Substantial progress has already been made in converting Japanese and U.S. food habits databases to a common format. The MSWG will prepare a report on these two areas of activity by March 1999.

The summary of sampling methods used on U.S. research vessels in 1997-1998 was submitted.

6.3 Report of the Working Group on Stock Assessment

The Working Group on Stock Assessment, represented by R. Beamish (on behalf of D. Noakes), S. Urawa, V. Radchenko (on behalf of S. Sinyakov), and H. Geiger, met and discussed the reestablishment of a stock assessment report. This report is to be prepared prior to Commission's Annual Meeting, starting with the 1999 Meeting. The U.S. member agreed to take on the responsibility for this report for the next Annual Meeting. This report is to contain two items: first, a preliminary written summary of the previous year's fishing season, with available preliminary catch statistics; and second, a time series summary of catch and escapement data for a set of key indicator stocks. Prior to the next Annual Meeting, each Party will need to develop a list of these indicator stocks and supply the report's editor with text and statistics as soon as these can be made available.

6.4 Report of the Ad Hoc Working Group on Salmon Marking

During the Sixth Annual Meeting, a meeting of the Ad hoc Working Group on Salmon Marking was held consisting of S. McKinnell (Chair), S. Urawa, A. Rogatnikh, and H. Geiger. Several documents describing the application of thermal marks on salmon were submitted to the CSRS for discussion. The Working Group noted that the application of thermal marks on salmon requires coordination among the Parties to achieve maximum benefits from such activities and to avoid releasing conflicting marks or patterns. The Working Group proposed that:

(a) Each Party will produce an annual report for the CSRS on the species, brood year, date released, site released, facility/agency, stock, treatment, RBr code, fish stage and size at release, and the number of fish released.

(b) The RBr coding system, now currently in use in Alaska and British Columbia, should be adopted as the standard coding system for exchange of thermal marking data among the Parties, but only after minor modifications to the existing coding are supported by all the Parties. A document describing the final standard will be developed by U.S. scientists for
review and adoption at the Research Planning and Coordinating Meeting in the spring of 1999.

(c) The Working Group considered the need for a thermal marking pattern to identify country of origin, however, the members of the working group did not have sufficient expertise from all Parties to recognize the technical problems that might arise in developing a standard. Therefore, the Working Group recommends that experts in the technical aspects of thermal marking should attend the Research Planning and Coordinating Meeting in the spring.

(d) A central repository for all North Pacific thermal marking release information (data and/or images) should be located at a U.S. facility. U.S. scientists will advise the CSRS on the selection of a suitable location.

6.5 Report of the Ad Hoc Working Group on Archival Tags

The ad hoc Working Group on archival tags met to begin planning for possible joint field programs and to prepare a summary of relevant documents reviewed at the meeting. The Working Group was composed of D. Welch (Chair), Y. Ishida (on behalf of M. Fukuwaka), V. Karpenko, J. Helle, and K. Myers.

Discussion centered on which species of salmon to focus the field program on, the types of tags to apply, and the appropriate tag attachment methodologies to use. The Working Group agreed to work inter-sessionally by e-mail to continue their discussions for a field program and to prepare a report in time for the March 1999 meeting.

Several papers submitted to the CSRS reported on new research involving archival tags. The reported results were very promising. To date, 6 tag recoveries have been reported from a small-scale experiment conducted in the summer of 1998 with 55 tags that recorded temperature. Data from these tags indicate that the behaviour of these salmon is quite different from the pattern reported from short term (<1 week) studies. Results from field experiments evaluating the accuracy of archival tags for estimating position indicate that the light-records are capable of resolving the position of tagged animals to an accuracy of about 1 degree, sufficient to give detailed information on the migration path.

The CSRS strongly supported the initiation of joint field programs among the Parties to develop full-scale archival tagging programs. The preliminary results from these experiments are promising and indicate that migrating Pacific salmon have much more complex behaviour than indicated by earlier research. Further research is clearly needed to establish how Pacific salmon are using their environment, and to establish how the migration and feeding behaviour of salmon might change if climatic change or global warming were to occur. In particular, additional work using tags that record data on depth and position in addition to temperature is highly desirable.

6.6 Report of the 1998 Research Planning and Coordinating Meeting (RPCM), Including Recommendations and Reports of Working Groups Established at RPCM

Due to the consideration of the RPCG’s proposals on joint scientific projects to be financed by the Commission, CSRS recommended that:

(a) a 2-day Symposium be held following the 1999 Annual Meeting in Juneau, Alaska, U.S.A.

(b) the subject of the Symposium be: RECENT CHANGES IN OCEAN PRODUCTION OF PACIFIC SALMON
(c) the Steering Committee consisting of D. Noakes of Canada, Y. Ishida of Japan, V. Radchenko of Russia, and J. Helle of the United States (Chairman) organize the Symposium in consultation with the Secretariat.

The Committee outlined possible topics for the Symposium and procedure for preparation and distribution of the Announcement and Call for Papers.

The CSRS recommended that $30,000 would be appropriated to fund participation in the symposium by selected scientists, and also advised the Commission to allocate necessary funds in fiscal year 2000/2001 for outside editorial help in preparation of the second NPAFC Scientific Bulletin.

(7) Statistical Yearbook

7.1 Parties' Comments on the Computer Version of the INPFC Statistical Yearbooks

The Secretariat informed the Committee that it had received comments from Canada and Japan, and that computer versions of INPFC Statistical Yearbooks are available on the NPAFC home page on the Internet.

7.2 Status of Progress for the 1995 and 1996 NPAFC Statistical Yearbooks

The Secretariat submitted a draft set of tables for the NPAFC 1995 Statistical Yearbook.

The Secretariat informed the Committee on the status of the 1996 NPAFC Statistical Yearbook. The Secretariat requested the Parties to provide final 1996 statistical data as soon as possible to facilitate early publication of the 1996 Statistical Yearbook.

The Committee advised the Parties to submit data for the 1997 and 1998 Statistical Yearbooks as soon as these data become available.

7.3 Status of Obtaining Catch Statistics from Countries that are not Members of the North Pacific Anadromous Fish Commission

The Secretariat informed the Committee on the efforts it has undertaken to obtain 1995 statistical data from the Republic of Korea, North Korea, China, and Taiwan. Requests were sent to all these countries. The Secretariat did not receive any response to its request from China and North Korea.

(8) Other Publications

8.1 Scientific Bulletin #1, Newsletters, and Technical Report for the first NPAFC Workshop on Climate Change and Salmon Production

The Committee expressed its satisfaction with the quality and time schedule of the reviewed publications.

8.2 NPAFC Homepage on Internet

The Committee encouraged members to add links to the NPAFC web site on their own web pages in order to publicize the Commission's site.
(9) **Cooperation with Relevant International Organizations**

### 9.1 Report of the Science Sub-Committee on Coordination of the Implementation of NPAFC and PICES Science Plans

The Committee **ENDORSED** the following report by the Science Sub-Committee:

Dr. Yukimasa Ishida, Chairperson of the Science Sub-Committee, represented the NPAFC at the meeting of the Executive Committee of the Climate Change and Carrying Capacity (CCCC) Implementation Panel (IP/EC) of PICES on 18 October 1998 in Fairbanks, Alaska. REX (Regional Experiment), one of the PICES task teams, is interested in comparative studies of the early marine survival of small pelagic species including juvenile salmon in near shore waters of northern Japan, Russia, and North America. Dr. Ishida informed PICES that NPAFC member countries were also interested in this topic and submitted several documents on this topic to the Annual Meeting of NPAFC this year. After the IP/EC meeting, Dr. Warren Wooster provided information on “El Niño and Beyond: A conference on Pacific climate variability and marine ecosystem impacts, from the Tropics to the Arctic.”

On behalf of PICES, Dr. Beamish invited the NPAFC to become a co-organizer and participant in the conference “Beyond El Niño.” The CSRS recommended that the NPAFC become a co-organizer and participant in the conference, and that Dr. Low of the United States serve as the NPAFC representative on the symposium Steering Committee.

### 9.2 Canada’s Proposal to Convene a Joint NPAFC/NASCO Meeting

Parties expressed difficulties in holding a joint NPAFC/NASCO meeting due to time constraints for preparation. The CSRS recommended that NASCO be invited to the RPCM Meeting in March 1999 to discuss future cooperation between NASCO and NPAFC.

### 9.3 Other Matters

With regard to observers at the Commission's 1998 Annual Meeting, the Committee recommended that the following organizations be invited to send representatives to act as observers:

- Asia Pacific Fisheries Commission
- Food and Agriculture Organization of the United Nations
- Inter-American Tropical Tuna Commission
- Inter-Governmental Oceanographic Commission
- International Baltic Sea Fishery Commission
- International Commission for the Conservation of Atlantic Tunas
- International Council for the Exploration of the Sea
- International Pacific Halibut Commission
- North Atlantic Salmon Conservation Organization
- North Pacific Marine Science Organization
- Northwest Atlantic Fisheries Organization
- Pacific Salmon Commission
(10) Development of the 1999 Work Plan

The Committee recommended the following workplan for the CSRS in 1999:

<table>
<thead>
<tr>
<th>Work Plan Item</th>
<th>Interim Term of Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>(A) report on last year's salmon catches, escapement, and wild and artificial production of juvenile salmon;</td>
<td>1</td>
</tr>
<tr>
<td>(B) review results of salmon stock assessment research and the condition of salmon stocks;</td>
<td>1 and 6</td>
</tr>
<tr>
<td>(C) review and summarize results of this year's salmon research beyond 200-mile limit;</td>
<td>2</td>
</tr>
<tr>
<td>(D) exchange biological samples as necessary;</td>
<td>5</td>
</tr>
<tr>
<td>(E) review and summarize salmon research plans for next year beyond 200-mile limits;</td>
<td>5</td>
</tr>
<tr>
<td>(F) propose data exchanges;</td>
<td>5</td>
</tr>
<tr>
<td>(G) review any documents submitted to the Commission prior to this year's annual meeting;</td>
<td>6 and 7</td>
</tr>
<tr>
<td>(H) the Parties will review any research proposals submitted in accordance with Article VII paragraph 6;</td>
<td>8</td>
</tr>
<tr>
<td>(I) consider international collaboration with relevant organizations;</td>
<td>6 and 7</td>
</tr>
<tr>
<td>(J) consider a report to the Commission.</td>
<td>12</td>
</tr>
</tbody>
</table>

Each Party's specific research and vessel cruise plans in relation to the 1999 Workplan are outlined below.

10.1 Research Plans

(i) Canada

C-1 Distribution, Growth and Bioenergetics of Salmon in the Eastern North Pacific Ocean.

High seas salmon research in 1999 will focus on the region from northern Vancouver Island to southeast Alaska. The research will involve juvenile salmon distribution relative to oceanographic and biological features and relative nutritional status and growth.

C-2 Stock and Species Interactions in the Eastern North Pacific Ocean.

The relationship between the size of Fraser River sockeye spawners in 1997 and the size of sockeye in other rivers and the Gulf of Alaska will be studied to determine the spatial correlation scale in sockeye body size.
The Canadian-GLOBEC study of Gulf of Alaska zooplankton will begin its third year in 1999. The major objective is to recalibrate the Station Papa time series (1956-1981) of zooplankton data and to examine the relationship between salmon stomach contents and zooplankton community structure. Deep water samples of overwintering stages of copepods will be studied.

C-3 Climate Change vs. Survival, St. of Georgia, Coho and Chinook Salmon.

Canada will continue to study climate impacts on the carrying capacity of the Strait of Georgia for coho and chinook. There will be support for expanded surveys off the west coast of Vancouver Island to monitor the impacts of El Niño. W.E. Ricker cruises are planned from mid-April to mid-May, July, September and November. The concept of regimes and the relationship between global climate indices of climate and regimes will be studied. A new index of regimes and regime shifts (IRRS index) is being developed. This will be used to forecast large-scale changes in marine ecosystems and possible relationships with total salmon catch. A part of this project will be the development of wind direction indices which will be used to study the mechanisms responsible for strong and weak year-classes of groundfish. A final study relates to a new hypothesis of the natural regulation of Pacific salmon abundance. It is proposed that coho salmon abundance is regulated in a number of stages: (1) high river water, (2) early marine stage, and (3) marine winter stage. The winter stage is a function of growth conditions in the summer. The hypothesis will be published and tested in 1998/99.

The effect of the 1997 El Niño-like event on Gulf of Alaska ocean conditions, salmon biology, distribution and migration routes will be studied with particular emphasis on sockeye and coho salmon. Stock identification studies will be used to determine the origin of spawning sockeye salmon found in unusual abundance and in unusual locations during the fall of 1997. Preliminary hypotheses suggest that straying of Fraser River sockeye to other coastal rivers in southern BC may have been a factor. The unusual sightings of sockeye in Washington, Oregon, and northern California will also be studied.

C-4 Stock Identification (genetics, scales, etc.)

Recent advances in genetic stock identification for coho, chinook, and sockeye salmon will be summarized. Implications for stock assessment and management will be summarized as well as opportunities for international cooperation.

(ii) Japan

J-1 Salmon Population Dynamics

J-1-1 Coastal Environment

Northern Japan is located in the southern limit of anadromous salmonid distribution, and the coastal environments occupy a significant impact on the survival of juvenile salmon. Salmon habitat environments will be monitored at 14 stations along the coast of Hokkaido, where juvenile salmon migrate in spring season. This monitoring program includes surface water temperature, salinity, and zooplankton biomass.

J-1-2 Offshore Environment

In relation to climate changes such as global warming, oceanographic conditions for salmon habitat including physical and chemical conditions, and phytoplankton and zooplankton biomass will be monitored in the western and central North Pacific, the Bering Sea, and the Gulf of Alaska in summer.
J-1-3 Biological Monitoring of Salmon in the North Pacific Ocean

Independently of coastal catch and escapement data, salmon abundance and fish size will be monitored on board the salmon research vessels in the western and central North Pacific, the Bering Sea, and the Gulf of Alaska in summer.

J-1-4 Biological Monitoring of Adult Salmon

This long-term monitoring research will focus on evaluating salmon stock conditions affected by various factors. Body size, fecundity, and egg size will be examined in adult chum salmon returning to major spawning rivers in Japan. The age structure will be determined in each local salmon population. Genetic variations will be monitored in five hatchery populations of chum salmon and a pink salmon population. Health status will be evaluated for wild and hatchery salmon.

J-1-5 Survival and Growth of Salmon

To clarify the survival process and growth history of salmon, the survival and growth rate at each life stage are estimated using mark-recapture experiments, calcified-tissue analyses, and population monitoring of high-seas salmon and returning adults.

J-2 Salmon Life History

J-2-1 Coastal Life History of Juvenile Salmon

Major mortality of chum and pink salmon may occur during the initial coastal life. Thus the coastal life history studies are important to understand the survival mechanism of salmon. Feeding, growth and survival of juvenile chum and pink salmon will be surveyed in the Nemuro Strait, eastern Hokkaido. The migration route of thermally marked chum salmon juveniles will be determined by geographically continuous surveys along the coast of Hokkaido.

J-2-2 Offshore Migration and Distribution of Salmon

To visualize offshore migration and distribution of salmon, abundance and biological data (species, age compositions, and maturity) collected by the salmon research vessels will be analyzed retrospectively. Tagging experiments using archival and disc tags will be conducted in the Bering Sea to investigate Japanese chum salmon migration route and relationship between salmon migration and ocean conditions.

J-2-3 Feeding and Growth of High Seas Salmon

To clarify ocean life history of Pacific salmon, variation of growth, maturity, and feeding ecology of salmon in the ocean will be analyzed using the data collected by the salmon research vessels.

J-2-4 High Seas Interaction

To clarify species interaction such as between chum and pink salmon and to investigate stocks interaction such as between Japanese and other chum salmon stocks, salmon abundance, distribution, prey organisms, and somatic growth obtained from high-seas surveys will be analyzed retrospectively.
J-2-5 Homing Migration and Maturing Mechanism

To determine the maturing mechanism, endocrinological surveys will be conducted for chum salmon during their feeding and homing migrations. Archival tags will be used for adult chum salmon migrating in the coastal waters to elucidate how they find out the natal river.

J-3 Salmon Stock Identification

J-3-1 Genetic Stock Identification

The genetic population structure and distribution of chum salmon will be determined by genetic stock identification (GSI). The GSI samples will be collected in the eastern, central and western waters of the North Pacific Ocean, and the central Bering Sea by Japanese research vessels.

J-3-2 Thermal Otolith Marking

About 4.5 million chum salmon fry will be released in the Chitose River after thermal otolith markings. Thermally marking techniques and facilities will be developed for further mass markings at Japanese national hatcheries. Thermally marked chum and pink salmon will be monitored in the North Pacific Ocean and Bering Sea.

J-3-3 Stock Identification by Scale Pattern

To clarify stock composition in the North Pacific Ocean, chum salmon stock identification will be conducted using scale pattern. Cooperative sockeye salmon stock identification using scale pattern will be conducted with scientists of member countries, if possible.

J-3-4 Stock Identification by High Seas Tagging

To confirm stock distribution in limited survey areas such as in the central Bering Sea and the Gulf of Alaska, tagging experiments will be conducted on board the salmon research vessels.

J-4 Salmon Stock Assessment

J-4-1 Modeling of Salmon Population and Ecosystem Dynamics

Using numerical models, dynamics of salmon population will be simulated and the effects of density dependence, environmental factors, carrying capacity, interaction with other populations, and harvest strategy will be examined and possible future surveys will be proposed.

J-4-2 Salmon Stock Assessment and Forecast

To manage salmon stocks, abundance and conditions of stocks will be assessed and forecasted using monitoring of conditions of released juveniles, survival, growth, environmental factors during freshwater, coastal, and oceanic lives, and population structure of returning adults.


(iii) Russia

R-1 Salmon Life History

R-1-1 Coastal Life History of Juvenile Salmon

High mortality of pink, chum, and others salmon juveniles of 0-class may occur in estuaries and coastal waters of far-eastern regions. The main factors are temperature regime, food supply and predators. The coastal life history is important for the survival mechanism and forming productivity of salmon stocks. Some areas are the main polygon of study these phenomena.

R-1-2 Offshore Distribution, Migration and Abundance of Salmon Juveniles

Offshore distribution, migration, abundance and biological data of salmon juveniles collect by research vessels annually, and will be analyzed retrospectively. Major investigation area are the western Bering sea, southern and eastern part Sea of Okhotsk, and north-western Pacific of the Kuril Islands. Meteorological and oceanographic data also will be collected during survey.

R-1-3 Anadromous Migration and Abundance of Adult Salmon

During spring-summer time data will be collected on the salmon research vessels concerning distribution, migration, abundance and biological characteristics of adult and immature salmon in different areas of far-eastern seas and Pacific.

R-2 Salmon stock identification

R-2-1 Population Genetics and Conservation of Endangered Species

Genetic characterization of main local stocks of Pacific salmon will be continued. The genetic aspects of interaction between natural and hatchery reared populations will be studied. Special attention will be paid to population dynamics and genetics of endangered populations of *Parasalmo* [Oncorhynchus] *mykiss*. An electrophoretic study of Asian chinook salmon will be continued. Research on distribution of Pacific salmon in the ocean will be focused on genetic stock identification of pink, chum, sockeye, and chinook salmon in mixed collections from the Bering Sea and Pacific.

R-2-2 Stock Identification by Scale Pattern

To clarify stock composition in the North Pacific Ocean, pink, chum, and sockeye salmon identification will be conducted using scale pattern. For this aim will be used database of Russia and other countries, if it will be possible.

R-2-3 Stock Identification Using Other Materials (Otoliths, Data on Parasites, etc.)

Thermal and “dry” marking programs will be continued at the hatcheries in the northern Okhotsk Sea region. The most part of chum release will be marked. Return of marked maturing fish will be monitored. In the Yana River portion of hatched salmon will be determined from mixed population. For correct stock identification we plan to collect new information on otoliths, parasites, morphometric characteristics of some stocks, and also participate international tagging experiments.
R-3 Salmon population dynamics

R-3-1 Coastal and Offshore Environment

Main environmental characteristics of salmon habitat will be monitored at the 7 main coastal areas off the Sakhalin, Kamchatka, and in northern Sea of Okhotsk, where salmon juveniles migrate in spring-summer season. Data will be collected in shelf and offshore regions during fall season on research vessels. Monitoring program includes water temperature measurement in 500-m layer, salinity, zooplankton, and micronekton biomass estimations, and studies of structure of community.

R-3-2 Biological Monitoring of Adult Salmon in REEZ

This monitoring study will concern on estimate salmon stock abundance, and population structure during anadromous migration. Biological characteristics of adult Pacific salmon and environmental conditions will be examined before returning to major spawning areas in Russia. In this period different biological and environmental data will be collected.

R-4 Assessment of salmon stocks

R-4-1 Salmon Stock Assessment and Forecast

Salmon stocks will be assessed using monitoring of reproduction conditions and abundance in freshwater period for management aims. Data on abundance of juveniles in rivers and coastal waters, their survival, growth, and population structure of returning adults will be used for forecasting of Pacific salmon returns in different regions of Far East.

R-4-2 Ecosystem of the North Pacific and Salmon Population Dynamics

Feeding of Pacific salmon will be studied during summer and fall expeditions in the far-eastern seas and North Pacific ocean. Also data will be collected in these surveys on other fishes of pelagic community. A comparison between salmon other pelagic fishes in the consumption rates of planktonic/micronektonic organisms will help to estimate the place of salmon in the trophic structure of northwest Pacific pelagic ecosystems. Salmon’s role as prey for large predatory fish species and marine mammals will be studied using data of marine surveys.

(iv) United States

U-1 Coastal Salmon Studies

A long-term coastal monitoring program was begun in 1996 designed to provide repeated measurements of the habitat, and biological and population characteristics of salmon from their early marine residence period to their later migration through coastal waters. Particular focus is placed on monitoring thermally marked pink and chum salmon stocks and studying effects of climate forcing on the physical and biological characteristics of salmon habitat. Other coastal projects are directed towards: (1) understanding biological and physical factors that influence the spatial and temporal occurrence of juvenile salmon as they migrate seaward; (2) prediction of year-class strength and adult size of southeast Alaska pink salmon based on first-year scale and otolith growth; and (3) describing the trophic dynamics of juvenile salmon and their predators in coastal waters.
U-2 Gulf of Alaska Salmon Ecology

Research activities are primarily located in Alaska Coastal Current waters and include: (1) broad-scale field studies of the distribution and migration of juvenile and immature salmonids; (2) fine-scale field studies that focus on aggregations of salmonids to look for specific processes or factors that influence their distribution, behavior, and growth; (3) studies on diet overlap and prey selectivity among salmon and other fishes; (4) genetic stock-identification studies of juvenile, immature, and maturing salmon; (5) monitoring of thermally marked salmon; and (6) studies of growth and size of juvenile and immature salmon.

U-3 Retrospective Analyses

Retrospective studies characterize past variability in climate and salmonid population parameters over various time and space scales and are a key component to understanding effects of climate change on the abundance and life-history of U.S. salmon populations. Current retrospective studies include: (1) analyses of scale growth patterns of Bristol Bay and other Alaskan sockeye salmon populations, (2) reconstructing long-term changes in salmon abundance using high-resolution paleoenvironmental analysis of sediment cores from sockeye salmon lake systems in North America and anoxic marine basins in Southeast Alaska, (3) analyses of pink and chum salmon growth patterns from geographically separated Alaskan populations, (4) time-series analyses of catch, escapement, and growth data from North American salmonid and herring populations; and (5) resumption of historic population assessments of pink and chum salmon at Sashin Creek and Olsen Bay, Alaska.

U-4 Stock Identification

This research program is designed to find biological markers capable of identifying stocks of salmon in the North Pacific Ocean. These biological markers include genetic characters displayed in protein electrophoresis and in various forms of DNA. Non-genetic characters being evaluated derived from scale pattern analysis and thermal marks on otoliths. The first task is to develop standardized methods of genetic analysis among parties, and to identify important stocks of salmon that should be included in the database. The United States is also continuing international cooperative high-seas tagging studies and recovery of coded-wire tagged salmonids in ocean fisheries and research vessel operations. These data will assist in identifying the origins of stocks harvested in mixed-stock fisheries and in determining the oceanic distribution of stocks.

U-5 High-seas Salmon Studies

An integrated program of field and laboratory studies, and computer modeling in cooperation with the other Parties is designed to address NPAFC-related scientific research issues in the international waters of the North Pacific Ocean and Bering Sea. The current cooperative program includes: (1) field research aboard salmon research vessels, (2) analyses of high-seas salmonid food habits data and development of ocean salmon bioenergetic models, (3) various studies of ocean growth of salmon using historical and recent high-seas salmonid scale collections and corresponding biological and oceanographic data, and (4) ocean salmon life history and carrying-capacity modeling.

10.2 Proposed Vessel Cruises

(i) Canada

Vessel cruises will continue in accordance with the Canadian research plan.
(ii) Japan

Four Japanese salmon research vessels are tentatively scheduled to conduct the following scientific research in the western North Pacific, Bering Sea, and Gulf of Alaska in 1999/2000 fiscal year. In case of gillnet operations, gillnets less than 2.5 km in length will be used.

The *Hokusei maru* will conduct three cruises for oceanographic observations and research with gillnets to obtain data on the distribution and ecology of salmon and other pelagic fishes in the western North Pacific Ocean from June to August.

The *Oshoro maru* will conduct research with gillnets, longlines, and small trawl to obtain data on the distribution and ecology of salmon and other pelagic fishes in the North Pacific, Bering Sea, and Gulf of Alaska from early June to mid-August.

The *Wakatake maru* will conduct research with gillnets and longlines to obtain data on the distribution and stock abundance of salmon along 180° longitude in the North Pacific and Bering Sea from early June to late July.

The *Hokko maru* will conduct research with gillnets and to obtain information on the distribution and stock abundance of Asian salmon at the stations along 165°E longitude in July.

(iii) Russia

The Russian plan will be presented at the next Research Planning and Coordinating meeting.

(iv) United States

The U.S. plan will be presented at the next Research Planning and Coordinating meeting.

(11) Invitation to State or Entity

With regard to observers at the NPAFC 1999 Annual Meeting, the Committee recommended that the following States be invited to send representatives to act as observers if they are not members of the Commission:

➢ People's Republic of China
➢ Republic of Korea.

(12) Future Meetings

The Committee recommended that a Research Planning and Coordinating Meeting (RPCM) be held March 24-26, 1999 in Vancouver, B.C.

7. Administrative and Fiscal Matters

At the First Plenary Session, this item (agenda item 9) was referred to the Committee on Finance & Administration (F&A) for consideration and report at the Second Plenary Session.
The Committee reviewed agenda items 9 and submitted its report for the Commission’s consideration and adoption. The Commission adopted the F&A Report, including all its recommendations. Discussions and recommendations on this agenda item are summarized below.

(1) **Review of Terms of Reference**

The Committee made no comments on Terms of Reference.

(2) **Financial Situation in Current Fiscal Year and Audit**

The Committee discussed the Commission’s financial situation in the 1998/99 fiscal year. The Committee approved the projected expenses for the current fiscal year with the understanding that the contributions by each Party shall be $135,000.

### Projected Expenditures for 1998/99 Fiscal Year

<table>
<thead>
<tr>
<th>Expenditures:</th>
<th>(Canadian dollars)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Projected</td>
</tr>
<tr>
<td></td>
<td>Expenditures</td>
</tr>
<tr>
<td>A. Personnel Services</td>
<td>$ 272,000</td>
</tr>
<tr>
<td>B. Other than Personnel Services</td>
<td></td>
</tr>
<tr>
<td>Travel</td>
<td>59,000</td>
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<tr>
<td>Communication</td>
<td>18,000</td>
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<tr>
<td>Contractual Services</td>
<td>63,000</td>
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<tr>
<td>Printing</td>
<td>32,500</td>
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<tr>
<td>Rentals</td>
<td>36,000</td>
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<tr>
<td>Supplies</td>
<td>8,500</td>
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<tr>
<td>Equipment</td>
<td>6,000</td>
</tr>
<tr>
<td>Miscellaneous</td>
<td>9,000</td>
</tr>
<tr>
<td><strong>Sub-Total</strong></td>
<td><strong>$ 232,000</strong></td>
</tr>
<tr>
<td><strong>Expenditures - Grand Total</strong></td>
<td><strong>$ 504,000</strong></td>
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</table>

### Income:

<table>
<thead>
<tr>
<th>Income:</th>
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<tbody>
<tr>
<td>Contributions</td>
<td>$ 540,000</td>
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<tr>
<td>Interest</td>
<td>12,000</td>
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<tr>
<td><strong>Income - Grand Total</strong></td>
<td><strong>$ 552,000</strong></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Income</th>
<th></th>
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</thead>
<tbody>
<tr>
<td>Less Expenditure</td>
<td>($552,000)</td>
</tr>
<tr>
<td>Transfer to/(from) Working Capital Fund</td>
<td>$ 48,000</td>
</tr>
<tr>
<td>** Appropriation per Party**</td>
<td><strong>$ 135,000</strong></td>
</tr>
</tbody>
</table>

The Committee received and adopted the Auditor's Report (Appendix 1 on page 71).

The Committee recommended the selection of KPMG as auditors for the current year.

(3) **Budget Estimate for Fiscal Year Beginning July 1, 1999**

The Committee approved a general fund budget for fiscal year 1999/2000 of $546,000.

The Committee recommended adoption of the Budget Estimate for the fiscal period beginning July 1, 1999.
Budget Estimate for the Fiscal Year Beginning July 1, 1999 (Canadian Dollars)

<table>
<thead>
<tr>
<th>Expenditures:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>A. Personnel Services</strong></td>
<td>$262,500</td>
</tr>
<tr>
<td><strong>B. Other Than Personnel Services</strong></td>
<td></td>
</tr>
<tr>
<td>Travel</td>
<td>45,500</td>
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<tr>
<td>Communications</td>
<td>19,000</td>
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<tr>
<td>Contractual Services</td>
<td>117,500</td>
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<tr>
<td>Printing</td>
<td>28,000</td>
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<tr>
<td>Rentals</td>
<td>56,000</td>
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<tr>
<td>Supplies</td>
<td>9,000</td>
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<tr>
<td>Equipment</td>
<td>3,000</td>
</tr>
<tr>
<td>Miscellaneous</td>
<td>5,500</td>
</tr>
<tr>
<td><strong>Sub-total</strong></td>
<td><strong>$283,500</strong></td>
</tr>
<tr>
<td>Expenditures - Grand-total</td>
<td><strong>$546,000</strong></td>
</tr>
</tbody>
</table>

Income:

- Contributions: $540,000
- Estimated Interest: 12,000

**Income - Grand Total**: $552,000

<p>| | |</p>
<table>
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<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Income</td>
<td>$552,000</td>
</tr>
<tr>
<td>Less Expenditures</td>
<td>(546,000)</td>
</tr>
<tr>
<td>Transfer to/from Working Capital Fund</td>
<td>6,000</td>
</tr>
</tbody>
</table>

**Appropriation per Party**: $135,000

(4) **Budget Forecast for Fiscal Year Beginning July 1, 2000**

The budget forecast of $536,000 (Canadian funds), of which $540,000 will be covered by the Parties' contributions, was presented.

The budget forecast is intended for the guidance of the Parties and will not be considered for adoption by the Commission until the 1999 Annual Meeting.

(5) **Administrative Report for 1998**

The Committee reviewed and adopted the Administrative Report for 1998 which provided information on actions of the Commission after the Commission's Fifth Annual Meeting, described actions taken with respect to decisions made at the meeting, and summarized activities of the Secretariat.

(6) **Administrative Matters**

The Executive Director expressed great appreciation for the efforts of the Canadian Party as the host country with regard to the relocation of the Commission's Headquarters.

(7) **Joint Projects to be Financed by the Commission**

The Committee considered recommendations made by ENFO and CSRS on joint projects and recommended that the Commission allocate the following Working Capital Funds in its 1998/1999 and 1999/2000 Fiscal Years respectively:
(a) $50,000 to finance a joint enforcement symposium in Kodiak, Alaska in February/March 1999;

(b) $30,000 to finance participation of selected scientists from the NPAFC Parties in a two-day symposium on “Recent Changes in Ocean Production of Pacific Salmon” to be held in conjunction with the 1999 Annual Meeting in Juneau, Alaska, U.S.A.

(8) NPAFC Homepage on Internet

The Committee reviewed the contents of the NPAFC Homepage and expressed its satisfaction with the Secretariat’s performance.

(9) Year 2000 (Y2K) Computer Challenge

The Executive Director explained that there were no visible problems with respect to complying with the Y2K challenge. The Committee concurred.

(10) Other Business

10.1 Amendment to the NPAFC Financial Rules 15

The Committee considered the Secretariat’s proposal and recommended to amend the NPAFC Financial Rules as follows:

Accounting Policies and Funds

15. Accounting policies will include the following:

(a) The annual financial statements and budget estimate and forecast shall be prepared in conformity with these financial rules using the accrual basis of accounting for assets, liabilities, income and expenditures. Capital assets acquired or leased by the Commission are to be recorded as expenditures in the year of acquisition, without capitalization and amortization in the accounts.

(b) For the purpose of accounting...

8. Memorandum of Understanding between NPAFC and PICES (MOU)

The Commission considered and approved a revised draft MOU. The President, Mr. Bevan signed the MOU, which was previously signed by President of the PICES.

9. Process to Recommend that Certain Other States of Origin Be Invited to Become Parties to the Convention

The Parties agreed that the Commission shall renew the invitation to the People’s Republic of China to accede to the Convention. The Parties agreed to undertake diplomatic demarches toward the People’s Republic of China in an effort to persuade the Chinese Government to accede to the Convention.
The Parties also agreed that the text of diplomatic demarches will be drafted by the NPAFC President and agreed upon by the Parties through the Secretariat by the end of January 1999.

The Parties reviewed the statement made by the observer from the Republic of Korea at the First Plenary Session and agreed that the Secretariat should maintain contact with the Korean authorities to facilitate the Republic of Korea's accession to the Convention.

The Parties agreed that the renewed invitation letter should contain a further clarification of the NPAFC's reasons for asking the Republic of Korea to accede to the Convention, as well as a request to the Korean authorities to provide the Commission with their reasons for not acceding to the Convention.

The Parties also agreed to discuss at the next Annual Meeting the results of undertaking the above approach and the Commission's further steps concerning the issue of the Republic of Korea's accession to the Convention.

10. NOMINATION OF THE EXECUTIVE DIRECTOR

The Commission considered the recommendation of the Review Committee and nominated Mr. Vladimir Fedorenko of the Russian Federation to serve as the next Executive Director of NPAFC.

11. OTHER BUSINESS

The Canadian proposal to hold a joint meeting with NASCO was discussed. All Parties supported an exchange of information between NPAFC and NASCO and consideration at the next Annual Meeting of a detailed proposal on a mutually useful joint meeting in the future.

Canada proposed to develop criteria for joint projects requiring financing from the Commission's working capital fund. The Parties agreed that draft criteria would be submitted by Canada and discussed at the Seventh Annual Meeting.

12. PLACE AND TIME OF THE SEVENTH, EIGHTH AND NINTH ANNUAL MEETINGS

The Seventh Annual Meeting will be hosted by the United States in Juneau, Alaska, during October 24-29, 1999, followed by a NPAFC Symposium during Nov. 1-2, 1999.

Japan extended an invitation to hold the Eighth Annual Meeting in Japan.

Canada extended an invitation to hold the Ninth Annual Meeting in Canada.

The Commission accepted the above invitations.

13. CLOSING REMARKS

Closing remarks were made by a spokesperson of each Party as follows:

Closing remarks by Mr. Paul Sprout, Alternate, Head of Canadian delegation:

Mr. Chairman, distinguished Representatives, ladies and gentlemen, it has been a pleasure for the Canadian delegation to participate at the Commission's Sixth Annual Meeting.
Canada is pleased with the cooperative efforts of the Parties to develop and implement effective enforcement and surveillance programs to ensure compliance with the Convention. The joint Enforcement Workshop in Kodiak, Alaska in the spring of 1999 should provide an excellent opportunity to develop contacts at the operational level, facilitate information exchange, and coordinate our respective enforcement strategies and actions with a view to optimizing their overall effectiveness. We are encouraged that each of the Parties is determined to cooperate to maintain similar levels of enforcement effort during 1999.

No less important, we have held extensive and in-depth discussions this week on scientific research on anadromous stocks. The Canadian delegation has been impressed by the overall quality of the scientific papers, many of which focussed on the impact of climate and climate change on salmon populations. We welcome next year's Symposium on "Recent Changes in Ocean Production of Pacific Salmon" as a further opportunity to understand what happens to our salmon during the ocean portion of their life cycle.

In the same context, we are encouraged by the increasing dialogue and collaboration on scientific research between the Commission and PICES. We are confident that the new MOU with PICES will enhance opportunities for constructive cooperation between the two organizations.

As we discussed during this week, we need to increase our joint efforts to persuade the Republic of Korea and the People's Republic of China to accede to the Convention. At the same time we must encourage non-member States to become party to the FAO Compliance Agreement as this could serve as a complementary means to support the objectives and principles of our Convention.

We congratulate Mr. Fedorenko, the successful candidate for Executive Director, and wish him all the best when he takes office in April 1999. At the same time, we would like to take this opportunity to recognize and sincerely thank Dr. Shestakova for her commitment, dedication and capable stewardship in guiding the Commission during its formative years.

Mr. Chairman, Canada again thanks the Russian delegation for its warm hospitality and for the provision of excellent facilities in hosting this meeting. We extend our appreciation to you for your able and effective chairmanship this week. We also thank the Chairmen of the three Committees, Dr. Shestakova and the Secretariat staff, the interpreters and technicians for their full support in ensuring a smooth meeting.

We look forward to seeing you all at the 7th Annual Meeting next year in Juneau, Alaska. We wish all delegations a safe trip home.

Thank you.

Closing remarks by Mr. Koji Imamura, Head of Japanese delegation:

I would like to make short remarks on behalf of the Japanese delegation at the closing of the NPAFC Sixth Annual Meeting.

First, I thank the members of the Russian Government for hosting this Meeting and reception as well as the NPAFC Secretariat for their best efforts to prepare and conduct this Meeting.
One of the important results of this Meeting is the appointment of Mr. Fedorenko to Executive Director starting from next April as a successor of current Executive Director, Dr. Shestakova.

Dr. Shestakova has taken responsibility of the first Executive Director for five years from the beginning of the Commission. She still has five more months of her term as Executive Director. I take this opportunity to express our appreciation for her efforts and to hope that she will take active roles in various fields after her departure from the Commission.

I am confident that Mr. Fedorenko will fully perform his duty at the Secretariat as he is a very efficient and good-natured person. I sincerely wish for his active role in the Commission and hope he establishes a friendly and efficient Secretariat having good communication with the staff.

Secondly, we had a large accomplishment of adopting the MOU with PICES after the intensive discussion under Mr. Bevan’s excellent Chairmanship. I hope the close cooperation between both organizations will contribute from now on to achieve the objective of the Convention.

As Mr. Pennoyer, Representative of the United State, had always proposed to finish the second Plenary Session earlier, this year, we are holding the session on Friday morning. I believe that it is also one of our accomplishments at this Meeting.

Finally, with close cooperation by all the Contracting Parties the Commission makes positive steps toward the goal of the Convention. I am looking forward to seeing you again at the next Annual Meeting in Juneau.

Thank you.

Closing remarks by Mr. William Hines, Alternate, Head of the U.S. delegation:

Mr. Chairman, distinguished representatives, ladies and gentlemen, the United States is pleased with the spirit of cooperation and compromise which all Parties have exhibited during discussions this week. As we indicated in our opening remarks, the joint enforcement efforts in the Convention Area during 1998 demonstrate the resolve of the Parties to implement the provisions of the Convention in safe guarding our salmon resources. While we are pleased with the high level of coordinated enforcement efforts, we remain, nevertheless, disturbed by the apparent increase in illegal fishing. We must maintain our collective resolve to ensure our peoples the maximum benefits of our salmon resource. To this end, we are encouraged that all Parties will continue to maintain similar levels of enforcement efforts during 1999.

We look forward to convening the enforcement workshop in Kodiak, Alaska, next spring with the intent to standardize and exchange ideas on enforcement methodologies. This will help ensure that joint, focused and efficient strategies will be developed and implemented.

The United States is pleased that greater synergy and cooperation have been achieved by our respective scientists. Questions continue to be asked about the relationship between climate change and salmon abundance. Only through collaborative research among the contracting Parties and with other relevant organizations such as PICES and GLOBEC will answers be provided.

This week witnessed the culmination of five years of discussions regarding collaboration with PICES by signing an MOU between the two organizations. We view this action as a positive step forward in the scientific process. We look forward to hosting a scientific symposium on
"Recent Changes in Ocean Production of Pacific Salmon" to help elucidate potential casual factors of changes in the marine ecosystem and salmon productivity. We can all be proud that this Commission is in the forefront of research and other contributions to the understanding of our salmon resources.

Mr. Chairman, as we all know change is inevitable. Today, we welcome a new Executive Direction and bid farewell to the current one. Dr. Irina Shestakova, thank you for guiding this Commission through stormy seas by maintaining a vigil at the helm these past five years. Thanks to your able leadership, we have bravely embarked upon new frontiers in our quest for scientific knowledge and the protection of our resources. Irina, we wish you well in your future endeavours and know that you are always welcome aboard the vessel you captained on its maiden voyage.

We welcome, Mr. Vladimir Fedorenko, as the new Executive Director and the captain of this vessel named the NPAFC. Mr. Fedorenko brings tremendous experience to this assignment which will serve him well. A good captain can only function with a good crew and we feel the Commission has one of the best. Thanks to the hard work and dedication of Ms. Wakako Morris, Ms. Hiroko Omori and Miss Denise McGrann, we are confident our important work will continue and they will serve the new Executive Director with the utmost professionalism as they have always done.

Finally, Mr. Chairman, as we bid "adieu" to this annual meeting, we thank our Russian hosts for their hospitality and the work of the Secretariat to ensure a successful meeting, which this meeting has been. We thank you, Mr. President for your chairmanship and all delegations as we leave for our respective home lands. We will be honored to host and look forward to seeing you all at the Seventh Annual Meeting next year in Juneau, Alaska.

Thank you and have a safe journey home.

Closing remarks by Mr. Vladimir Izmailov, Head of Russian delegation:

Mr. Chairman, distinguished members of delegations, ladies and gentlemen.

The Commission's Annual Meeting is coming to an end.

It has become a tradition to finish our work in the atmosphere of mutual understanding. Not only have we summarized the outcome of our joint effort to implement provisions of the Convention but we have also achieved significant progress in the development of relations with other international organizations. One example is signing of Memorandum of Understanding between NPAFC and PICES. Further steps to develop relations with NASCO were envisaged.

We were satisfied with the statement of the Republic of Korea's representative regarding the position of his country in respect of acceding to the Convention.

The Russian delegation highly appreciates the results of work of the Committee on Science and Statistics, Enforcement Committee, Administration and Finance Committee. Close cooperation among our nations allowed us to get a more profound understanding of the role of salmon in the ecosystems of the North Pacific, to identify individual stocks, assess their abundance.

We expect that the seminar of representatives of enforcement organizations of the Parties, with the invitation of participants from China and Republic of Korea planned for February-March
1999, will make it possible to coordinate better our effort to establish enforcement in the Convention Area. We hope that in 1999 our joint effort will obstruct the attempts to conduct illegal fishing for salmon with drift nets in the Convention Area.

We should heed the finance component of the Commission’s activities. Saving some funds will permit us to use the reserve fund for scientific conferences, training of enforcement personnel.

During the Sixth Meeting we accomplished the difficult task of electing the new Executive Director of the Commission out of several highly professional candidates.

May I congratulate Mr. Fedorenko on the occasion of his being elected to this post in the expectation of our future productive work to unite the effort of the Parties. Would like to wish him to become part of the small Secretariat, and to set up their team work.

I believe I’ll express common view regarding termination of her functions of the Executive Director by Dr. Irina Shestakova. Throughout years we have been able to jointly find ways to resolve many problems of the Commission. Even more so, since those were the years when the Commission was being established.

The active position and professionalism of the Secretariat headed by Irina allowed us to create during a very short period of time a mechanism for the adoption of many complicated decisions. Similarly, we were always sure of timely preparation of numerous materials, and their delivery to the Parties.

My deep gratitude to Mrs. Shestakova leads me to note that here in Russia we are awaiting her return to the service at the same organization which she had left to join the NPAFC Secretariat.

May I once again thank you all for the fruitful work, and wish you success in your future work aimed at conservation of the North Pacific salmon.

I look forward to future meetings, and joint work with the participants of the Sixth Meeting of NPAFC.

Closing remarks by Mr. David Bevan, President:

Distinguished Representatives, ladies and gentlemen, I would like to conclude the meeting with a few brief remarks.

First, I would like to thank each of the five candidates for participating in the selection process for the new Executive Director. There were strengths to each candidate and I know the Review Committee process was difficult. I am pleased that the selection process was conducted on the basis of consensus and in the spirit of cooperation.

I congratulate Mr. Fedorenko as the successful candidate. I know Mr. Fedorenko, not only from his work in this Commission but also in the NAFO context. I am confident in his abilities and believe that he is superbly equipped to lead this Commission into the next millennium.

As this also is the last annual meeting for the current Executive Director, I want to take this opportunity to extend my personal thanks to Dr. Shestakova for her hard work, dedication and effective stewardship of the affairs of the Commission over the last several years. Thank you Irina.
At the conclusion of the sixth annual meeting, I again want to commend the mutual confidence and spirit of collaboration that exists in this Commission. I have found the enforcement experts, managers, scientists and all others connected with the Commission to be mutually supportive in their joint work.

I wish to express my satisfaction with the resolve of the Contracting Parties to remain vigilant against the threat of salmon poaching in the Convention Area.

I want to thank all delegations for their full and active support in bringing about a successful conclusion to our meeting.

I look forward to the 7th annual meeting in Juneau and wish you all a safe trip home.

14. NEWS RELEASE

Representatives of Canada, Japan, Russia, and the United States, the primary states of origin for salmon stocks in the North Pacific, met in Moscow, Russia, on November 1-6, 1998, for the Sixth Annual Meeting of the North Pacific Anadromous Fish Commission (NPAFC). Observers from the Republic of Korea, the North Pacific Marine Science Organization (PICES), and the North Atlantic Salmon Conservation Organization (NASCO) were also in attendance. The meeting was chaired by Mr. David Bevan, President of the NPAFC.

The NPAFC was established by the Convention for the Conservation of Anadromous Stocks in the North Pacific Ocean (the Convention) which entered into force on February 16, 1993. The Convention prohibits directed fishing for salmonids on the high seas of the North Pacific Ocean and includes provisions to minimize the number of salmonids taken in other fisheries. The NPAFC promotes the conservation of salmonids in the North Pacific and its adjacent seas and serves as a venue for cooperation in and coordination of enforcement activities and scientific research.

The NPAFC’s Committees on Enforcement, Finance and Administration, and Scientific Research and Statistics met to consider activities of the Parties in support of the objectives of the Convention.

The Committee on Enforcement reviewed unauthorized salmon fishing activities in the Convention Area in 1998 on the basis of information provided by the Parties. The cooperative enforcement efforts of the Parties resulted in the detection of seven vessels conducting illegal fishing operations in or near the Convention Area. Of those seven vessels, the U.S. apprehended two and referred another two vessels to Russia for prosecution. Due to the continued threat of high seas fishing for salmon in the Convention Area, all Parties pledged to maintain 1999 enforcement activities at levels similar to those of 1998, as a deterrent to the threat of potential unauthorized fishing activity. The Commission decided to conduct a joint enforcement workshop in Kodiak, Alaska, in early spring, 1999.

The Parties concurred that the Agreement to Promote Compliance with International Conservation and Management Measures by Fishing Vessels on the High Seas, approved by the United Nations Food and Agriculture Organization (FAO) in 1993 and open for acceptance, could serve as a mechanism to obligate non-member States to support and cooperate with the objectives and principles of the Convention. A country’s acceptance of the FAO Agreement would, inter alia, obligate it to ensure that its fishing vessels do not undermine the effectiveness of conservation and measures adopted by such regional fisheries organizations as the NPAFC. The Parties decided, as appropriate, to encourage States or entities not party to the Convention to whom the FAO Agreement is open, to adopt the FAO Agreement as soon as possible.
In continuation of discussions at the two-day workshop in Vancouver (March 1998), the Committee on Scientific Research and Statistics reviewed and discussed new evidence of climate changes and biological phenomena that may have caused the very low returns of some economically important stocks in 1998. Scientists are addressing questions with new technologies that can directly measure ocean conditions for salmon. NPAFC scientists are continuing to gather data on climate and salmon runs from around the Pacific Rim. Scientists will meet in November 1999 in Juneau, Alaska, for a 2-day symposium entitled “Recent Changes in Ocean Production of Pacific Salmon.”

Total commercial salmon catch in 1997 was 838,802 metric tons. Nearly 4.9 billion juvenile hatchery salmon were released in the North Pacific in 1997.

The NPAFC approved a cooperative arrangement with the North Pacific Marine Science Organization (PICES) to enhance cooperation between the two bodies on marine scientific research.

The Committee on Finance and Administration considered and adopted the 1998/99 budget. Administrative topics were discussed and approved.

The Seventh Annual Meeting of the NPAFC is scheduled to be held in Juneau, Alaska during October 24-29, 1999.

The NPAFC is pleased to announce the selection of Mr. Vladimir Fedorenko as its new Executive Director. Mr. Fedorenko will assume the office on April 1, 1999.

For Information
Dr. Irina Shestakova, Executive Director
NPAFC Secretariat
Suite 502, 889 West Pender Street
Vancouver, B.C. V6C 3B2, Canada
Tel: (604) 775-5500
Fax: (604) 775-5577
e-mail: npafc@interchange.ubc.ca
Web Site: http://www.npafc.org
APPENDIX 1

AUDITORS' REPORT TO THE COMMISSION

We have audited the balance sheet of the North Pacific Anadromous Fish Commission (the "Commission") as at June 30, 1998 and the statements of income and expenditures and fund balances of the general and working capital funds and International North Pacific Fisheries Commission Reserve Fund and cash flows for the year then ended. These financial statements are the responsibility of the Commission's management. Our responsibility is to express an opinion on these financial statements based on our audit.

We conducted our audit in accordance with generally accepted auditing standards. Those standards require that we plan and perform an audit to obtain reasonable assurance whether the financial statements are free of material misstatement. An audit includes examining, on a test basis, evidence supporting the amounts and disclosures in the financial statements. An audit also includes assessing the accounting principles used and significant estimates made by management, as well as evaluating the overall financial statement presentation.

In our opinion, these financial statements present fairly, in all material respects, the financial position of the Commission as at June 30, 1998 and the results of its operations and its cash flows for the year then ended in accordance with the accounting principles disclosed in note 2 to the financial statements.

Chartered Accountants

Vancouver, Canada

July 31, 1998
### STATEMENT OF ASSETS AND LIABILITIES AND FUND BALANCES

June 30, 1998 with comparative figures for 1997

<table>
<thead>
<tr>
<th></th>
<th>1998</th>
<th>1997</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Assets</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cash and term deposits (note 3)</td>
<td>$ 702,110</td>
<td>$ 664,607</td>
</tr>
<tr>
<td>Interest and other receivables</td>
<td>4,037</td>
<td>4,491</td>
</tr>
<tr>
<td>Advance to employee</td>
<td>11,082</td>
<td>-</td>
</tr>
<tr>
<td><strong>Total Assets</strong></td>
<td>$ 717,229</td>
<td>$669,098</td>
</tr>
</tbody>
</table>

|                  |          |          |
| **Liabilities and Fund Balances** |          |          |
| Liabilities balances: |          |          |
| Accounts payable and accrued expenses | $ 12,535 | $ 16,848 |
| Contribution received in advance | 202,500  | 202,500  |
| **Total Liabilities** | 215,035  | 219,348  |

|                  |          |          |
| Fund balances:   |          |          |
| Internally restricted: |          |          |
| INPFC Reserve Fund (note 2(a)) | 158,679  | 154,235  |
| Working capital fund: |          |          |
| Contingency fund | 75,000   | 75,000   |
| Severance fund   | 12,612   | 3,979    |
| Moving fund      | 255,903  | 216,536  |
| **Total Fund Balances** | 343,515  | 295,515  |

|                  |          |          |
| Unrestricted:    |          |          |
| General fund     | -        | -        |
| **Total Fund Balances** | 502,194  | 449,750  |

|                  |          |          |
| Commitments (note 5) |          |          |
| **Total**          | $ 717,229 | $669,098 |

See accompanying notes to financial statements.
### Statement of Income and Expenditures and Changes in Working Capital Funds

Year ended June 30, 1998, with comparative figures for 1997

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Contingency</td>
<td>Severance</td>
<td>Moving</td>
</tr>
<tr>
<td><strong>Income:</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Contributions from contracting parties</td>
<td>$540,000</td>
<td>$</td>
<td>$</td>
</tr>
<tr>
<td>Interest</td>
<td>15,559</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Levies (note 2(b))</td>
<td>-</td>
<td>-</td>
<td>8,633</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>555,559</td>
<td>-</td>
<td>8,633</td>
</tr>
<tr>
<td><strong>Expenditures:</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Personnel services</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Permanent</td>
<td>198,398</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Benefits</td>
<td>27,470</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Overtime</td>
<td>1,968</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Temporary</td>
<td>169</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>228,005</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td><strong>Other:</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Travel</td>
<td>20,124</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Communications</td>
<td>18,407</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Contracts</td>
<td>102,563</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Printing</td>
<td>42,748</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Rentals</td>
<td>48,652</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Supplies</td>
<td>6,189</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Equipment</td>
<td>17,681</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Miscellaneous</td>
<td>4,975</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Moving</td>
<td>-</td>
<td>-</td>
<td>22,853</td>
</tr>
<tr>
<td>Workshop</td>
<td>-</td>
<td>-</td>
<td>28,958</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>261,339</td>
<td>-</td>
<td>51,811</td>
</tr>
<tr>
<td><strong>Excess of income over expenditures</strong></td>
<td>489,344</td>
<td>-</td>
<td>51,811</td>
</tr>
<tr>
<td><strong>Fund balances,</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>beginning of year</strong></td>
<td>-</td>
<td>75,000</td>
<td>3,979</td>
</tr>
<tr>
<td><strong>Transfers:</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Excess (note 2(a))</strong></td>
<td>(66,215)</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td><strong>Fund Balances,</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>end of year</strong></td>
<td>$</td>
<td>$75,000</td>
<td>$12,612</td>
</tr>
</tbody>
</table>

See accompanying notes to financial statements.
STATEMENT OF INPFC RESERVE FUND
Year ended June 30, 1998, with comparative figures for 1997

<table>
<thead>
<tr>
<th></th>
<th>1998</th>
<th>1997</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interest Income</td>
<td>$ 4,600</td>
<td>$ 4,158</td>
</tr>
<tr>
<td>Expenditures:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Contracts</td>
<td>6</td>
<td>-</td>
</tr>
<tr>
<td>Miscellaneous</td>
<td>150</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>156</td>
<td>-</td>
</tr>
<tr>
<td>Excess of income over expenditures</td>
<td>4,444</td>
<td>4,158</td>
</tr>
<tr>
<td>INPFC Reserve Fund balance, beginning of year</td>
<td>154,235</td>
<td>150,077</td>
</tr>
<tr>
<td>INPFC Reserve Fund balance, end of year</td>
<td>$ 158,679</td>
<td>$ 154,235</td>
</tr>
</tbody>
</table>

See accompanying notes to financial statements.

STATEMENT OF CHANGES IN CASH
Year ended June 30, 1998, with comparative figures for 1997

<table>
<thead>
<tr>
<th></th>
<th>1998</th>
<th>1997</th>
</tr>
</thead>
<tbody>
<tr>
<td>Source of cash:</td>
<td>$ 540,000</td>
<td>$ 607,500</td>
</tr>
<tr>
<td>Contributions from contracting parties</td>
<td>$ 540,000</td>
<td>$ 607,500</td>
</tr>
<tr>
<td>Interest</td>
<td>20,461</td>
<td>16,752</td>
</tr>
<tr>
<td>Levies</td>
<td>33,596</td>
<td>34,969</td>
</tr>
<tr>
<td>Provincial sales tax and goods and services taxes recovered</td>
<td>767</td>
<td>1,676</td>
</tr>
<tr>
<td></td>
<td>594,824</td>
<td>660,897</td>
</tr>
<tr>
<td>Use of cash:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Personnel services</td>
<td>241,461</td>
<td>269,131</td>
</tr>
<tr>
<td>Travel</td>
<td>20,150</td>
<td>39,996</td>
</tr>
<tr>
<td>Communications</td>
<td>19,226</td>
<td>17,109</td>
</tr>
<tr>
<td>Contracts</td>
<td>102,947</td>
<td>102,937</td>
</tr>
<tr>
<td>Printing</td>
<td>42,748</td>
<td>22,079</td>
</tr>
<tr>
<td>Rentals</td>
<td>45,619</td>
<td>29,550</td>
</tr>
<tr>
<td>Supplies</td>
<td>7,460</td>
<td>5,674</td>
</tr>
<tr>
<td>Equipment</td>
<td>14,749</td>
<td>2,754</td>
</tr>
<tr>
<td>Moving expenses</td>
<td>29,090</td>
<td>28,545</td>
</tr>
<tr>
<td>Miscellaneous expenses</td>
<td>4,913</td>
<td>4,777</td>
</tr>
<tr>
<td>Workshop expenses</td>
<td>28,958</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>557,321</td>
<td>522,552</td>
</tr>
<tr>
<td>Increase in cash</td>
<td>37,503</td>
<td>138,345</td>
</tr>
<tr>
<td>Cash, beginning of year</td>
<td>664,607</td>
<td>526,262</td>
</tr>
<tr>
<td>Cash, end of year</td>
<td>$ 702,110</td>
<td>$ 664,607</td>
</tr>
</tbody>
</table>

Cash is comprised of cash and term deposits.
See accompanying notes to financial statements.
NOTES TO FINANCIAL STATEMENTS  
Year ended June 30, 1998

1. General  
The North Pacific Anadromous Fish Commission (the "Commission") was established on February 16, 1993 jointly with the contracting parties, Canada, USA, Japan and Russia, in accordance with the Convention for the Conservation of Anadromous Stocks in the North Pacific Ocean.

2. Significant accounting policies  
The financial statements are prepared on the accrual basis of accounting in accordance with the Handbook of the Commission. The following is a summary of the significant accounting policies used in the preparation of these financial statements.

(a) Fund accounting  
The financial statements include the results of three funds:  
The General Fund accumulates the current period operating income and expenditures.  
The Working Capital Fund represents the income from levies less moving expenditures and the accumulated excess of income over expenditures of the General Fund. This fund is comprised of reserves for contingencies, severance pay and moving expenditures.  
Pending its decision as to use of the funds, the Commission maintains the International North Pacific Fisheries Commission ("INPFC") Reserve Fund which earns interest on funds on deposit.

(b) Levies  
In accordance with the provisions in the Commission's Handbook an amount is calculated, based on salaries of all foreign officers of the Commission, which is estimated to be equal to their contribution for income taxes which would otherwise be payable. The amount so calculated is recorded as income in the Working Capital Fund under the caption "levies".

(c) Equipment  
Equipment acquired by the Commission is expensed in the year of acquisition (note 4).

(d) Income tax  
The Commission is a non-taxable organization under the Headquarters Agreement with the Government of Canada.

(e) Foreign exchange  
Transactions originating in foreign currencies are translated at the exchange rate prevailing at the transaction dates. Assets and liabilities denominated in foreign currency at the balance sheet date are translated to equivalent Canadian amounts at the rate of exchange on that date.

(f) Contributed services  
The Commission does not include the amount of contributed services and rent in the statement of income and expenditures.

3. Cash and term deposits  
Cash and term deposits include $158,829 (1997 - $155,672) in a separate bank account which is designated for the INPFC Reserve Fund.
4. **Equipment**

<table>
<thead>
<tr>
<th></th>
<th>Cost at June 30, 1997</th>
<th>Additions Charged to operations during the year</th>
<th>Cost at June 30, 1998</th>
</tr>
</thead>
<tbody>
<tr>
<td>Furniture and fixtures</td>
<td>$6,440</td>
<td>$6,194</td>
<td>$12,634</td>
</tr>
<tr>
<td>Office equipment</td>
<td>5,748</td>
<td>-</td>
<td>5,748</td>
</tr>
<tr>
<td>Computers</td>
<td>20,163</td>
<td>9,337</td>
<td>29,500</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>$32,351</td>
<td>$15,531</td>
<td>$47,882</td>
</tr>
</tbody>
</table>

5. **Commitments**

(a) As at June 30, 1998, the Commission is obligated under equipment leases to minimum annual payments of $2,199 in 1999 (nil thereafter).

Office space is supplied at no charge to the Commission by the Government of Canada through the Departments of Fisheries and Oceans and Public Works.

(b) **Pension plan**

The Commission has a contributory defined benefit pension plan which covers substantially all of its employees. The pension plan is administered through the International Fisheries Commissions Pension Society. The pension plan provides pension benefits based on length of service and final average earnings.

Based on an actuarial valuation as at January 1, 1997, the Commission had a funding excess of $17,000. The pension plan assets were $428,332 at June 30, 1998.
### Schedule of Status of General and Working Capital Fund Expenditures

**Year ended June 30, 1998**

<table>
<thead>
<tr>
<th></th>
<th>Original budget appropriations (unaudited)</th>
<th>Expenditures</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Personnel services:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Permanent</td>
<td>$203,900</td>
<td>$198,398</td>
</tr>
<tr>
<td>Benefits</td>
<td>33,000</td>
<td>27,470</td>
</tr>
<tr>
<td>Overtime</td>
<td>3,000</td>
<td>1,968</td>
</tr>
<tr>
<td>Temporary</td>
<td>3,000</td>
<td>169</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>242,900</td>
<td>228,005</td>
</tr>
<tr>
<td><strong>Other:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Travel</td>
<td>32,500</td>
<td>20,124</td>
</tr>
<tr>
<td>Communications</td>
<td>18,000</td>
<td>18,407</td>
</tr>
<tr>
<td>Contracts</td>
<td>103,500</td>
<td>102,563</td>
</tr>
<tr>
<td>Printing</td>
<td>45,000</td>
<td>42,748</td>
</tr>
<tr>
<td>Rentals</td>
<td>54,000</td>
<td>48,652</td>
</tr>
<tr>
<td>Supplies</td>
<td>7,700</td>
<td>6,189</td>
</tr>
<tr>
<td>Equipment</td>
<td>20,000</td>
<td>17,681</td>
</tr>
<tr>
<td>Miscellaneous</td>
<td>5,000</td>
<td>4,975</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>285,700</td>
<td>261,339</td>
</tr>
</tbody>
</table>

**Total general fund expenditures**

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Original budget appropriations</td>
<td>Expenditures</td>
</tr>
<tr>
<td></td>
<td>$528,600</td>
<td>$489,344</td>
</tr>
</tbody>
</table>

**Total working capital fund expenditures**

|                        | $22,000                                   | 51,811       |

**Total**

<table>
<thead>
<tr>
<th></th>
<th>Original budget appropriations</th>
<th>Expenditures</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$550,600</td>
<td>$541,155</td>
</tr>
</tbody>
</table>
APPENDIX 2

To find a list of NPAFC Scientific Research Papers authorized for distribution and citation amended as of November 1998, please visit our web site at: http://www.npafc.org