INTERNATIONAL NORTH PACIFIC FISHERIES COMMISSION

ANNUAL REPORT 1984

VANCOUVER, CANADA, 1985
INTERNATIONAL NORTH PACIFIC
FISHERIES COMMISSION

OFFICERS FOR 1984

Chairman
Gary C. Vernon (to 1984 March 30)
John C. Davis (from 1984 October 15)
Vice-Chairman
Kenjiro Nishimura
Secretary
Dayton L. Alverson

COMMISSIONERS

CANADA
Gary C. Vernon (to 1984 March 30)
John C. Davis (from 1984 October 15)
Donovan F. Miller
Michael Z. Florian
Joseph A. Garcia

UNITED STATES
Elmer E. Rasmuson (to 1984 June)
Robert W. McVey
Robert M. Thorstenson
Dayton L. Alverson
Clement V. Tillion (from 1984 Nov. 5)

JAPAN
Kenjiro Nishimura
Shintaro Yamashita
Keisichi Nakajima (to 1984 October 30)
Ryuichi Tanabe (from 1984 October 30)
Shunichi Ohkuchi (to 1984 October 2)
Tojiro Nakabe (from 1984 October 2)

SECRETARIAT
C. R. Forrester, Executive Director
Shuichi Takehama, Assistant Director
Evelyn Funk, Administrative Assistant
LETTER OF TRANSMITTAL

In compliance with Article III 1. (g) of the International Convention for the High Seas Fisheries of the North Pacific Ocean and Rule 17 of the Rules of Procedure, it is my pleasure as Chairman of the International North Pacific Fisheries Commission to present my compliments to the Contracting Parties and their Commissioners and to transmit herewith the report described below.

This report summarizes the activities of the International North Pacific Fisheries Commission during the year from the adjournment of the 30th Annual Meeting on November 3, 1983 through to the adjournment of its 31st Annual Meeting, held in Vancouver, Canada, from November 6 through November 8, 1984. It contains a summary account of the 31st Annual Meeting, a brief resume of activities during the interim period between annual meetings, and summaries of investigations which the three national fishery research agencies carry out under the planning and coordination of the Commission. The views expressed in these research summaries are those of the authors and not necessarily those of the Commission. Annual reports of the Commission are printed separately in the English and Japanese languages. The accuracy of translation is the responsibility of the Secretariat.

JOHN C. DAVIS
CHAIRMAN
TABLE OF CONTENTS

Letter of Transmittal

I. REPORT OF THE 31ST ANNUAL MEETING—1984 ........................................ 1
   1. Introduction .................................................................................. 1
   2. Time and place of meeting .......................................................... 1
   3. Participants .................................................................................. 1
   4. Agenda .......................................................................................... 1
   5. The first plenary session ............................................................... 1
   6. Procedures .................................................................................... 6
   7. Consideration of administrative matters ........................................ 6
      (a) Report of the Chairman ........................................................... 6
      (b) Action on reports submitted by the Secretariat ....................... 6
      (c) Other administrative actions .................................................. 6
   8. Consideration of matters of research ........................................... 6
   9. Activities of the Commission concerning salmonids ..................... 7
      (a) Background ........................................................................... 7
      (b) Salmonid research .................................................................. 7
   10. Activities of the Commission concerning non-anadromous species ... 11
   11. Activities of the Commission concerning marine mammals ......... 15
   12. Publications of the Commission .................................................. 16
   13. Officers elected for 1985 .............................................................. 16
   14. Closing remarks at the final plenary session ................................. 16

APPENDIX 1. List of Participants ............................................................. 19

APPENDIX 2. Agenda .......................................................................... 24

APPENDIX 3. Auditors’ Report ............................................................... 25

II. ADMINISTRATIVE REPORT FOR 1984 ............................................. 28

III. THE RESEARCH PROGRAM
   A. Research by Canada in 1984 ....................................................... 32
   B. Research by Japan in 1984 .......................................................... 38
   C. Research by the United States in 1984 ......................................... 47

Publications of the International North Pacific Fisheries Commission
CORRECTION

International North Pacific Fisheries Commission
Annual Report 1984

Page 13  Paragraph 2.(a)(v), 11th line, should read:
"other fish" (-1,279 t),
I. REPORT OF THE 31st ANNUAL MEETING—1984

1. INTRODUCTION

The International Convention for the High Seas Fisheries of the North Pacific Ocean was brought into force on June 12, 1953, with the exchange of ratifications among Canada, Japan and the United States. The purpose of the original Convention was to ensure that the fishery resources of the Convention area were maintained at the level of maximum sustained productivity. The Convention established the International North Pacific Fisheries Commission, which is composed of three national sections, each consisting of not more than four members appointed by the governments of the respective Contracting Parties. The Commission meets at least once annually, and oftener when necessary, and conducts its business between meetings through its permanent Secretariat in Vancouver, Canada.

In April 1978 the Convention was amended by a Protocol signed by representatives of the three governments at Tokyo. That Protocol provided for the maintenance of the International North Pacific Fisheries Commission which in turn would:

(a) provide for scientific studies and for coordinating the collection, exchange and analysis of scientific data regarding anadromous species, including data regarding the continent of origin of these species, and provide a forum for cooperation among the Contracting Parties with respect to these species; and

(b) pending the establishment of an international organization with broader membership dealing with species other than anadromous species, provide a forum for cooperation among the Contracting Parties with respect to the study, analysis and exchange of scientific information and views relating to the stocks of non-anadromous species of the Convention area, including information and views relating to all relevant factors affecting these stocks, the promotion of scientific research designed to fill gaps in knowledge and the compilation and dissemination of statistics and records.

Instruments of ratification were formally exchanged between Canada, Japan and the United States at Tokyo on February 15, 1979 and the amended Convention came into force on that day. The following is a report of the Commission's 1984 (31st) Annual Meeting, the sixth conducted after formal amendment of the Convention.

2. TIME AND PLACE OF MEETING

The 31st Annual Meeting of the International North Pacific Fisheries Commission was held in Vancouver, Canada, from November 6 to 8, 1984 under the chairmanship of Commissioner John C. Davis of Canada. During the week immediately preceding the plenary sessions of the Commission, meetings of the Standing Committee on Biology and Research and its various sub-committees were held. Commissioner Michael Z. Florian of Canada chaired those meetings and Dr. L. Margolis of Canada acted as scientific convenor. The Standing Committee on Finance and Administration met on November 5, 7, and 8 with Commissioner Donovan F. Miller of Canada as Chairman. The Ad Hoc Committee on Marine Mammals met on November 6 and 7 with Commissioner Joseph A. Garcia of Canada as Chairman.

3. PARTICIPANTS

Persons participating in the 31st Annual Meeting are listed in Appendix 1 of this report, which also shows committee assignments. Changes in Commission membership which occurred during the year are indicated in the Administrative Report for 1984 (Part II of this Annual Report). As in past years the Commissioners of each national section were assisted by a number of advisers and experts. At the invitation of the Commission, the International Pacific Halibut Commission was represented by observers who also acted as technical consultants on matters pertaining to halibut. The Commission values highly the cooperation and assistance shown in this consultation service. The total number of participants was 118, including 35 from Canada, 24 from Japan, 46 from the United States, 5 permanent and 4 temporary members of the Secretariat and 4 consultant-observers.

4. AGENDA

The agenda for the 31st Annual Meeting, as adopted by the Commission, is Appendix 2 of this report. The sections of this report which follow cover the Commission's actions in relation to each item on the agenda.

5. THE FIRST PLENARY SESSION

The first plenary session of the 31st Annual Meeting, chaired by Commissioner John C. Davis of Canada, was held on November 6, 1984 in the Social Suite of the Hotel Vancouver in Vancouver, Canada. At
this session, which was open to the public, there were addresses of welcome, statements by the national sections, introduction of delegations, and an address by the Chairman.

Alderman Bruce Eriksen, Deputy Mayor of Vancouver, addressed the meeting and welcomed delegates to Vancouver.

The Honourable Anthony Brummet, Minister of Environment, Province of British Columbia, addressed the meeting and welcomed delegates to British Columbia. The text of his address was as follows:

It is my pleasure to welcome the Commissioners and delegations from the member countries of Japan, the United States, and Canada to the 31st Annual Meeting of the International North Pacific Fisheries Commission.

As Minister of Environment for the Province of British Columbia, I have a special concern for conservation and wise management of renewable resources. In the Province of British Columbia, this is often a difficult balancing act because the demands for the use of our fresh water, our lands, and our forests often impinge on the habitat on which our salmon depend. I suspect that the sometimes conflicting demands for fish resources in the North Pacific made by bordering countries, makes the balancing act of effective management difficult for this Commission and its member countries.

Clearly, the goodwill, good judgement, and expertise of the member countries of this Commission continue to contribute to management of stocks in a fashion that provides for the reasonable demands of all users of the North Pacific stocks.

It is certainly in the economic interests of the Province of British Columbia to ensure that cooperative management in the North Pacific will continue to protect both salmon and steelhead trout stocks that originate in our rivers.

In this Province, we have foregone major and inexpensive hydro-electric developments and other development opportunities in order to preserve the fresh water habitat on which salmonids depend. The agreements structured under the auspices of this Commission help to provide for the jobs and incomes that are based on the commercial salmon industry, in particular.

On the subject of salmon, I would like to add my wishes to those of retired Commissioner Elmer Rasmuson of Alaska, who last year, suggested that some of the expertise and experience of this Commission at negotiating difficult settlements, be regarded as a model for negotiating an equitable settlement of salmon interceptions between the United States and Canada. I note that recently, the matter of dwindling stocks has added new impetus to negotiating an agreement between the United States and Canada.

It was recognition of the need for conservation and scientific management that was the motivation for forming this Commission in 1952-53. Obviously, the basis of successful management of such a large area and diverse resources, will challenge the expertise of our scientific communities.

Our government had the pleasure of hosting a reception for the first-ever scientific meeting sponsored by the INPFC which included scientists from non-member nations in 1981. In the interests of contributing further to scientific management, I would urge the Commission to continue with this precedent set at your last meeting in Vancouver.

In closing, I would like to reiterate my support in principle for the work of the Commission, and to reaffirm the support of the Province of British Columbia in pursuit of the international cooperative undertakings of this Commission.

I wish you continued success in your efforts and would urge the Commissioners from Japan, the United States, and Canada, as partners, to continue to pursue agreements and cooperative management strategies that will enable all neighbors of the North Pacific to enjoy the benefits of harvests for a long time to come.

On behalf of Premier Bennett, our Government, and our people, I welcome you to British Columbia and wish you success in your deliberations for the benefit of all concerned.

Dr. Victor Rabinovitch, Assistant Deputy Minister, Canada Department of Fisheries and Oceans, addressed the session on behalf of the Honourable John Fraser, Minister of Fisheries for Canada, and welcomed the delegates to Canada. The text of his address was as follows:

The Honourable John Fraser, Minister of Fisheries and Oceans, had wanted to be with you today but because of the opening of Parliament he was unable to leave Ottawa. However, he has asked me to say a few words of welcome on his behalf. We appreciate the warm words of welcome by Deputy Mayor Eriksen and by Mr. Brummet, Minister of Environment.

Canada places considerable importance on international fishery relationships, both in the bilateral sphere and in multi-lateral associations such as is represented by the International North Pacific Fisheries Commission. The resources of Canada are vitally important to the people on both coasts. We in Canada have a responsibility to manage these resources well so that they may continue to provide the benefits to our people and the people of other nations. The orderly management of fisheries and the promotion of trade in fish products is a general goal for which we all strive. Each country represented here today has an interest in the continuing good health of the living resources of the world's oceans.

During this week, your focus will be on the resources of the North Pacific Ocean, resources which are very important to Canada, Japan, and the United States. In the forum of the International North Pacific Fisheries Commission, you have the opportunity to address and resolve many complex questions pertaining to those resources. We wish you well in your deliberations, for your success will be of benefit to us all.

On behalf of the Minister of Fisheries and Oceans, the Honourable John Fraser, I welcome our colleagues from Japan and the United States. I hope your time in Canada will be enjoyable and memorable. To all the delegations, we wish you every success in your discussion of the issues which bring our three countries together at this 31st Annual Meeting of the International North Pacific Fisheries Commission.

Commissioner Dayton L. Alverson, Chairman of the United States National Section addressed the session. The text of his address was as follows:

It is an honor for me to greet you on behalf of the U.S. Na-
The United States is pleased to note the signing of a new Memorandum of Understanding regarding marine mammals. This agreement will continue joint efforts to study and minimize the incidental take of marine mammals in the high seas salmon fishery. We would also like to note that later this month the United States will be hosting a scientific and technical workshop on marine debris and entanglement issues. As problems relating to marine debris are becoming increasingly important, we encourage the participation in this workshop of all nations conducting fisheries in the North Pacific.

In conclusion, I wish to express our delegation's pleasure in being here in Vancouver. We have every expectation that our discussions this week will be fruitful and productive.

Commissioner Kenjiro Nishimura, Chairman of the Japanese National Section, addressed the session. The text of his address was as follows:

At this opening session of the 31st Annual Meeting of the International North Pacific Fisheries Commission, it is my great pleasure to say a few words on behalf of the Japanese National Section.

First of all, I would like to express the sincere appreciation of the Japanese delegation for the warm words of welcome extended by our Chairman, Dr. Davis, Dr. Rabinovitch, Assistant Deputy Minister of Fisheries and Oceans of Canada, Mr. Brummet, Minister of Environment of British Columbia, and Mr. Eriksen, Deputy Mayor of Vancouver.

British Columbia is richly endowed with fisheries, forestry, and mineral resources, and has had close ties with Japan through trade of these resources and through tourism.

It is evidence of this close relationship between this province and our country that the Annual Meeting of the International North Pacific Fisheries Commission is held every three years in Vancouver, the largest city in British Columbia and Canada's gateway to the Pacific.

The Japanese National Section would like to welcome the new Commissioner from Canada, Dr. John Davis, and the new Commissioner for the United States, Mr. Clement Tillion. We look forward to our association with them in the coming days. At the same time we would like to pay our respects to their predecessors, Mr. Vernon and Mr. Rasmuson. We enjoyed very much working with them. We should like to offer our heartfelt congratulations to Mr. Miller, who has been appointed Officer of the Order of Canada in recognition of his outstanding contributions to fisheries and his active role in various fields. We are also very glad to find Mr. Garcia well and attending this annual meeting.

Since the last meeting, there has been a change of Commissioners in the Japanese National Section as well. Mr. Ryuichi Tanabe, Councillor with the Fisheries Agency, has recently been appointed to succeed Mr. Nakajima, and Mr. Nakabe was also appointed replacing Mr. Ohkuchi who worked actively with us for two years. These new Commissioners are present at this annual meeting. Commissioner Yamashita, who was unable to attend the annual meeting in Anchorage last year, is also present with us this year.

We note with great satisfaction that this Commission has become even more active over the thirty years since its foundation.
The North Pacific was first developed as a fishing ground by Japanese fishermen and traditionally Japan's fishing industry has depended heavily on this major fishing ground. The Japanese fishery in this area plays a significant role as a source of food supply for our people and therefore Japan has always had a great deal of interest in conservation and effective utilization of the fishery resources in the North Pacific.

The fishery resources in the North Pacific are abundant within and beyond the 200 mile zones of the United States and Canada and a considerable part of this comes under United States and Canadian jurisdiction, but we believe that conservation and rational utilization of these resources can be most effectively carried out through close cooperation among the countries concerned.

In this regard, the importance of the role of this Commission has been immeasurable, and it is Japan, the United States, and Canada, the three countries deeply involved in the North Pacific fisheries and recognizing the importance of the fishery resources in that area that have enabled the Commission, through their support and participation, to be active in conserving and bringing about effective utilization of these resources.

Over the many years since the establishment of the Commission, Japan has actively cooperated with the United States and Canada in scientific research and study on the fishery resources in the North Pacific. In particular, Japan's contribution has been significant in terms of the scale of its tagging operations for salmon research and the financing of groundfish surveys. Japan intends to continue such efforts.

Seven years have passed since the establishment of 200 mile fishery zones in the North Pacific. During these years, Japan has intensified its research activities so that we may make a greater contribution to the effective utilization of the resources. At present, the condition of the stocks in this area, including species such as pollock, yellowfin sole, Pacific cod, and sablefish has been found to be generally favorable thus allowing high levels of effective utilization.

It is our sincere hope that research and studies carried out under the Commission will be furthered through closer collaboration and that resources which are in healthy condition, such as I mentioned earlier, will be utilized in the most effective manner, thus ensuring an advancement of the fishing industries in the United States and Canada and a stable continuation of the traditional fishing industry of Japan. Further, I would like to ask you to give careful considerations so that the good relationships matured among ourselves in the fishing area would not be damaged by affairs not related to fisheries.

As to the measures to be taken for proper conservation and effective utilization of the fishery resources, there may exist disagreements among us which arise from historical differences of experiences in the field of fisheries in the North Pacific and such disagreements may at times cause difficulties. We must, however, continue our effort, as we have done to date, to find satisfactory and truly workable solutions to the problems that we may face by working closely together and combining all our wisdom.

In connection with this, I am happy to report to you the measures taken by Japanese fishing industries to the matter of the incidental take of chinook salmon by the Japanese mothership salmon fishery over which concern was expressed by the United States and Canada at the last annual meeting. In response to the concern expressed, the Japanese fishing industry sent representatives to Alaska on several occasions to discuss with people concerned in Alaska, after having listened to the requests of Alaska and as a result has decided to take voluntary restraint measures that are even more severe than the past for three years from the current fishing season until 1986. We are also informed that as the result of these measures which also resulted in a sacrifice to be paid by the Japanese fishermen in restricted operations for their targeted fisheries the level of incidental taking of chinook salmon in the current fishing season was lower than that of any of the preceding three seasons.

With regard to the incidental take of marine mammals such as Dall's porpoise, Japan is faithfully conducting scientific research relating to marine mammals referred to in Article X of the Convention along the line of the Memorandum of Understanding signed in June of this year between Japan and the United States. In addition, over one-fourth of the catcher boats attached to the motherships conducted fishing operations this season with improved fishing gear in order to avoid the incidental take of Dall's porpoise. As seen in this example, Japan has always made every effort to reduce the incidental take of marine mammals such as Dall's porpoise and we are determined to continue such effort that the United States and Canada will come to a further understanding in this regard. We understand that, in accordance with the pertinent Act of the United States, the Secretary of Commerce makes public each year a review of the situation regarding the incidental take of marine mammals such as Dall's porpoise and research and survey plans for the following fishing season. Japan hopes that the results of discussions at this meeting of the Commission will be fully taken into consideration in this undertaking.

Let me conclude by expressing my hope that, through an active and constructive exchange of views in a spirit of cooperation and mutual understanding that we have always had, this annual meeting will prove to be fruitful.

Commissioner Donovan F. Miller, Spokesman for the Canadian National Section, addressed the session. The text of his address was as follows:

At this opening session of our annual meeting, it is a great pleasure to welcome you to Canada and to say a few words on behalf of the Canadian National Section. First of all, I join with my fellow Commissioners in thanking Deputy Mayor Eriksen, Mr. Brummet, Minister of Environment, and Dr. Rabinovich, Department of Fisheries and Oceans, for their kind words.

I should also like to take this opportunity to thank my Japanese and U.S. colleagues for their comments and extend to them and their colleagues a warm welcome to Canada.

We welcome as new Commissioners Mr. Nakabe, who has served the Japanese National Section as a Commissioner in prior years, Mr. Glen Tillion, a new United States Commissioner, again a friend and knowledgeable member of the United States delegations, and Mr. Ryuichi Tanabe, a new Commissioner from the Fisheries Agency of Japan, who replaces Mr. Nakajima.

Dr. John Davis, a new Canadian Commissioner, is the Chairman of the Canadian Section replacing Gary Vernon. The Canadian Section welcomes John Davis who is very familiar with the resources of the Pacific Ocean.
At this time, we would also wish to acknowledge the attendance at this plenary session of the Consul-General of Japan based in Vancouver, Mr. K. Katakura.

Mr. Takehama, the Commission's Assistant Director, has been with the Secretariat since March 1982. In a few months, his tour of duty will finish. We value the association which we have had with him over the past three years and his contribution to the Commission is noteworthy. The Canadian National Section thanks Mr. Takehama and wishes him every success in his new assignment.

In October of 1954 the First Annual Meeting of this Commission was held in Vancouver. We had hoped that at this 31st Annual Meeting, two of the original participants at that first meeting would be present. Unfortunately, Mr. Jim Cameron, one of the first Canadian Commissioners, is unable to be with us this morning, as he is out fishing.

Mr. Kenzo Kawakami, currently an Alternate Commissioner for Japan, is the other participant who attended the First Annual Meeting as an Adviser, and Kawakami-san is with us today.

I am sure these two gentlemen have followed with interest the Commission's activities over the past 30 years.

Mr. Chairman and fellow Commissioners there are a number of issues which we will discuss this week of importance to the Canadian National Section. Given the difficult economic times faced by the Canadian west coast fishing industry there is a renewed and heightened interest in marine survival, migration, and interception of salmonids. In particular, Canadians perceive a scarcity of information on early sea life, ocean survival and productivity. The impact on the North American salmon resource of lost and abandoned nets is an issue of great concern and needs to be discussed with a view to determining the extent of the problem and to seek a way to minimize this source of needless marine life mortality. The Canadian National Section also perceives a need for more comprehensive information on the distribution of the driftnet fishery for squid and other species and their impact on the salmon resource. The interception in the Bering Sea of Yukon River chinook salmon continues to be of concern to us and we will address this issue in the meetings this week.

We also expect to discuss the need for better information on the high seas distribution and origin of steelhead trout. One of the paramount tasks of this Commission is the coordination of research to determine the continent of origin of anadromous species. Until our knowledge in this area is improved, there may always be a question or doubt in the minds of Commission members. Salmon fishing in the Convention area by non-contracting nations and its impact on anadromous species must also be considered.

The Convention area encompasses one of the richest fishing areas of the world. It holds an abundance of fish which is a major source of protein for many peoples. It is known that anadromous species from the continents of North America and Asia co-mingle in its waters. In the various discussions this week the Canadian National Section hopes to explore with the national sections of Japan and the United States the implications of this situation and to achieve an accommodation to this reality.

I would like to refer to the Workshop on Age Determination which took place recently in Nanaimo, B.C. We considered it a worthwhile undertaking, which broadened scientific understanding of the North Pacific fisheries resources. This workshop and the symposia held in the past demonstrate the potential benefits of a broader scientific forum for the North Pacific Ocean.

We are beginning a full week of discussions with many important issues to address. The scientific meetings which have preceded this session have provided the basis for our deliberations with our colleagues from the United States and Japan.

In closing, I should once again like to welcome you to Canada. I hope that you will be able to enjoy the beauty and hospitality of our great country and the city of Vancouver.

The Chairman of the Commission, Dr. John C. Davis, addressed the session. The text of his address was as follows:

As Chairman of this Commission, it gives me great pleasure to welcome you to our 31st Annual Meeting. To those of you from Japan and the United States, welcome to Canada and to our host City of Vancouver. I hope you will enjoy your stay with us and that this meeting is highly productive.

On behalf of all INPFC members, I join with the other Commissioners in expressing our appreciation to Mr. Eriksen, Mr. Brummet and Dr. Rabinovitch for their warm words of welcome at this Opening Plenary Session of the 31st Annual Meeting.

I should also like to thank Commissioner Alverson, Commissioner Nishimura and Commissioner Miller for their very kind words of recognition of my role as a new Commissioner and this year's Chairman. I know I can count on all of you in assisting me with my duties and ensuring that our discussions this week are fruitful. I join with all of you in recognizing other participants, especially Commissioner Mr. Nakabe, Commissioner Mr. Tanabe, and Commissioner Mr. Tillion. In addition, we have a number of special guests present today including the Consul-General of Japan, Mr. Katakura and Dr. Donald McCaughran, Executive Director of the International Pacific Halibut Commission. Finally, I should like to say thank you to Commissioner Nishimura of Japan who, as Commission Vice-Chairman this year, performed many additional responsibilities during the interval between my predecessor, Mr. Vernon's departure, and my appointment.

Mr. Takehama, the Commission's Assistant Director, has been with the Secretariat since 1982. Soon he will be returning to Japan as this will be his last annual meeting in his current capacity. On behalf of all Commission members, I would like to express appreciation for his diligent efforts to help the Commission operate efficiently and wish him every success in his future endeavor.

Past initiatives will aid us in our deliberations this week. At the 30th Annual Meeting in Anchorage, agreement was reached to continue coordinated research on the continent of origin of salmonids south of 46°N latitude, as well as studies on incidental catches of marine mammals and on steelhead biology and distribution in the North Pacific. A prime concern for the Commission has been the continent of origin of salmon within the Convention Area. On this topic, I am pleased to note that progress has been made this year however, there still remain questions of concern to the Commission and there is a need to further our knowledge and improve the precision of our data. I look forward to a complete review of these and other topics
over the next several days.

Further, I should like to recognize the successful Workshop on Aging held in Nanaimo just prior to this meeting. Similar to other scientific symposia supported by the Commission, the Workshop provides another example of fruitful scientific exchange regarding salmon and non-anadromous stocks in the North Pacific Ocean.

I should also like to note the Memorandum of Understanding on marine mammals signed by the United States and Japan in June of this year. This bilateral agreement furthers the cooperation's ability to deal with difficult problems and wish you well in your important deliberations over the coming days.

The fisheries of the North Pacific have changed substantially over the life of this Commission and no doubt much change will continue to occur in the future. I have faith in this Commission's ability to deal with difficult problems and wish you well in your important deliberations over the coming days.

6. PROCEDURES

The Commission continued without change procedures followed at past annual meetings.

7. CONSIDERATION OF ADMINISTRATIVE MATTERS

7(a) Report of the Chairman

The Commission adopted the address given by Dr. John C. Davis of Canada at the opening plenary session as the Chairman's report to the Commission for 1984.

7(b) Action on reports submitted by the Secretariat

The following actions were taken on reports submitted by the Secretariat which had been referred to the Standing Committee on Finance and Administration:

i. Auditors' report for the fiscal year ended June 30, 1984

ii. Details of items in the auditors' report for the 1983/84 fiscal period

The auditors' report (Appendix 3 of this report) was approved as was retention of Peat, Marwick, Mitchell and Company as auditors.

iii. Budget estimate for the fiscal year beginning July 1, 1985 and budget forecast for the fiscal year beginning July 1, 1986

The Commission recommended that a budget totalling $375,000 (Canadian funds) be adopted for the fiscal year beginning July 1, 1985. Each Contracting Party is to contribute a one-third share ($125,000). The committee presented to the Commission a budget forecast totalling $386,250 (Canadian funds) for the fiscal year beginning July 1, 1986. The forecast represents a 3% increase over the budget for the 1985/86 fiscal year. The budget forecast is provided for the guidance of national sections and is not to be considered for adoption until the 32nd Annual Meeting in 1985.

iv. Administrative report for 1984

The committee reviewed this report submitted by the Secretariat (p. 28 of this report) and recommended its acceptance by the Commission.

v. Status of receipt of information pertinent to Articles III 1. (c) and IX 2.

In discussion of this item the committee agreed that national sections should continue submission of reports as in previous years.

7(c) Other administrative actions

The Commission confirmed that the first plenary session of the 32nd Annual Meeting of the Commission be held on Wednesday, November 6, 1985, in Tokyo, Japan, and endorsed the committee's recommendation that the 33rd Annual Meeting be held in Anchorage, Alaska, with the first plenary session on Tuesday, November 4, 1986.

The Commission also endorsed the committee's recommendation that meetings of the Standing Committee on Finance and Administration associated with the 1985 Annual Meeting be convened on November 5, 1985.

At the fourth plenary session, the Commission announced the selection of Mr. Daishiro Nagahata to assume the duties of Assistant Director effective March 1, 1985 at which time the incumbent, Mr. Shuichi Takehama, would be leaving the Commission to resume responsibilities with the Fisheries Agency of Japan in Tokyo.

8. CONSIDERATION OF MATTERS OF RESEARCH

The Commission requires its Standing Committee on Biology and Research to arrange for research on various problems and to report on the results of that research. At the 1984 Annual Meeting the committee established two sub-committees to assist in the conduct of its work. These were: the Sub-Committee on Salmon and the Sub-Committee on Non-Anadromous Species which included two panels to consider matters related to Bering Sea groundfish and king and tanner crab and the northeast Pacific. The 1984 Report of the Standing Committee on Biology and Research contained appendices prepared by these sub-
committees and reference is made in the following sections to the report and certain of its appendices.

Progress in publication of research and other material by the Commission was reviewed by the committee.

The Report of the Standing Committee on Biology and Research was submitted to the Commission at the second plenary session and adopted at the third plenary. At the time of adoption there were comments concerning information contained in the report and all national sections expressed their pleasure at the quality of the scientific information in the report. The Commission agreed to retain the present time schedule for conduct of work of the Standing Committee on Biology and Research.

9. Activities of the Commission Concerning Salmonids

9(a) Background

Responsibilities with respect to salmon were assigned to the Commission through the Protocol amending the Convention which had been signed at Tokyo, April 25, 1978, and with the formal exchange of instruments of ratification at Tokyo, February 15, 1979. Specifically, the Commission was to (1) provide for scientific studies and for coordinating the collection, exchange and analysis of scientific data regarding anadromous species, including data regarding the continent of origin of these species, and provide a forum for cooperation among the Contracting Parties with respect to these species; and (2) coordinate scientific studies to determine the continent of origin of anadromous species migrating in the waters south of 46° north latitude, and following three years of such studies make recommendations if appropriate relating to the conservation of salmon of North American origin. To aid in these responsibilities the Contracting Parties agreed to establish a scientific program to coordinate their scientific research activities in the Convention area.

9(b) Salmonid Research

The Standing Committee on Biology and Research is responsible for planning and coordinating the research on anadromous salmonids required by the Convention and the analysis and reporting of that research.

At the 31st Annual Meeting, the committee referred matters concerning salmonids to a Sub-Committee on Salmon with terms of reference as adopted by the Commission at the 1978 Annual Meeting.

In its report to the Commission, the Standing Committee on Biology and Research reported on certain findings of the Sub-Committee on Salmon as follows:

1. Studies relating to distribution and continent of origin of salmonids

The 1984 research program was diverse and provided new information pertaining to Articles III 1. (a) and III 1. (d) of the Protocol. New information was gained from high seas sampling and tagging, coded-wire tag recovery, scale pattern analyses, parasite "tag" studies, and from analyses of catch and effort statistics and biological data.

(a) Studies pertinent to Article III 1. (d)

The sub-committee reviewed new information on continental origins of salmonids occurring in waters south of 46°N latitude. Significant new findings derived from tag recoveries and from parasite "tag" studies (for steelhead) include: (1) extension of the southern distribution of maturing British Columbia sockeye salmon to 44°29'N (at 168°33'W); (2) extension of the southern range of immature chum salmon from Japan to 42°42'N (at 179°32'W); (3) extension of the eastern range of western Kamchatka pink salmon to 178°29'E (at 43°29'N); (4) extension of the western range of Western Alaska coho to 177°33'E (at 44°30'N); (5) extension of the southern and western range of North American steelhead to 42°51'N (at 167°32'E) and to 167°21'E (at 43°54'N), respectively. New scale pattern analyses of chinook salmon samples from south of 46°N, indicated that most of the chinook between 160°E and 175°W are of Central Alaskan origin followed in relative abundance by Western Alaskan, Asia, and Southeast Alaska/British Columbia. Regarding methodology of this analysis, however, several questions were pointed out in the special panel topic discussions. Moreover, there were few samples from the specified area. Therefore, relative proportions of stock-groups should be a subject for further discussion.

As in 1983, the sub-committee report included an updated, species-by-species summary of knowledge on continental origins of salmonids southwest of 46°N, 175°W (Appendix 1, section 7). North American sockeye, chum, pink, coho, and chinook salmon, and steelhead trout occur in these waters and intermingle with Asian stocks. The committee concurred with the sub-committee's recommendation to refer the information presented in the sub-committee report to the Commission for its use in implementation of Article III 1. (d). The committee also endorsed the sub-committee's recommendation that research efforts be continued to advance the knowledge on distributions and origins of salmonids throughout Convention waters as required under Articles III 1. (a), III 1. (d), and X of the Protocol.

(b) Other research to determine distributions and origins of salmonids in the North Pacific Ocean and Bering Sea

Considerable new information was reported on salmonids in waters north of 46°N. Recoveries from high seas taggings resulted in the extension of the known northern range of Sakehalin chinook salmon. High seas recoveries of coded-wire tagged chinook salmon and steelhead provided significant new information on the high seas distribution of North American stocks of these species. For the first time chinook salmon from the southeast Alaska-northern British Columbia area were demonstrated to occur in the Bering Sea. The known range of British Columbia steelhead was extended westward (from 43°39'N, 179°39'E) to the area 49°23'-50°05'N, 173°13'E-174°51'E by recovery of four
fish by the mothership fishery. Another fish caught by the
mothership fishery in the same small area marked the first high
seas recovery of a coded-wire tagged steelhead from Southeast
Alaska. This is the first demonstrated occurrence of British
Columbian and Southeast Alaskan steelhead in Japanese moth­
ership catches.

Analysis of data on chinook and chum salmon distributions
and origins is described under item (3) Special panel topic.

The sub-committee reviewed data on catch per unit of effort
from variable-mesh gillnets. This analysis provided information
on relative abundance and distribution of salmonids in April­
August 1984. Other studies included scale pattern analyses of
masu and coho salmon, sampling efficiency of gillnets, oceanogra­
phy of the western and central North Pacific, and assessments of
Canadian chinook, coho, and sockeye salmon stocks.

(2) Data and sample exchanges and publications

The sub-committee noted the valuable exchanges of data and
samples which had taken place since the last annual meeting.
There were 13 exchanges of publications, scale samples, whole­
fish steelhead samples, biological data, and salmonid snout sam­
ples, in addition to the exchanges in Document form and on com­
puter tapes.

(3) Special panel topic

The sub-committee devoted one full day to discussions of ori­
gins of chinook salmon in the Bering Sea and North Pacific and
contribution of Japanese hatchery-reared chum to high seas
fisheries.

Chinook salmon

Information was presented on continental origin of chinook
salmon found in the Bering Sea and North Pacific based on scale
pattern analysis for the years 1975-81. Western Alaskan stocks
were predominant in the Bering Sea, followed in abundance by
Asian stocks. These findings are substantiated by previous tag­
gging and scale analysis data. Analysis of samples from the North
Pacific indicated a greater diversity of stocks, with the Central
Alaskan stock-group predominating. Asia was the next most
abundant stock, followed closely by the Western Alaskan stock.

The estimated interceptions of Western Alaska fish by the
mothership fishery compared closely with those based on the
earlier scale pattern study. The authors estimated that the com­
bined high seas fisheries caught an average of 188,000 Western
Alaska chinook annually in the period 1964-77, and 149,000 an­
ually in 1978-83 (92,000 excluding the 1980 estimate). The
mean estimated interception of Central Alaska fish was nearly as
high, 148,000 annually in 1964-77 and 130,000 annually in 1978–
83 (101,000 excluding the 1980 estimate). Most of the Western
Alaska fish were caught in the Bering Sea, while most of the
Central Alaska fish were caught in the North Pacific, especially
by the landbased driftnet fishery.

Discussion following presentation of the document on chinook
origins pointed out potential bias in the standard samples used
in the analysis. Noted particularly was the fact that samples
from only two rivers represented the entire Asian chinook popula­
tion. Another possible source of bias was inclusion of some scales
from non-preferred fish body location. It was agreed to exchange
the data base used in the analysis and also agreed that ideally,
several approaches to stock separation should be used.

Chum salmon

The scale pattern analysis to determine continental origins of
age 0-3 maturing chum salmon in the western and central North
Pacific and Bering Sea in May to July, 1972, 1981, was con­
tinued from last year. U.S.S.R. chum salmon were the major
stock-group throughout the North Pacific study area in May,
June, and July, although Japanese chum apparently predominated
in some Bering Sea areas (the present mothership fishing area) in
July.

The analysis again indicated some contradiction with results
from tagging. The possible reasons for contradiction are (1) tag
recovery data may not describe fully the distribution of Japanese
chum; (2) chums originating from other areas may have been
misclassified as Japanese; and (3) the distribution of Japanese
chum may have expanded following greatly increased produc­
tion in recent years.

(4) Squid driftnet fisheries

The members discussed squid driftnet fisheries in the North
Pacific Ocean with respect to their potential incidental catches
of salmonids. Attention was drawn to the need for more infor­
mation to evaluate the potential impacts of squid driftnet fis­
heries by nations operating in the area north of Japan's designated
domestic fishing area.

(5) Research plans for 1985

Tentative research plans for each national sections were dis­
cussed as were requests for samples and associated data. It was
agreed that all national sections would meet the requests as far
as possible and expedite sample exchange.

(6) Recommendations of the Sub-Committee on Salmon

The committee endorsed the recommendations made by the
Sub-Committee on Salmon pertaining to: referral of informa­
tion to the committee and the Commission; the slight modifica­
tion to the sub-committee's terms of reference; coded-wire tag
recovery; salmonid catch by non-member nations; continuation
of the rapporteur system and selection of special topics.

In addressing the concern of the sub-committee regarding its
appointed Ad Hoc Salmon Research Coordinating Group, the
committee noted the prime importance of the meeting of the
Sub-Committee on Salmon associated with the annual meeting
of the Commission and recognized the value, principally to Japan
and the United States, of the functions of the Ad Hoc Salmon
Research Coordinating Group with its present terms of reference.

Canada, while endorsing in principle the terms of reference of
the ad hoc group, noted that current activities of the group em­
phasize principally certain logistics with which Canada is not
presently involved. Both Japan and the United States were in
agreement with this view at the present time.

Recognizing the views expressed the committee recommended
that the Ad Hoc Salmon Research Coordinating Group meet for
its designated function in Tokyo in February or March 1985.

Embodied in the Report of the Standing Committee on Biology and Research was a comment on the
Workshop on Age Determination which was held in
Nanaimo in the latter part of the week preceding the formal meeting of the committee, as follows:

The committee expressed satisfaction with the workshop on age determination of salmonids and groundfish which was held October 25-27 in Nanaimo. The committee noted the value of deliberations by representatives from many agencies on standardization of criteria for age determination and expressed its appreciation to the organizers in Nanaimo.

The committee also noted that the workshop identified the need for further dialogue in a series of recommendations and committee members will initiate a dialogue to alleviate problems identified in the workshop recommendations.

During discussion of the Report of the Standing Committee on Biology and Research, a spokesman for each national section made comments respecting salmonid research as follows:

United States comments:

The United States National Section remains pleased with the function and work of the Standing Committee on Biology and Research and with the high quality of the information contained in the committee report. We support the recommendations made by the committee and the adoption of its report.

Regarding anadromous salmonids in Convention waters, the United States is pleased that scientists of all national sections effected close coordination and cooperation in their efforts to determine origins and distributions of salmonids taken on the high seas. Coordinated research in 1984 provided considerable new information on distributions of North American and Asian salmonids in the area of directed high seas fishing. The results from parasitological study, tagging, and scale pattern analysis are of special interest to the United States. These data increase the Commission’s understanding of high seas fishing on salmonid stocks from North America and Asia.

A problem of special concern to our delegation has been the interception of western Alaskan chinook salmon by the Japanese mothership salmon fishery. Results of a recent study indicate that the mothership fishery intercepts not only western Alaskan chinook but nearly as many central Alaskan chino. Further, provisional estimates indicate that chinook caught by the landbased drift net fishery are predominantly of central Alaskan origin, and that western Alaskan chinook are also intercepted south of 46°N. The estimated high seas catch levels for these stocks are unacceptable. We ask Japan’s understanding of our concerns regarding these interceptions, and ask for cooperation in determining and implementing effective measures to eliminate this problem.

In 1984 catcher boats of the Japanese mothership fishery complied with a U.S. request by providing incidentally caught steelhead to U.S. observers for biological sampling. As a result, valuable new information was gained on origins of steelhead found in the mothership fishery area. For 1985 the United States again requests that catcher boats promptly provide all steelhead caught within the U.S. FCZ to the observers for biological sampling and examination.

With respect to drift net fishing for squid, we note the need for more information on squid and salmonid distributions as related to oceanographic conditions, and request that member nations direct more research to this issue. Fishing within the authorized area of the Japanese squid drift net fishery is not likely to significantly impact salmonid stocks. However, fishing north of the area by vessels of Japan or non-member nations may be common and pose a serious problem if salmonids are present.

The scientific studies reported this year by the Standing Committee on Biology and Research provide significant new information on continent of origin of salmonid species migrating south of 46°N. The report of the Sub-Committee on Salmon details this information and clearly shows that North American salmon of all five species as well as steelhead trout intermingle with Asian species in this area. Quantitative analyses reported previously indicate (1) that significant numbers of Bristol Bay sockeye are still taken in the present land based fishing area, (2) that western and central Alaskan coho salmon are apparently present in high proportions between 175°E and 175°W longitude, and (3) that steelhead trout migrating south of 46°N are primarily of North American origin. New information from tagging and parasitological studies greatly strengthen this latter conclusion on steelhead, and catch reports of the land based drift net fishery provide quantitative information on magnitude of catch. For chinook salmon, new scale pattern analyses enabled the first quantitative estimates for the area south of 46°N, and indicate that most of the chinook taken between 160°E and 175°W are of central Alaskan origin. For chum salmon, new scale pattern analyses again indicate the presence of U.S. chum salmon stocks in the area southwest of 46° N, 175° W.

In view of the additional advances in knowledge, the United States reiterates its opinion of 1983 that Commission discussions of recommendations pertaining to Article III 1. (d) should begin. Now that presence of all five species of North American salmon and of steelhead trout in the land based fishing area is proven, the United States urges the exploration of strategies to minimize or eliminate capture of these stocks in the land based area.

Canadian comments:

The Canadian National Section has examined the report of the Standing Committee on Biology and Research and wishes to make a few observations before supporting the adoption of the report. The work produced by the scientists of the three national sections continues to meet the high standards of excellence of the Commission.

The incidental catches of salmonids in the increasing drift net fishery for squid and other species is a major concern to Canada. We consider it imperative that studies be undertaken to assess the impact of these fisheries on our salmonid stocks. We query the economic viability of the squid fishery. The reported catch and subsequent market value of the squid product, together with an escalation of the number of catcher boats, lends doubt to the economic feasibility of those operations per fishing unit. We look forward to a more detailed explanation from our Japanese colleagues and a satisfactory follow-up to our concerns.

We continue to have grave concern with respect to the high seas gill net fisheries in general. The phenomenon of a ghost fishery from lost and intentionally discarded nets presents a threat that is detrimental to the long term survival of salmonids on the high seas.

With respect to the high seas salmon catch by vessels of non-
member countries and the implication of this fishery regarding conservation of the stocks, we are concerned that information on this fishery is not being conveyed to the scientists of the Commission. Canada wishes to express its desire for information from these non-participating countries through scientific exchange, the Commission itself, or diplomatic channels.

The accuracy of scientific information is of great concern to the Canadian National Section. The Commission exists on scientific exchanges and regards the integrity of data, both scientific and catch information, the cornerstone of its effective longevity. We are disappointed in the need to question the information presented by Contracting Parties.

We note with interest the discussion regarding the Ad Hoc Salmon Research Coordinating Group. Canada supports the continued existence of the group, however, we propose that the agenda of the meeting be circulated well in advance and that the discussions be confined to the business of the observer program.

We note with alarm the recovery of steelhead of Canadian origin in waters west of 175°E in the mothership fishery. We strongly encourage continued tagging of steelhead trout and the continued study of continent of origin of this valuable species.

We are concerned with the catch of salmonids of Yukon River origins. Canada is pleased to see that the mothership fleet is increasing its efforts to recover coded-wire tags. The use and recovery of coded-wire tags enable scientists of all sections to study the continent of origin of chinook salmon.

Information obtained this year by the Standing Committee on Biology and Research indicates the presence of salmonids of Canadian origin in waters south of 46° north latitude that may be subject to interception by the Japanese land-based fishery. We are concerned about this and support the continuation of studies on distribution of continent of origin of salmonids as required under Convention Article III 1. (d).

Finally, we wish to thank all the scientists for their untiring efforts over the past year. We also wish to thank the Secretariat and the interpreters. Canada supports the motion to adopt the report with all its recommendations.

Japanese comments:

The Japanese National Section has carefully studied the report and is very pleased to see that the cooperation among our three nations in the area of research is being intensified and is steadily bearing fruit.

The Japanese National Section would like to take this opportunity to make comments on some contents of this report. With respect to anadromous species, we note with satisfaction that a substantial amount of knowledge has been accumulated on the continent of origin of salmonids migrating south of 46° north latitude. The Japanese National Section takes this opportunity to express its intention to continue studies on the continental origin of anadromous species in the entire Convention waters, including areas referred to in Article III 1. (d) of the Convention.

Next I would like to touch on the chinook salmon issue. I understand that the United States research on chinook salmon is an ambitious program with a tremendous amount of work. However, we consider that their analysis is based on quite a limited number of samples and there are some questionable aspects of the appropriateness of the methods of their scale pattern analysis. Therefore, a further study is necessary to achieve improvement in these points. Further, we note that the U.S. document states that no correlation was found in general between the levels of interception and the levels of coastal runs. We also understand that recent coastal runs of chinook salmon in the U.S. are at historically high levels. Therefore, we cannot believe that interception of this species by Japanese vessels has a significant adverse effect on the coastal salmon fishery.

Having said this I would like to state at this moment that the Japanese National Section intends to provide biological samples of steelhead, as has been requested by the United States and Canada. We intend to continue to provide such samples next year as we have done this year.

According to the Report of the Standing Committee on Biology and Research, the scientific studies cover the past seven fishing seasons on the continent of origin of anadromous species migrating in waters south of 46° north latitude, east of 175° east longitude, and west of 175° west longitude have produced a substantial amount of information. The knowledge obtained to date indicates that while some of the salmon of North American origin do migrate to these waters and intermingle with fish of Asian origin, the chum and pink salmon, which are the predominant species in these waters, are mostly of Asian origin. Based on this knowledge, we believe that there is little rationale or need for closing the waters south of 46° north latitude, east of 175° east longitude, and west of 175° west longitude. However, we would like to state here that we wish to reserve the right to propose an amendment to the annex concerning restriction of land-based operations until such time as we may be in a position to make a more comprehensive judgment using the outcome of continued studies on distribution and continent of origin of salmonids in waters both inside and outside of the area as has been recommended by the Standing Committee on Biology and Research.

As we have expressed in our statement under Agenda Item 7, regarding the results of the U.S. scale pattern analysis of chinook salmon, it has been pointed out that the methodology should be reviewed and that the number of samples from certain areas was limited. Therefore, we consider it premature for us to accept the results obtained from these analyses at this time.

At the same time, we wish to state our intention of continuing studies on continent of origin of salmonids migrating in Convention waters through continued collaboration with the United States and Canada.

Finally, I would like to touch on the drift gillnet fisheries in the high seas. At present, Japan voluntarily restrains operations of the drift gillnet fishery for squid by limiting its northern and eastern boundaries in order to avoid the incidental take of salmon of North American origin. With respect to the drift gillnet fishery for marlin and others, Japan has similar regulations. We will continue this restraint in the future and instruct Japanese fishermen to fully observe this restriction. At the same time we will continue providing the Commission with as much information as possible on these fisheries as has been requested by Canada.

The Commission, during discussion of an agenda item related to salmonid research, took consideration of other fisheries in the Convention area and their effect on anadromous species. Comments were made by each national section as follows:
United States comments:

The United States National Section continues to be concerned over the potential interception of salmon by high seas driftnet fisheries for squid and other non-anadromous species. This issue is of particular importance as 1984 is the second consecutive year in which a non-member nation has harvested large amounts of salmon on the high seas. Although we have taken significant steps towards addressing this serious problem, we should consider further measures of ensuring that this fishery does not continue. In addition, our detection of numerous squid drift gillnet vessels operating north of 44°N in August 1984 is alarming and compels us to ask Japan to ensure that her squid drift gillnet fishery complies fully with domestic regulations.

The U.S. Section also notes that later this month there will be a workshop held on the impact of marine debris, particularly in the North Pacific. We remain concerned that discarded and lost nets and debris may reduce the number of salmonids returning to their countries of origin. We would like to consider methods of obtaining more information on this increasingly important issue.

Japanese comments:

As we stated under Agenda Item 7, we restrict operations of the Japanese squid gillnet fishery and drift net fishery for marlin and others by limiting the northern and eastern boundaries of the fishing ground in order to avoid incidental taking of salmonids of North American origin. This restriction has been established with ample allowance to achieve the purpose. A comprehensive study of information presented at our meetings this year allows us to believe that these two fisheries, which have been operating strictly within the restricted area, have caused no adverse effect on salmonids of North American origin.

As has just been pointed out by the United States Section, to our regret, some Japanese squid gillnet vessels were reported to have operated north of the northern limit of this area last year and this year and the report has been confirmed. We understand that the water temperature was relatively high this year, thus the squid fishing ground shifted to the north, possibly serving as one of the causes. These vessels will be severely punished under our domestic law. However, I can report that inspection by the Japanese Government inspectors of these vessels at their entry port upon returning from the cruises, in which violation had taken place, did not reveal any evidence that these vessels had any salmon in their possession.

Finally, I would like to touch upon the question that was raised earlier by the Canadian National Section, namely, the economic feasibility of the squid fishery. The squid drift gillnet fishing vessels in Japan must have permits issued by the Minister of Agriculture, Forestry, and Fisheries and the Minister has directed, by issuing such permits, that the number of those fishing vessels should not increase from August of 1981. I am not sure what calculation the Canadian National Section used in arriving at the conclusion that there was a doubt as to the economic feasibility of this fishery, but to respond to this query by Canada, let me explain. Of the vessels engaged in the squid gillnet fishery, very few operate in this fishery alone and the large majority also engage in other types of fisheries in other seasons of the year. The flying squid, which is the target species of this fishery, is mainly used for processed products in Japan and there exists a strong demand for this species that results in maintaining a stable price for the species. I hope this answers the Canadian query.

Canadian comments:

Canada continues to be concerned about the rapidly expanding high seas drift gillnet fisheries for squid because of the possible impact of these fisheries on salmonids. Last year we noted that the Standing Committee on Biology and Research requested detailed catch and effort statistics for the Japanese squid drift gillnet fishery in the North Pacific.

Our analysis of the available data raises questions about these fisheries and we continue to request detailed and accurate information. We reiterate that it is imperative that studies be undertaken to address the impact of this fishery on our salmonid stocks.

We continue to view with concern the increasing incidence of lost and discarded nets which cannot help but reduce the numbers of salmonids returning to their countries of origin. We again request that the national sections develop systems for recording and advising the Secretariat on an annual basis on the time, place, type, and quantity of nets lost or discarded.

We have expressed our grave concern regarding the salmon fishery in the North Pacific Ocean carried out by non-Contracting Parties. This type of activity threatens the conservation of North Pacific salmon stocks. We know that both Japan and the United States share our concern on this issue.

At the fourth plenary session, the Commission formally approved the following statement for transmission to Contracting Governments:

The Commission is gravely concerned with salmon fishing on the high seas of the North Pacific Ocean conducted by vessels other than those of the Contracting Parties. This fishing activity is threatening the conservation of North Pacific salmon stocks. Therefore, the Commission RECOMMENDS that Contracting Parties take or continue to take effective action to eliminate such fishing activities on the high seas of the North Pacific Ocean.

10. ACTIVITIES OF THE COMMISSION CONCERNING NON-ANADROMOUS SPECIES

Articles of the amended Convention provide that the Contracting Parties shall work towards the establishment of an international organization with broader membership (than the three Contracting Parties) dealing with species of the Convention area other than anadromous species. The Convention also provides that pending the establishment of such an international organization, the Commission would provide a forum for cooperation among the Contracting parties with respect to the study, analysis and exchange of
scientific information and views relating to the stocks of non-anadromous species of the Convention area, including information and views relating to all relevant factors affecting these stocks, the promotion of scientific research designed to fill gaps in knowledge and the compilation and dissemination of statistics and records.

At the 1978 Annual Meeting the Commission established a Sub-Committee on Non-Anadromous Species to assume the responsibilities of the former Sub-Committees on Bering Sea and Northeast Pacific Groundfish. Within this sub-committee two panels were created to deal with matters concerning the Bering Sea and the northeast Pacific. In 1982 the responsibilities of the sub-committee were expanded to include king and tanner crab, and a working panel to consider those species was established. The King and Tanner Crab Panel was dissolved in 1983 and its responsibilities assumed by the Bering Sea Panel for the following year.

At its 1984 meeting the sub-committee received, amended, and adopted reports which had been prepared in advance by pre-designated rapporteurs for the two panels. The following is a summary of the various proceedings of the panels and the sub-committee.

1. **Bering Sea Groundfish Research**

   The Bering Sea Panel of the Sub-Committee on Non-Anadromous Species met during the early part of the week of the meeting of the Standing Committee on Biology and Research. The panel reviewed results of commercial fisheries and research on groundfish and king and tanner crab in the Bering Sea and emphasized the following points in its report to the sub-committee:

   (a) **Nature of the fishery**

   (i) Fisheries on groundfish, squid, and crab in the eastern Bering Sea and Aleutian Region operated under area-time restrictions and catch limitations established by the United States through its 200 mile extended jurisdiction authority. The United States is the only nation permitted to fish for Pacific halibut and crab in the eastern Bering Sea.

   (ii) The all-nation catch of groundfish and squid in 1983 was 1,375 million t, 55,000 more than in 1982. All-species catches by nation were: Japan, 872,163 t; United States 249,335 t; Republic of Korea, 229,255 t; and West Germany, 23,802 t. U.S. catches comprised 38,180 t by the domestic fishery, and 211,155 t by joint-venture fisheries (almost double that in 1982).

   (iii) As in past years, pollock was the predominant species in the all-nation catch of groundfish and accounted for 76% of the total. Secondary species were: (iv) Pacific cod (7%), turbots (4%), U.S. catch of halibut was 880 t.

   (iv) Incidental catches of halibut in 1983 were 790,000 fish, or 2,310 t, a decrease of 5% from the 853,000 taken in 1982. Although the incidental catch increased nearly 2% in the non-U.S. fishery, this was more than offset by a 33% decrease in U.S. joint-venture fisheries.

   (v) All-species crab landings in 1983 totalled 19,800 t - 14,300 t of tanner crab (two species) and 5,500 t of king crab (two species). For most stocks, landings have decreased in recent years.

   (b) **Status of stocks**

   (i) The condition of groundfish stocks, with the exception of pollock, Pacific ocean perch, and Greenland turbot was considered to be good or improved.

   (ii) Pollock abundance has been stable during 1975-82 but the poor recruitment of recent year classes is of concern to U.S. scientists, while Japanese scientists consider recruitment in recent years to have been average or above average.

   (iii) Pacific cod abundance has increased substantially since the mid-1970s because of strong recruitment from the 1977 year class. Abundance remained high in 1984.

   (iv) Yellowfin sole abundance remains substantially higher than during the early 1970s due to the abundant 1966-70 and 1973-76 year classes. The population is expected to remain in good condition in coming years.

   (v) Poor recruitment of juvenile Greenland turbot has led to a decline in abundance, and the stock is currently producing below the MSY level.

   (vi) Abundance of “other flatfish” is at a high level primarily because of the substantial increase in stocks of rock sole, flathead sole, and Alaska plaice.

   (vii) Sablefish abundance has improved substantially in recent years.

   (viii) Pacific ocean perch abundance remains at a low level.

   (ix) Atka mackerel resource has been in good condition in recent years.

   (x) There is little information to assess the condition of the squid resource but it is assumed to be lightly exploited.

   (xi) Substantial increases in biomass of "other species" (sculpins, sharks, skates, smelts, and octopuses) that currently have slight economic value but have potential value or are important ecosystem components indicate that these resources are in good condition.

   (xii) Abundance remains low for all species of king and tanner crab. Only Bristol Bay red king crab may be exhibiting some increase in recruitment.

   (c) **Research activities**

   (i) Japan conducted four types of surveys in late 1983 and 1984: (1) a multi-vessel survey of young pollock in the eastern Bering Sea during May-June 1984; (2) a sablefish and Pacific cod longline survey in the eastern Bering Sea and Aleutians during June-July 1984; (3) a gear-modification study to determine methods of reducing incidental catches of Pacific halibut and chinook salmon in trawl catches during November-December 1983; and (4) a spe-
cial groundfish survey in the eastern Bering Sea to study diurnal changes in CPUE and feeding habits during May-June 1984.

(ii) The United States conducted three surveys during 1984: (1) the standard crab-groundfish survey in the eastern Bering Sea during June-August; (2) an age-0 pollock survey to examine the feasibility of monitoring the abundance of this age group; and (3) a special groundfish survey to study the distribution of groundfish relative to ocean fronts, cannibalism in pollock, and to tag Pacific cod.

(iii) The IPHC conducted a longline survey for stock assessment of halibut surrounding the Pribilof Islands.

(iv) Japanese trawl-modification experiments indicated that certain adjustments did reduce the incidence of halibut and chinook salmon. Unfortunately, catches of target species were also reduced, and substantially in some cases.

(v) Results of tagging experiments revealed that: (1) halibut tagged near the Pribilof Islands migrated to the edge of the continental shelf within the Bering Sea, and also southward, in substantial numbers, to the Gulf of Alaska and southward; (2) small and medium, but not large, sablefish move predominantly northward from the western Gulf of Alaska to the continental slope of the Bering Sea.

(vi) Japan plans four research surveys in 1985: (1) spring and fall multi-vessel surveys on young pollock; (2) longline survey on sablefish and Pacific cod; (3) trawl modification studies; and (4) comprehensive crab-groundfish survey (with U.S. scientists).

(vii) United States to date have planned one survey comprehensive groundfish survey (with Japan).

(viii) IPHC plans one survey—juvenile halibut.

2. Northeast Pacific

The Northeast Pacific Panel reviewed results of commercial fisheries and research on groundfish in the northeast Pacific and emphasized the following points in its report to the Sub-Committee on Non-Anadromous Species.

(a) Nature of the fishery

(i) The groundfish fisheries in the northeast Pacific were conducted under regulations promulgated by Canada and the United States within their respective 200-mile fishery zones.

(ii) Canadian landings other than halibut increased slightly (2%) to 35,113 t in 1983. Principal species were "other rockfish" (7,024 t), Pacific ocean perch (5,655 t), Pacific cod (4,505 t), sablefish (4,414 t), and lingcod (3,755 t). Trawl landings were 28,048 t and those by other gear (trap, longline, and handline) were 6,265 t.

(iii) The U.S.S.R. received 14,192 t of hake and 25 t of pollock from Canadian vessels in the joint-venture fishery.

(iv) Polish vessels caught 13,177 t of hake in the Canadian portion of the Vancouver Area in 1983. In addition, Polish vessels received 13,465 t of hake from Canadian vessels in the joint-venture fishery.

(v) Total catch by the Japanese groundfish fishery in 1983 decreased 5.0% from 1982, to a total of 96,507 t. The trawl fishery contributed 66,090 t to this total, a decrease of 10.5% from 1982. Frozen-fish factory trawlers accounted for 50.2% (33,182 t) of the trawl catch while the surimi factory trawlers contributed the remaining 49.8% (32,900 t). Pollock, Pacific ocean perch, and arrowtooth flounder continued to be the major species in the trawl catch. Almost all of the 1983 decrease in trawl production was accounted for by decreases in Pacific ocean perch (-1,744 t), pollock (-5,627 t), "other fish" (-1,297 t), and other flounders (-1,206 t). Increases occurred in arrowtooth flounder (+2,244 t).

(vi) The total estimated catch for the Republic of Korea in the Gulf of Alaska during 1983 was 48,821 t. Principal species caught were pollock (33,633 t) and Atka mackerel (6,664 t).

(vii) The total estimated catch in the U.S. joint-venture fishery in 1983 was 216,250 t; 143,000 t in the Gulf of Alaska and 73,250 t off Washington-California.

(viii) The total halibut catch in the northeast Pacific by North American longline vessels was 22,273 t, an increase of 4,960 t.

(ix) The incidental catch of halibut in non-U.S. fisheries in the Gulf of Alaska in 1983 was 689,688 fish, an increase of 22.7% from the 1982 estimated catch. The weight (3,235 t) was a 20% increase from the 1982 catch.

(b) Status of stocks

(i) Abundance of adult halibut is increasing although the level is still below the historic high. Juvenile abundance is increasing which is considered to be another encouraging sign.

(ii) U.S. scientists feel there continues to be little evidence of any improvement in the condition of Pacific ocean perch stocks. The catch for 1983, was less than one-sixth of the ABC. Because of the slow growth rate of the individual fish and apparent lack of successful year classes, it may be several years before any significant change in the status quo can be expected. Japanese scientists consider that it is difficult to evaluate the condition of Pacific ocean perch stocks from the information obtained from the commercial fisheries due to the reductions in catch allocation.

(iii) Canadian scientists believe that Pacific ocean perch stocks off Canada have undergone considerable over-exploitation largely as a result of excessive removals by non-Canadian fleets in 1965–74, and indicate that rehabilitation of Pacific ocean perch stocks will be achieved at a fishing mortality of $F=0.06$ or lower.

(iv) Both Japanese and U.S. scientists agree that there has been an increase in the sablefish stock in the Gulf of Alaska as a result of recruitment and growth of the 1977 year class.

(v) Japanese scientists feel that the sablefish stock is in good condition and that EV should be 24,000 t. U.S. scientists consider the results of both U.S. and Japanese analyses tentative and reported that estimates of EV for the Gulf range from 10,965 t to 26,100 t. Canadian scientists report that CPUE of sablefish in the Vancouver-Charlotte Region has remained relatively stable since 1979. They
suggest the stock will experience an increase in biomass over the next few years due to the entry of the strong 1977 year class which will maximize in the recruited stock in 1987. This indicates yield can increase over the next few years to capitalize on this year class.

(iii) In 1984 the U.S. scientists reported that age 5 pollock were the dominant year class during 1983 and that the abundance of age 3 and age 4 pollock was low. Results of U.S. acoustic surveys indicate that the pollock biomass has declined from 3.8 million t in 1981 to 1.8 million t in 1984. U.S. scientists feel that it will continue to decline over the next few years. Japanese scientists believe that the total pollock stock in the Gulf of Alaska has increased recently, based on CPUE trends, and suggest that the allowable-biological catch (ABC) can be set at a level of 484,000-524,000 t.

(iv) Research activities carried out during 1984 by the International Pacific Halibut Commission included: (a) a trawl survey of juvenile halibut in the Gulf of Alaska; (b) the standardized longline survey of adult halibut in the Gulf of Alaska and off Canada in late May through early September; (c) comparative fishing between J-hooks and circle hooks off Canada and in the Kodiak Area; and (d) comparative fishing between bottom trawls and two sizes of circle hooks off Canada.

(v) Canadian research projects for 1985 are not yet finalized.

(vi) In 1985 Japan plans to continue the longline survey of sablefish and Pacific cod in 1985. Japan also plans to test modifications to gear and fishing methods to reduce the incidental catch of the minimum allocation species.

(vii) In 1985 the U.S. plans to conduct cooperative U.S.-U.S.S.R. and U.S.-R.O.K. bottom-trawl surveys; a late winter survey to monitor Pacific cod and Atka mackerel; a pre-recruit survey of groundfish species; an ichthyoplankton survey to determine the spawning period for sablefish; the annual sablefish index site survey; an acoustic-midwater trawl survey of spawning pollock in the Shelikof Strait; and a multi-discipline examination of fisheries oceanography to examine the environment in which pollock spawn.

(viii) In 1985 the International Pacific Halibut Commission will carry out a juvenile halibut survey and the standardized adult halibut survey will be continued. In addition, the field research activities required to maintain the longterm fishery data series will be continued.

3. Recommendations from the Sub-Committee on Non-Anadromous Species

The committee approved most recommendations of the Sub-Committee on Non-Anadromous Species pertaining to working group meetings and other aspects of its responsibilities.

Regarding the recommendation on submission of documents for consideration by the Sub-Committee on Non-Anadromous Species, the committee noted that not all national sections submit documents for consideration by the Standing Committee on Biology and Research in compliance with dates suggested by the Secretariat. Late submission of documents hampers the work of rapporteurs and denies participants adequate time to carefully consider the material contained therein. The committee urged compliance
with time frames proposed for submission of documents.

4. International Symposia

The Standing Committee on Biology and Research reviewed the status of publication or preparation for publication of papers presented at the 1981 Vancouver and 1983 Anchorage symposia and endorsed the planning by the organizing committee for the symposium to be held in Tokyo in 1985, October 29-31.

Topics for the 1985 Symposium, which will be held in the Ishigaki Memorial Hall of the Sankaido Building in Tokyo are:

(1) Biological interactions of fisheries resources in the North Pacific region
(2) Environmental and biological factors affecting recruitment, distribution, and abundance of non-anadromous species

During discussion of activities of the Commission concerning non-anadromous species, a spokesman for each national section made comments as follows:

United States comments:

On non-anadromous species matters, the United States would like a wider exchange of information on resources to include the western and central portion of the Convention area. This information would broaden our understanding of the scientific interrelationships between many of the resources that are common to all regions.

Regarding the International Groundfish Symposium, the United States is pleased that organization of the 1985 symposium is proceeding as scheduled. We look forward to an informative exposure to many scientists who work on similar topics as we do, but who are not usual participants to INPFC. We continue to support the continuation of the symposia concept to broaden our discussions at INPFC.

In this regard, we must also note that the number of nations fishing in the North Pacific is increasing, and it becomes more important that scientists from other countries be involved in contributing to the work of the Commission. We cannot forget that the INPFC is charged by its Protocol to work "toward establishment of an international organization with broader membership dealing with species other than anadromous species". We hope to explore this subject further with the other national sections.

Canadian comments:

The need to acquire more information on the fisheries resources in the North Pacific is critical and essential for the Commission and its dedicated scientists. Canada strongly supports the work of the groundfish symposium and the scientific exchange it provides. We urge all national sections to support an increase of participants from non-contracting countries in the symposia. Canada has always enthusiastically supported free exchange of data among scientists of all national sections. We are very concerned that certain data presented are being questioned with respect to their validity. Indeed the threat of misinformation is a threat to the very fabric of the Commission itself.

Japanese comments:

We are very satisfied that intensified joint research efforts have resulted in a great increase in scientific information on stocks of non-anadromous species in the North Pacific and that as a result the gap in views on stock conditions among the three nations is being narrowed. We also note with satisfaction that such research indicates generally healthy conditions of stocks of these species in the Bering Sea, the Aleutians area, and in the Gulf of Alaska. We earnestly hope that these views of the scientists of all of the three national sections regarding the healthy stock conditions in these waters will be taken into consideration in managing the fisheries within the United States 200 mile zone thus allowing effective utilization of the resources.

It is regrettable that there is a difference in results of U.S. and Japanese stock assessments on pollock, an important species in the Bering Sea and Gulf of Alaska. We feel it would be desirable for joint field research to be intensified in order to solve this question.

11. Activities of the Commission Concerning Marine Mammals

At the 1978 Annual Meeting the Commission established an Ad Hoc Committee on Marine Mammals to consider the question of marine mammals incidentally caught in the Convention area when fishing was being conducted for anadromous species. To aid in the conduct of the committee's work the Commission subsequently established a Scientific Sub-Committee of the Ad Hoc Committee on Marine Mammals.

The committee proper has met during the week of the plenary sessions, but the scientific sub-committee has held its meetings in late winter or early spring prior to initiation of the Japanese high seas fishery for salmon.

At the 1984 Annual Meeting the Commission received a report from the Ad Hoc Committee on Marine Mammals to which it had referred the agenda item "Consideration of status of Article X and Annex 1(c) with respect to anadromous species in the Convention area and species of marine mammals caught in fishing for anadromous species". The chairman of the committee, Mr. Joseph A. Garcia of Canada, submitted his report at the fourth plenary session. In the report it was recorded that the scientific sub-committee, chaired by Dr. Shigeru Odate of Japan, had met in Tokyo, March 5 to 9, 1984. At that meeting the sub-committee had reviewed research activities in 1983, various research programs, and planned research activities in 1984. The 1983 research activities included estimation of population sizes of Dall's porpoise which ranged from 1.0 to 2.5 million individuals and tests of modifications to gear.
to reduce the incidental catch rates of Dall’s porpoise. Analyses of vocalization of Dall’s porpoise, their responses to supersonic waves, and field experiments on acoustic devices were also continued. Surveys in areas outside the salmon mothership grounds and in non-fishing seasons showed that areas of distribution are separated for females, males, and mother and calf pairs of Dall’s porpoise. Exchanges of tooth section slides for cross checks of age determination were agreed upon and the United States continued its study of responses of Dall’s porpoise to vessels. The committee heard preliminary summaries of research activities in 1984 given by Japanese and United States scientists which included studies similar to those conducted in 1983.

The Report of the Ad Hoc Committee on Marine Mammals was adopted including the recommendations: (1) that its scientific sub-committee meet in Tokyo in February or March 1985; (2) for continuation of committee activities and those of its scientific sub-committee; and (3) that the life of the Ad Hoc Committee on Marine Mammals be the subject of discussion at the 1986 Annual Meeting of the Commission.

12. Publications of the Commission

The Commission publishes an Annual Report, a Bulletin, and a Statistical Yearbook. The Annual Report and Bulletin are published in separate English and Japanese versions of identical content. The Bulletin is published at irregular intervals. The statistical Yearbook contains data on catches of species of interest to the work of the Commission. Information on the current status of these three publications is given in the Administrative Report section and on the back cover of this Annual Report.

13. Officers Elected for 1985

The Commission elected the following officers for 1985 in accordance with its Rules of Procedure:

Chairman of the Commission
Mr. Kenjiro Nishimura of Japan

Vice-Chairman of the Commission
Mr. Clement V. Tillion of the United States

Secretary of the Commission
Dr. John C. Davis of Canada

Chairman of the Standing Committee on Biology and Research
Mr. Tojiro Nakabe of Japan

Chairman of the Standing Committee on Finance and Administration
Mr. Shintaro Yamashita of Japan

Chairman of the Ad Hoc Committee on Marine Mammals

Mr. Ryuichi Tanabe of Japan

Terms of all officers of the Commission begin with the adjournment of the annual meeting and continue until the adjournment of the subsequent annual meeting.

14. Closing Remarks at the Final Plenary Session

Concluding statements were made by a spokesman for each of the national sections and by the Chairman of the Commission as follows:

Closing remarks by Commissioner Dayton L. Alver-son on behalf of the United States National Section:

On behalf of the United States National Section, I would like to make some closing remarks at this 31st Annual Meeting. First of all, I would like to express our appreciation for the progress made by our scientists in answering some of the difficult questions placed before them. The United States is gratified by the scientific efforts of all the national sections, which form such an integral part of this Commission's activities. We look forward to next year's groundfish symposium which we hope will lead to a greater exchange of information among the nations of the North Pacific.

In the past week, we have emphasized the continuing concern of the United States over the interception of North American salmon and steelhead by the high seas fisheries. Starting new information presented at this annual meeting indicates that these interceptions are much more extensive than previously believed. In particular, the high seas fishery has been found to take an alarmingly high number of Alaska chinook salmon vital for that state's economy and for subsistence use. We have had frank and productive discussions with our Japanese and Canadian colleagues and are confident that we can work together towards a solution of this important problem.

To our Canadian hosts, we extend our sincere thanks for a most pleasant and rewarding meeting. We particularly want to thank you for the superb reception at the Vancouver Aquarium and for your warm hospitality. We also wish to express our appreciation to the Executive Secretary and his staff for their diligent work which has contributed so much to the success of this meeting. In this regard, we express particular thanks to Mr. Takehama and wish him well in his future endeavors.

This Commission has an impressive record of scientific and management accomplishments and has served as an important forum for international cooperation. We look forward to our meetings next year in Tokyo where we can continue the rewarding work of this Commission.

Closing remarks by Commissioner Tojiro Nakabe on behalf of the Japanese National Section:

At the closing of the 31st Annual Meeting of the International North Pacific Fisheries Commission I would like to say a few words on behalf of the Japanese National Section.

At the Biology and Research Committee meetings held prior to the plenary meetings, it was noted that cooperation among the three contracting nations in the area of research continued to
be intensified and as a result useful and reliable information was
cumulated and included in its report. For this achievement
I would like to pay high tribute to the scientists involved for their
efforts.

We believe that non-anadromous species generally enjoy
healthy stock conditions and we hope that such conclusions on
evaluation of the stock conditions will be reflected in rational
management of the resources in the North Pacific Ocean.

As for the anadromous species and chinook salmon in par-
icular, for which the United States and Canada have expressed
special concern, I would like once again to emphasize the need
for increased data and for improvement of analytical metho-
dology.

I would also like to reiterate here that even though the Japa-
nese salmon fisheries target mainly on salmon of Asian origin,
our mothership fishery has been implementing voluntary re-
straints from the year 1984 which are even more restrictive than
in the past.

On the matter of the marine mammals, we are pleased that
considerable knowledge has accumulated as a result of vigorous
research efforts. I would like to request, however, better un-
derstanding and cooperation of the people associated with the
INPFC so that Japanese fishermen will not be subjected to ex-
cessive economic and technical burdens when the United States
develops "research action plans" in their North Pacific Fisheries
Act and when they determine the level of increase in the propor-
tion of vessels which should use the modified gears to reduce in-
cidental take of marine mammals.

Finally, I would like to pay high tribute on behalf of the Japa-
nese National Section to Chairman Dr. Davis for having con-
ducted our meetings in an efficient manner and to thank the
members of the Canadian and United States National Sections
for their contribution to the smooth progress of our deliberations
at this annual meeting.

At the same time I wish to compliment Executive Director Dr.
Forrester and his Secretariat staff as well as the interpreters
for their hard work and extend our gratitude to them and in par-
cular to Mr. Takehama, the Assistant Director, who will be com-
pleting his term of duty early next year. We thank you very
much for your work of three years.

I also add that we, the Japanese National Section, as the coun-
try of origin of Mr. Takehama, will be looking forward to
his return to his river of origin.

Closing remarks by Commissioner D. F. Miller on behalf of the Canadian National Section:

We have come to the end of an interesting and challenging
annual meeting. Many issues have been discussed and I believe
we have made some progress. In these closing remarks, I would
like to touch on those issues of particular interest to the Canadian
National Section.

We are gratified with the continued advance in our knowledge
on the continent of origin of salmonids occurring on the high
sea. However, this new information heightens our concerns
about the interception of Canadian salmonids. In particular, we
are most concerned about steelhead and Canadian Yukon River
chinook.

There is a substantial incidental catch of North American
steelhead trout by the high seas salmon fisheries which we estimate
to be a minimum 30% of Canadian origin. The Canadian
Government is under increased pressure to provide effective pro-
tection for this most valuable British Columbian recreational re-
source. Canada therefore strongly recommends measures to
decrease fishing effort from May to mid-July in INPFC Areas
4265, 4270, and 4470. We are also alarmed about the new
evidence demonstrating that Canadian steelhead are being taken
by the mothership fishery in the Aleutian area. Canada requests Japan to take steps to eliminate this interception.

On the matter of Canadian Yukon River chinook salmon, we
continue to view with concern the catch of these fish in the
mothership fishery in the Bering Sea. Canada therefore requests
that Japan take all measures possible to eliminate this catch.

We are also concerned with the new evidence that indicates
that Canadian Yukon River chinook may also be taken in the
high seas salmon fisheries in the North Pacific Ocean. We look
forward to the results of further research on this question.

In view of our concerns we strongly support the continuation
of studies on the continent of origin of salmonids.

The problem of lost and intentionally discarded nets is of con-
cern to Canada and other countries. Because the gillnet fisheries
are extensive and increasing, the problem of lost and discarded
gear continues to escalate. The resulting marine life mortalities
are needless and should be eliminated.

We have already expressed our grave concern regarding the
salmon fishery in the North Pacific Ocean carried out by non-
Contracting Parties. This activity threatens the conservation of
North Pacific salmon stocks. We know that both Japan and
the United States share our concern on this issue and that we will
all take whatever action is necessary to bring this fishery to a
halt.

This Commission fulfills an important function by encourag-
ing a broader exchange of scientific knowledge. The workshops,
joint surveys, joint comprehensive reports, and the scientific symp-

owa all contribute to better understanding of the marine re-

sources of the North Pacific Ocean. Canada continues to sup-
port and encourages the expansion of these scientific activities.

We should like to express our appreciation to the scientists
from all national sections who diligently strive to increase our
knowledge of the fish stocks of the North Pacific Ocean.

We should also like to thank the interpreters for their most
commendable service. Without their dedicated efforts and expert
contribution, the effectiveness of the Commission would be
hampered.

To the Executive Director and the staff of the Secretariat, we
extend our sincere thanks for all the time and effort which they
have expended in order to make this annual meeting productive.
We also recognize that the work you do is not confined to a few
weeks but takes place every week of the year. We wish to com-
}
of the participants for joining us in Vancouver and we look forward to our 32nd Annual Meeting in Tokyo, Japan. We wish you a safe journey home.

Closing remarks by Dr. John G. Davis, Chairman of the Commission, at the Final Plenary Session of the 31st Annual Meeting:

Over the past few days it has become abundantly clear that what makes this Commission work and allows for resolution of difficult issues is the hard work, professionalism, and dedication of the people associated with INPFC. Many individuals have devoted their time and effort to making this meeting a success. Our Commissioners, scientists, advisers, and support staff have all cooperated in a highly effective manner, both preceding this meeting and over the busy schedule we have followed in pursuit of our business.

I should particularly like to thank the Executive Director and the staff of the Secretariat who spend many hours in preparing for our meeting and who so ably manage all the essential support functions which make this meeting and our annual business a success. In addition, we should console Dr. Forrester and those individuals who spent long and difficult hours in the Standing Committee on Finance and Administration discussing the budget. The fact that those difficult discussions finally ended in resolution is a tribute to the energy and persistence of all!

Ladies and gentlemen, during the last few days we have accomplished much demonstrating once again the benefit of this Commission to the conservation of the fishery resources of the North Pacific Ocean. I believe that all national sections have affirmed their dedication to the provision of accurate, complete, and timely scientific information which is the very cornerstone of our deliberations.

While we have not totally resolved all the issues before us, we take heart in knowing that during this week we have moved a step closer to their eventual resolution. It is only through a forum such as INPFC and a free and frank exchange of ideas and information that we can hope to deal with the complex and dynamic issues in the world of fisheries management.

As each of you prepares to leave, some to travel great distances, I again thank you for your support and consideration during this past week. Until we meet again next year in Tokyo, I wish you a good and safe journey and every success in the coming year.
APPENDIX 1

LIST OF PARTICIPANTS

31st ANNUAL MEETING—1984

Vancouver, Canada, October 25 to November 8, 1984

OFFICERS OF THE MEETING

Chairman ............................................... John C. Davis
Vice-Chairman ......................................... Kenjiro Nishimura
Secretary ................................................ Dayton L. Alverson

CANADA

Commissioners

John C. Davis
Ottawa, Ontario
Donovan F. Miller
Vancouver, British Columbia

Joseph A. Garcia
Bamfield, British Columbia
Michael Z. Florian
Prince Rupert, British Columbia

Alternate Commissioner

Wayne Shinners
Vancouver, British Columbia

Advisory Committee

E. Anthony
S. Dickens
T. Earl

T. G. Halsey
L. Iverson
D. McEachern

F. Penland
R. Thomas

Advisers and Experts

R. Ablett
C. Allen
T. Beacham
R. J. Beamish
F. Bernard
M. Bigg
D. Chilton
J. Fargo

M. Henderson
S. McFarlane
L. Margolis
F. D. Martens
R. Morley
L. Richards
M. Saunders

B. Shaw
R. Stanley
P. Starr
A. V. Tyler
S. J. Westrheim
C. Wood
E. Zyblut

JAPAN

Commissioners

Kenjiro Nishimura
Tokyo, Japan
Shintaro Yamashita
Tokyo, Japan

Tojiro Nakabe
Tokyo, Japan
Ryuichi Tanabe
Tokyo, Japan
Alternate Commissioner
Kenzo Kawakami

Special Advisor
Kunio Katakura

Advisers and Experts
Ministry of Foreign Affairs
Yoshiaki Ito
Toshiyuki Iwado

Fisheries Agency of Japan
Keisuke Okada
Mamoru Kato
Kiyoshi Wakabayashi
Toshihiko Okazaki
Daishiro Nagahata

Others
Hiroshi Ogiwara
Shintaro Enomoto
Katsuhiko Tokusa
Kiyoshi Kurita

UNITED STATES

Commissioners
Dayton L. Alverson
Seattle, Washington
Robert W. McVey
Juneau, Alaska
Robert M. Thorstenson
Seattle, Washington
Clement Tillion
Halibut Cove, Alaska

Advisory Committee
D. R. Allison
J. Gilbert
H. Mitchell
R. Alverson
J. A. Hanson
R. Moos
J. Bergy
G. Jensen
K. W. Specking
A. R. Burch
R. B. Lauber
J. Stephan
J. Easley
C. H. Meacham

Advisers and Experts
M. S. Alton
M. L. Dahlberg
K. W. Myers
W. Aron
S. Davis
R. S. Otto
R. G. Bakkala
R. Ford
S. Pennoyer
K. T. Beiningen
J. C. Hammond
D. Rogers
J. Breiwick
C. K. Harris
L. L. Ronholt
E. Brown
D. Ito
C. S. Rose
R. L. Burgner
L. L. Jones
A. M. Shimada
N. Cohen
L. L. Low
G. D. Stauffer
J. Cunningham
C. P. Meacham
C. Walters
CONSULTANTS—OBSERVERS

International Pacific Halibut Commission

D. A. McCaughran
R. J. Myhre
C. C. Schmitt
G. H. Williams

SECRETARIAT

Permanent
C. R. Forrester
Shuichi Takehama
Evelyn Funk
Annette Hansen
J. T. Yokoyama

Interpreters:
Toshiko Adilman
Taka Crowston
Fumiko Gregg
Mieko Kondo

MEMBERSHIP OF COMMITTEES

1. Standing Committee on Finance and Administration

Canada
Commissioner-member: D. F. Miller
Commissioner-advisers:
J. C. Davis
M. Z. Florian
Advisers:
R. Ablett
C. Allen
D. Martens
R. Morley

Japan
Commissioner-member: Shintaro Yamashita
Commissioner-advisers:
Kenjiro Nishimura
Kenzo Kawakami
Toshiihiko Okazaki
Daishiro Nagahata
Toshiyuki Iwado

United States
Commissioner-member: R. M. Thorstenson
Commissioner-advisers:
D. L. Alverson
R. W. McVey
R. Ford
J. Gilbert
J. C. Hammond
G. Jensen
R. Moss
K. Specking
C. Walters
C. R. Forrester
Shuichi Takehama

Secretariat
Ex officio:
M. Z. Florian
J. C. Davis
J. A. Garcia
R. J. Beamish
L. Margolis
B. Shaw
R. Stanley

2. Standing Committee on Biology and Research

Canada
Commissioner-member: M. Z. Florian
Commissioner-advisers:
J. C. Davis
J. A. Garcia
Advisers:
R. Ablett
T. Beacham
F. Bernard
J. Fargo
T. G. Halsey
M. Henderson
S. McFarlane
L. Richards
M. Saunders

**JAPAN**

Commissioner-member: Tojiro Nakabe
Commissioner-adviser: Ryuichi Tanabe
Scientist-members:
Advisers:

**UNITED STATES**

Commissioner-member: D. L. Alverson
Commissioner-adviser: R. L. Burgner
Scientist-members:
Advisers: R. Alverson
M. S. Alton
W. Aron
R. G. Bakkala
K. T. Beiningen
E. Brown
M. L. Dahlberg
S. Davis
J. Easley
C. K. Harris
D. Ito

**SECRETARIAT**

Ex officio

**3. Ad Hoc Committee on Marine Mammals**

**CANADA**

Commissioner-member: J. A. Garcia
Commissioner-advisers:
Scientist-members:
Advisers:

**JAPAN**

Commissioner-member: Kenjiro Nishimura
Commissioner-advisers:
Scientist-members:
Advisers: Ryuichi Tanabe
Kenzo Kawakami
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<table>
<thead>
<tr>
<th>UNITED STATES</th>
<th>Commissioner-member:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>R. W. McVey</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Scientist-member:</th>
</tr>
</thead>
<tbody>
<tr>
<td>L. L. Jones</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Advisers:</th>
</tr>
</thead>
<tbody>
<tr>
<td>D. Allison</td>
</tr>
<tr>
<td>W. Aron</td>
</tr>
<tr>
<td>J. Bergy</td>
</tr>
<tr>
<td>J. Breiwick</td>
</tr>
<tr>
<td>A. Burch</td>
</tr>
<tr>
<td>R. Ford</td>
</tr>
<tr>
<td>J. Hanson</td>
</tr>
<tr>
<td>R. Lauber</td>
</tr>
<tr>
<td>C. R. Forrester</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SECRETARIAT</th>
<th>Ex officio</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

|                                           |
|                                           |

|                                           |
|                                           |
APPENDIX 2

AGENDA AS ADOPTED

31st ANNUAL MEETING—1984

Vancouver, Canada, October 25 to November 8, 1984

1. Opening addresses and introductions
2. Adoption of agenda
3. Report on delegation memberships
4. Meeting procedures
   (a) Attendance at meetings
   (b) Schedule of sessions
   (c) Press policy
   (d) Minutes
5. Report of the Chairman
6. Submission of reports by the Secretariat
7. Consideration of research results, research planning, and publications
   (a) Salmonids and oceanography
   (b) Non-anadromous species (Bering Sea, northeast Pacific groundfish, and
       king and tanner crab)
   (c) Publication of research results and statistics
8. Actions required for implementation of Article III 1. (d) with respect to salmon
9. Consideration of other fisheries in the Convention area and their effect on
   anadromous species
10. Consideration of status of Article X and Annex I (c) with respect to anadro-
    mous species in the Convention area and species of marine mammals caught
    in fishing for anadromous species
11. Review of the Annex under Article III 1. (c)
12. Consideration of status of implementation of Articles III 1. (e) and IX 2.
13. Consideration of administrative and fiscal matters
    (a) Accounts and audit
    (b) Financial situation in current fiscal year
    (c) Budget estimate for fiscal year beginning July 1, 1985
    (d) Budget forecast for fiscal year beginning July 1, 1986
    (e) Administrative report for 1984
    (f) Schedule of future meetings
    (g) Other matters
14. Election of officers
15. Other business
16. Closing remarks
AUDITORS' REPORT—JUNE 30, 1984

APPENDIX 3

AUDITORS' REPORT TO THE COMMISSION

PEAT, MARWICK, MICHELL, & CO.
Chartered Accountants
Suite 2400—1055 West Georgia Street
P.O. Box 11150, Royal Centre
Vancouver, British Columbia
V6E 3P3

We have examined the statement of assets and liabilities of the International North Pacific Fisheries Commission as at June 30, 1984 and the statement of income and expenditure, changes in working capital fund and changes in cash for the year then ended. Our examination was made in accordance with generally accepted auditing standards, and accordingly included such tests and other procedures as we considered necessary in the circumstances.

In our opinion, these financial statements present fairly the financial position of the Commission as at June 30, 1984 and the results of its operations and changes in cash for the year then ended in accordance with accounting principles generally accepted for non-profit organizations applied on a basis consistent with that of the preceding year.

PEAT, MARWICK, MITCHELL & CO.
Chartered Accountants
Vancouver, British Columbia, Canada
August 3, 1984

STATEMENT OF ASSETS AND LIABILITIES
June 30, 1984
(With comparative figures for 1983)

<table>
<thead>
<tr>
<th>Assets</th>
<th>1984</th>
<th>1983</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cash and term deposits</td>
<td>$154,013.68</td>
<td>224,279.96</td>
</tr>
<tr>
<td>Interest receivable</td>
<td>587.00</td>
<td>666.00</td>
</tr>
<tr>
<td>Advance to assistant director</td>
<td>—</td>
<td>3,890.00</td>
</tr>
<tr>
<td>Equipment, at cost</td>
<td>34,378.07</td>
<td>35,212.50</td>
</tr>
<tr>
<td>Less accumulated depreciation</td>
<td>17,908.87</td>
<td>14,946.90</td>
</tr>
<tr>
<td>Accrued expenses</td>
<td>16,469.20</td>
<td>20,265.60</td>
</tr>
<tr>
<td>Contributions received in advance from Contracting Parties</td>
<td>$61,900.00</td>
<td>24,000.00</td>
</tr>
<tr>
<td>Advances from Contracting Parties representing the Working Capital Fund: Contingency fund (Note 2): Pension reserve</td>
<td>—</td>
<td>14,594.96</td>
</tr>
<tr>
<td>Reserve for year ended June 30, 1984</td>
<td>—</td>
<td>46,268.00</td>
</tr>
<tr>
<td>Reserve for year ended June 30, 1985</td>
<td>—</td>
<td>54,660.00</td>
</tr>
<tr>
<td>Total contingency fund</td>
<td>67,328.68</td>
<td>115,522.96</td>
</tr>
<tr>
<td>Severance pay reserve</td>
<td>7,772.00</td>
<td>5,637.00</td>
</tr>
<tr>
<td>Moving expense reserve</td>
<td>17,600.00</td>
<td>10,600.00</td>
</tr>
<tr>
<td>Travel expenses—1983 Groundfish Symposium</td>
<td>—</td>
<td>20,000.00</td>
</tr>
<tr>
<td>Recorded value of equipment</td>
<td>16,469.20</td>
<td>20,265.60</td>
</tr>
<tr>
<td>Total Working Capital Fund</td>
<td>$109,169.88</td>
<td>172,025.56</td>
</tr>
<tr>
<td>Pension plan commitment (Note 3).</td>
<td>$171,069.88</td>
<td>249,101.56</td>
</tr>
</tbody>
</table>

See accompanying notes to financial statements.
### Statement of Income and Expenditure

Year ended June 30, 1984  
(With comparative figures for 1983)

<table>
<thead>
<tr>
<th></th>
<th>1984</th>
<th>1983</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Income:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Contributions from Contracting Parties</td>
<td>$318,456.00</td>
<td>$318,456.00</td>
</tr>
<tr>
<td>Interest earned</td>
<td>18,499.21</td>
<td>25,694.49</td>
</tr>
<tr>
<td></td>
<td>$336,955.21</td>
<td>$344,150.49</td>
</tr>
<tr>
<td><strong>Expenditure:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Personnel services</td>
<td>219,460.31</td>
<td>199,894.18</td>
</tr>
<tr>
<td>Travel</td>
<td>36,408.77</td>
<td>28,799.11</td>
</tr>
<tr>
<td>Communications</td>
<td>10,730.95</td>
<td>9,795.14</td>
</tr>
<tr>
<td>Contractual services</td>
<td>99,328.49</td>
<td>70,755.30</td>
</tr>
<tr>
<td>Supplies</td>
<td>6,534.44</td>
<td>6,280.56</td>
</tr>
<tr>
<td>Depreciation</td>
<td>3,437.83</td>
<td>3,455.79</td>
</tr>
<tr>
<td>Net loss on sale of equipment</td>
<td>8.57</td>
<td>-</td>
</tr>
<tr>
<td>Annual meeting rentals</td>
<td>29,056.78</td>
<td>8,459.56</td>
</tr>
<tr>
<td>Moving expenses</td>
<td>-</td>
<td>(500.00)</td>
</tr>
<tr>
<td>Groundfish Symposium 1983</td>
<td>24,522.03</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td><strong>429,488.17</strong></td>
<td><strong>326,919.58</strong></td>
</tr>
<tr>
<td><strong>Excess (deficiency) of income over expenditure</strong></td>
<td><strong>$(92,532.96)</strong></td>
<td><strong>17,230.91</strong></td>
</tr>
<tr>
<td>transferred to (from) Working Capital Fund</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### Status of Appropriations

<table>
<thead>
<tr>
<th></th>
<th>Original budget appropriations</th>
<th>Appropriations as modified by transfers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Personnel services</td>
<td>$215,874.00</td>
<td>219,460.31</td>
</tr>
<tr>
<td>Travel</td>
<td>33,700.00</td>
<td>36,408.77</td>
</tr>
<tr>
<td>Communications</td>
<td>8,400.00</td>
<td>10,730.95</td>
</tr>
<tr>
<td>Contractual services</td>
<td>86,750.00</td>
<td>99,328.49</td>
</tr>
<tr>
<td>Supplies</td>
<td>6,500.00</td>
<td>6,534.44</td>
</tr>
<tr>
<td>Depreciation</td>
<td>2,000.00</td>
<td>3,437.83</td>
</tr>
<tr>
<td>Loss on sale of equipment</td>
<td>-</td>
<td>8.57</td>
</tr>
<tr>
<td>Annual meeting rentals</td>
<td>19,500.00</td>
<td>29,056.78</td>
</tr>
<tr>
<td>Moving expenses</td>
<td>7,000.00</td>
<td>-</td>
</tr>
<tr>
<td>Groundfish Symposium 1983</td>
<td>-</td>
<td>24,522.03</td>
</tr>
<tr>
<td></td>
<td><strong>$379,724.00</strong></td>
<td><strong>429,488.17</strong></td>
</tr>
</tbody>
</table>

See accompanying notes to financial statements.
AUDITORS’ REPORT—JUNE 30, 1984

STATEMENT OF CHANGES IN CASH
Year ended June 30, 1984
(With comparative figures for 1983)

<table>
<thead>
<tr>
<th></th>
<th>1984</th>
<th>1983</th>
</tr>
</thead>
<tbody>
<tr>
<td>Source of cash:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Contributions from Contracting Parties</td>
<td>$265,380.00</td>
<td>318,456.00</td>
</tr>
<tr>
<td>Interest</td>
<td>18,578.21</td>
<td>26,128.49</td>
</tr>
<tr>
<td>Repayment of advance to Assistant Director</td>
<td>3,890.00</td>
<td>4,668.00</td>
</tr>
<tr>
<td></td>
<td>$287,848.21</td>
<td>349,252.49</td>
</tr>
<tr>
<td>Use of cash:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Personnel services</td>
<td>189,783.03</td>
<td>172,892.93</td>
</tr>
<tr>
<td>Travel</td>
<td>36,408.77</td>
<td>28,799.11</td>
</tr>
<tr>
<td>Communications</td>
<td>10,730.95</td>
<td>9,795.14</td>
</tr>
<tr>
<td>Contractual services</td>
<td>61,428.49</td>
<td>63,655.30</td>
</tr>
<tr>
<td>Supplies</td>
<td>6,534.44</td>
<td>6,260.56</td>
</tr>
<tr>
<td>Equipment</td>
<td>(350.00)</td>
<td>2,199.50</td>
</tr>
<tr>
<td>Annual meeting rentals</td>
<td>29,056.78</td>
<td>8,459.50</td>
</tr>
<tr>
<td>Moving expenses</td>
<td></td>
<td>(500.00)</td>
</tr>
<tr>
<td>Groundfish Symposium</td>
<td>24,522.03</td>
<td></td>
</tr>
<tr>
<td></td>
<td>$358,114.49</td>
<td>291,562.04</td>
</tr>
<tr>
<td>Excess (deficiency) of source of cash</td>
<td>(70,266.28)</td>
<td>57,690.45</td>
</tr>
<tr>
<td>over use of cash</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cash balance, beginning of year</td>
<td>$224,279.96</td>
<td>166,589.51</td>
</tr>
<tr>
<td>Cash balance, end of year</td>
<td>$154,013.68</td>
<td>224,279.96</td>
</tr>
</tbody>
</table>

See accompanying notes to financial statements.

STATEMENT OF CHANGES IN WORKING CAPITAL FUND
Year ended June 30, 1984

<table>
<thead>
<tr>
<th></th>
<th>Contingency fund</th>
<th>Severance pay reserve</th>
<th>Moving expense reserve</th>
<th>Groundfish Symposium</th>
<th>Recorded value of equipment</th>
<th>Total Working Capital Fund</th>
</tr>
</thead>
<tbody>
<tr>
<td>Balance, beginning of year</td>
<td>$115,522.96</td>
<td>5,637.00</td>
<td>10,600.00</td>
<td>20,000.00</td>
<td>20,265.60</td>
<td>172,025.56</td>
</tr>
<tr>
<td>Levies</td>
<td>29,677.28</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>29,677.28</td>
</tr>
<tr>
<td></td>
<td>145,200.24</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>201,702.84</td>
</tr>
<tr>
<td>Excess (deficiency) of income</td>
<td>(92,532.96)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>(92,532.96)</td>
</tr>
<tr>
<td>over expenditure, per attached statement</td>
<td>52,667.28</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>109,169.88</td>
</tr>
<tr>
<td>Transfers</td>
<td>14,661.40</td>
<td>2,135.00</td>
<td>7,000.00</td>
<td>(20,000.00)</td>
<td>(3,796.40)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>134,493.80</td>
<td>4,270.00</td>
<td>14,000.00</td>
<td>(20,000.00)</td>
<td>(3,796.40)</td>
<td></td>
</tr>
<tr>
<td>Balance, end of year</td>
<td>$67,328.68</td>
<td>7,772.00</td>
<td>17,600.00</td>
<td>—</td>
<td>16,469.20</td>
<td>109,169.88</td>
</tr>
</tbody>
</table>

See accompanying notes to financial statements.

NOTES TO FINANCIAL STATEMENTS
June 30, 1984

Significant accounting policy:
1. The accompanying financial statements are prepared on the historic cost basis in accordance with accounting principles generally accepted for non-profit organizations in Canada and conform in all material respects to International Standards.

2. Contingency fund and reserves:
   In the current year, the pension reserves and the reserves for the years ended June 30, 1984 and 1985 have been reclassified under the caption contingency fund.

3. Pension plan commitment:
   Based on an actuarial re-evaluation the Commission has an unfunded past service liability of approximately $57,000.00. The Commission has been advised to amortize this liability over a period of 15 years with annual payments of approximately $6,300.00. As at June 30, 1984, a funding policy has not been approved by the Commission.
II. ADMINISTRATIVE REPORT FOR 1984

C. R. Forrester
Executive Director

1. CONTENT OF THE REPORT

This report provides information on actions of the Commission between the 30th (1983) and 31st (1984) Annual Meetings, describes actions taken with respect to decisions made at the 30th Annual Meeting and summarizes activities of the Secretariat. The period covered is from the adjournment of the 30th Annual Meeting, 1983 November 3, to 1984 October 15.

The report will be submitted to the Commission at the 31st Annual Meeting, reviewed by the Standing Committee on Finance and Administration, and brought up to date as of 1984 November 6 when the 31st Annual Meeting is convened, for publication in the Annual Report for 1984.

2. MEMBERS

Membership of the Commission during the period covered by this report was as follows—

**CANADA**
- Gary C. Vernon (to 1984 March 30)
- John C. Davis (from 1984 October 15)
- Donovan F. Miller
- Michael Z. Florian
- Joseph A. Garcia

**JAPAN**
- Kenjiro Nishimura
- Shintaro Yamashita
- Keiichi Nakajima (to 1984 October 30)
- Ryuichi Tanabe (from 1984 October 30)
- Shunichi Ohkuchi (to 1984 October 2)
- Tojiro Nakabe (from 1984 October 2)

**UNITED STATES**
- Elmer E. Rasmuson (to 1984 June)
- Robert W. McVey
- Robert M. Thorstenson
- Dayton L. Alverson
- Clement V. Tillion (from 1984 November 5)

3. OFFICERS

Officers of the Commission for the period were as follows—

Chairman of the Commission
- Mr. Gary C. Vernon of Canada (to 1984 March 30)
- Dr. John C. Davis of Canada (from 1984 October 15)
- Vice-Chairman of the Commission
- Mr. Kenjiro Nishimura of Japan
- Secretary of the Commission
- Dr. Dayton L. Alverson of the United States
- Chairman of the Standing Committee on Biology and Research
- Mr. Michael Z. Florian of Canada
- Chairman of the Standing Committee on Finance and Administration
- Mr. Donovan F. Miller of Canada
- Chairman of the Ad Hoc Committee on Marine Mammals
- Mr. Joseph A. Garcia of Canada

4. EDITORIAL REFEREES

Editorial Referees, as of 1984 October 1, are—

**CANADA**
- Dr. Richard J. Beamish

**JAPAN**
- Dr. Ikuo Ikeda

**UNITED STATES**
- Dr. Loh-Lee Low

5. STAFF

C. R. Forrester continued through the period as Executive Director, Shuichi Takehama as Assistant Director, Evelyn Funk as Administrative Assistant, Annette Hansen as Secretary, and Jonathan T. Yokoyama as Clerk-Translator.

6. INTERIM APPROVALS OF THE COMMISSION

From the adjournment of the 30th Annual Meeting (1983) through 1984 October 15, the following Commission approvals were obtained by correspondence—

(a) Publications


ii. Masu salmon Bulletin (No. 43) (Circular Letters No. 1448, 1984 February 14 and No. 1455, 1984 May 7)


(b) Proceedings of the 30th Annual Meeting
   i. Summary minutes of the Third and Fourth (final) Plenary Sessions and Distribution List (Circular Letters No. 1445, 1983 November 18 and No. 1457, 1984 May 23)

(c) Matters concerning the 31st Annual Meeting
   i. Tentative agenda (Circular Letter No. 1463, 1984 July 26)
   ii. Invitation of observers from other interested countries
       The Secretariat asked for submission of requests on this matter for approval by the Commission (Circular Letter No. 1461, 1984 July 24). No requests were received.

(d) Staff
   The Executive Director was requested to extend his term of employment (due to expire in January 1985) to January 1986. All national sections approved the request and extension. A Nominating Committee was established to select a successor for the Assistant Director whose term with the Commission expires at the end of February 1985 (Circular Letter No. 1465, 1984 August 16).

7. INTERIM MEETINGS
   The Commission did not hold any meetings in the period between the 30th and 31st Annual Meetings but the following meetings were held—

(a) Working Group on Joint Surveys of the Subcommittee on Non-Anadromous Species
   1983 October 31 to November 4, Seattle, Washington, co-chaired by R. Bakkala and L. Ronholt. The report of this meeting was submitted to the Subcommittee on Non-Anadromous Species.

(b) Ad Hoc Salmon Research Coordinating Group
   The eighth meeting of the group was held in Tokyo, 1984 February 27 to March 2 with participants from each country and the Secretariat. S. Odate of Japan chaired the meeting, the report of which was submitted to the Sub-Committee on Salmon.

(c) Scientific Sub-Committee of the Ad Hoc Committee on Marine Mammals
   The sixth meeting of the Scientific Sub-Committee of the Ad Hoc Committee on Marine Mammals was held in Tokyo, 1984 March 5 to 9 with participants from Japan, the United States, and the Secretariat. S. Odate of Japan chaired the meeting, the report of which will be submitted to the Ad Hoc Committee on Marine Mammals.

8. ACTIONS TAKEN BY THE SECRETARIAT ACCORDING TO DECISIONS AT THE 30TH ANNUAL MEETING OF THE COMMISSION
   (a) Information from non-member countries
       Contained in a report on publications to be submitted to the 1984 Annual Meeting.
   (b) Tabling of conventions and treaties concerned with the Convention area
       A report on any new information tabled with the Secretariat will be submitted to the 1984 Annual Meeting.

9. RECEIPT OF INFORMATION REGARDING ARTICLES III 1. (e) AND IX 2. OF THE CONVENTION
   In connection with the Commission's consideration of the status of implementation of Articles III 1. (e) and IX 2. of the Convention, the Secretariat obtained from the national sections information pertaining to 1984, similar to that submitted annually since 1970, and prepared a report summarizing the data.

10. COMMISSION PUBLICATIONS
    The Secretariat's activities concerning publications during the period are summarized below. Details of these activities have been submitted to the Commission.

(a) Annual Report
    The 1983 Annual Report (170 pages) in English was published prior to the Annual Meeting and will be distributed immediately following the meeting.
    Early publication of the Annual Reports depends upon early submission of research summaries and early approval of the manuscript by each national section.

(b) Bulletin
    The Japanese version of Historical Groundfish Statistics 1971-76 (Bulletin No. 41) was published and distributed in 1983 December.
    The manuscript of the 1981 Symposium papers (Bulletin No. 42, English) was published and distributed in 1984 July. The masu salmon report (Bulletin No. 43, English) is in press, as is the Japanese version of this Bulletin. The manuscript on the 1979 Cooperative Survey in the Bering Sea (Bulletin No. 44, English) is also in press.
The 1980 Statistical Yearbook was published in 1984 May. The 1981 Statistical Yearbook is now in press. Most material has been received for the 1982 Yearbook and some for the 1983 Yearbook.

Proceedings of the 30th Annual Meeting
"Proceedings of the 30th Annual Meeting—1983" (428 pages) in English was prepared and distributed in 1984 March. The Japanese version of the Proceedings (345 pages) was prepared and distributed in 1984 August.

11. FISCAL MATTERS
(a) Accounts and audit
The report of the Commission's auditors, Peat, Marwick, Mitchell and Co., for the fiscal year ending 1984 June 30 was transmitted to the Commission with Circular Letter No. 1466 on 1984 September 6, together with a report prepared by the Secretariat giving details of items in the auditors' report.

The Commission's liability bond on Secretariat staff in the amount of \$100,000 was continued. This bond is on file in the Secretariat.

(b) Working Capital Fund
The Commission's Working Capital Fund at 1983 June 30 totalled \$172,025.56. The amount was increased to \$201,702.84 during the fiscal year by the addition of \$29,677.28, the amount which accrued from levies on staff salaries and decreased to \$109,169.88 by the transfer of \$92,532.96 which was the deficiency of income over expenditures during the year.

The Working Capital Fund includes the value of fixed assets (\$16,469.20) which are capitalized, and reserves for severance pay (\$7,772) and moving expense (\$17,600).

(c) 1984/85 Budget
The budget estimate for the 1984/85 fiscal year was adopted by the Commission at the 1983 Annual Meeting on the understanding \$318,456 be provided in three equal shares, a sum unchanged from that in 1982/83 and 1983/84.

Full or partial contributions for the first half of the fiscal year (\$53,076) have been received from all Contracting Parties as follows:
Canada: First half contribution, \$53,076, was received 1984 July 4.
Japan: First half contribution of \$53,076 was received 1984 August 10.
United States: Contribution of \$57,670.61 (slightly exceeding the first half contribution due) received 1984 August 10.

(d) Budget Estimate (1985/86) and Forecast (1986/87)
In accordance with Financial Regulation 7, the Secretariat sent to all Commissioners 60 days in advance of the 31st Annual Meeting a Budget Estimate for 1985/86 and a Budget Forecast for 1986/87 (Circular Letter No. 1466, 1984 September 6).

12. AGENDA FOR THE 31ST ANNUAL MEETING
A tentative agenda for the 31st Annual Meeting, prepared by the Executive Director in consultation with the Chairman, was sent to the three national sections on 1984 July 26 (Circular Letter No. 1463), with a request for approval and comments. All national sections approved the tentative agenda without comment which then became the provisional agenda.

The provisional agenda was sent to the three national sections with Circular Letter No. 1467, dated 1984 September 6 and will be considered for adoption at the Second Plenary Session at the 1984 Annual Meeting.

13. STAFF ACTIVITIES
During the period, the Secretariat has performed all duties set forth in the Rules of Procedure, Financial Regulations and decisions of the Commission in accordance with the duties of each member of the staff.

The Executive Director and Assistant Director visited laboratories and offices of the Canada Department of Fisheries and Oceans in Nanaimo and Vancouver, and laboratories and offices of the U.S. National Marine Fisheries Service in Seattle to discuss INPFC matters.

The Executive Director attended the meetings of the Ad Hoc Salmon Research Coordinating Group and Scientific Sub-Committee of the Ad Hoc Committee on Marine Mammals held in Tokyo in 1984 February and March.

The Executive and Assistant Directors attended the Annual Meeting of the International Pacific Salmon Fisheries Commission in Richmond in 1983 December.

The Commission was invited to be represented by observers at (a) the 42nd Annual Meeting of the Inter-American Tropical Tuna Commission being held in La Jolla, (b) the 72nd Statutory Meeting of the International Council for the Exploration of the Sea being held in Copenhagen, (c) the 4th Special Meeting of the International Commission for the Conservation of Atlantic Tunas being held in Las Palmas de Gran Canaria, (d) the FAO World Conference on Fisheries Management and Development
in Rome, and (e) the Sixtieth Annual Meeting of the International Pacific Halibut Commission in Anchorage. No INPFC observers were designated to represent the Commission at these meetings.

The Secretariat has received enquiries on fishery matters from citizens, journalists, students, libraries, consultants, translators, industry, etc., and has endeavored to respond to the requests within its jurisdiction and competence. The Secretariat was visited by Commissioners, scientists, administrators, industry representatives, etc., from the three member countries.
III. THE RESEARCH PROGRAM

A. REPORT ON RESEARCH BY CANADA FOR THE INTERNATIONAL NORTH PACIFIC FISHERIES COMMISSION IN 1984

Department of Fisheries and Oceans
Fisheries Research Branch
Pacific Biological Station
March 1985

INTRODUCTION

There is a broad range of research projects undertaken by Canadian researchers every year. Most of this research is undertaken within the Fisheries Research Branch. Some research relating to salmon enhancement, stock management and habitat management is undertaken by other branches in the Pacific Region.

The summaries included in this report relate to research projects of direct interest to I.N.P.F.C. Additional information is available from annual reports and an annual publication list is also available on request.

SALMONIDS

ASSESSMENT OF BRITISH COLUMBIA SALMON STOCKS

The status of British Columbia chum, chinook and sockeye salmon stocks and their coastal fisheries have been reviewed. Catch trends by gear and area, escapement levels, exploitation rates, problems of mixed-stock fisheries, diversity of fisheries, and run timing were covered in the reviews.

TRENDS IN SIZE OF BRITISH COLUMBIA SALMON 1975–1982

Comparison of recent (1976–82) data on trends in size of salmon from British Columbia commercial catches with data from the previous decade showed that: (1) weights of troll-caught chinook in the northern and central areas increased, but in southern areas they generally continued to decrease, (2) weight of coho caught by troll, seine, and gillnet gear continued to decline except in certain central areas, (3) pink salmon in northern areas were generally larger in the recent period, the increases being greater for odd-year fish, (4) both even- and odd-year pinks continued to decrease in weight in southern areas, (5) chum salmon generally have been larger in the recent period, and (6) sockeye increased in weight in all areas, but the increases were slight in important areas.

PROBLEMS IN AGEING PACIFIC SALMON

A review of ageing Pacific salmon from scales led to the following conclusions: (1) close agreement in age determination between scale readers does not necessarily indicate accuracy, (2) for all salmon species there is a need to validate ages determined by scale reading, using independent techniques or information, (3) the availability of coded-wire tagged salmonids provides a means for developing objective criteria for ageing and to validate age determinations, and (4) greater communication between various agencies and individuals engaged in salmon ageing is desirable.

STEELHEAD STOCK IDENTIFICATION

To explore the possibility of using parasites to identify the origins of steelhead trout captured on the high seas, 295 steelhead caught by Japanese research vessels in the North Pacific Ocean in 1983 were examined. Thirty species of parasites, almost equally divided between freshwater and marine species, were found. Two freshwater species, the trematodes Plagioporus shawi and Nanophyetus salmincola (metacercarial stage), are unique to the U.S. Pacific Northwest region of North America. Using the presence of these two parasites, 40 (13.6%) of the sampled fish were identified as originating from this geographic area. They occurred in samples from the northern Gulf of Alaska (in July) and from the central and western Pacific Ocean from May through July as far west as 167°21’E, between 42°44’N and 47°10’N. The ocean range of North American steelhead as determined by parasite indicators is similar to that determined from data on tag recoveries and gene frequency analysis.

OBSERVATIONS ON HEALING OF EXPERIMENTALLY INDUCED MARKS AND WOUNDS ON CHINOOK SALMON

The rate of healing of experimentally induced marks and wounds on chinook salmon was followed over a period of 5 months. These marks and wounds simulated natural marks and wounds observed in...
troll-caught salmon, particularly in Alaska. Simulated net or line marks persisted for about 2 months after infliction but had essentially disappeared by 5 months. The rate of healing suggested that similar marks observed in Alaskan troll-caught salmon were no more than one month old. No conclusions could be reached concerning repair of experimentally descaled areas because the affected areas were difficult to define and because capture and handling for observation caused further descaling. Deep wounds into the musculature were still readily visible, but no longer raw, after 3-4 weeks; healing was well advanced at 5-6 weeks, although the skin was not yet intact. Histologically, these deep cuts showed six distinguishable phases over the first 6 weeks after wounding, but thereafter the rate of change was much slower.

GROUND Fish

STOCK Assessment

A major accomplishment in 1984 was the preparation of a comprehensive stock assessment report, and recommended yield options, for all important groundfish stocks. Publication is scheduled for 1985.

STATISTICS AND SAMPLING

Principal activity is maintaining the long-term data series involving catch/effort, by interviewing vessel captains at time of landing, and biological data (length-frequencies, sex, age structures, gonad condition, etc.) by sampling the various species landed. Additional activities during 1984 included: (1) evaluating the effect of reduced effort expended to interview vessel captains (manuscript submitted for publication); (2) initiating procedures for encoding all biological data to permit machine access and integration with other data systems (such as catch/effort); (3) analysis of biological sampling for rockfish (completed); (4) photographic atlas of groundfish gonad maturities (continuing); and (5) initiating development of an electronic measuring board for collecting groundfish length-frequencies at ports of landing.

AGE Determination

In October 1984, the unit hosted the I.N.P.F.C. Fish Ageing Workshop, attended by 52 specialists from Canada, Japan, and the United States. "Working" visitors have come from China, Finland, Japan, Korea, USA, and elsewhere in Canada. In 1984, some 110,000 age structures were processed and read, including 8,200 from groundfish. Results for groundfish were 4,700 otoliths (Pacific hake, rockfish, and sablefish), and 3,500 fin rays (lingcod and walleye pollock.)

FLATFISH

Field studies were confined to the fifth annual trawl survey for juvenile flatfish in Hecate Strait. Primary target species are English sole and rock sole. The survey took place in April, and results suggest that the 1983 year-class of English sole is exceptionally abundant.

Laboratory studies included age validation of English sole and rock sole, analysis of results from the 1979 Dover sole tagging experiment in Hecate Strait, and population dynamics of Dover, English, and rock soles in Hecate Strait. The age validation studies involve establishing criteria for identifying annuli and interpretation of otoliths from recaptured, tagged fish which had been injected with oxytetracycline at time of tagging.

ROCKFISH

Rockfish studies have been sub-divided into those involving shelf species (principally S. brevispinis, S. flavidus, and S. pinniger), and slope species (principally S. aleutianus, S. alutus, and S. reidi).

Shelf species. Field studies consisted of one observer trip aboard a trawler targeting on shelf rockfish. The purpose was to examine the feasibility of a shelf rockfish survey off northwest Vancouver Island.

Slope species. All studies of slope rockfish dealt with Pacific ocean perch (S. alutus). The single field study was a two-vessel trawl survey to estimate biomass in Goose Island Gully (Queen Charlotte Sound), the eighth such biomass survey since 1965. Laboratory studies included: (1) reproductive biology; (2) age-correction matrix; (3) a new "search-theory" method for stock assessment; and (4) gill parasite incidence for stock delineation. The reproductive biology study is continuing, and involves the integration of life history characteristics (age-specific fecundity, reproductive value, and reproductive effort) and their dynamics into an age-structured population model. Completion is scheduled for 1985. The age correction matrix is being developed to calibrate past otolith readings, based on surface reading, to recent otolith readings based on "break-and-burn" readings. Completion is scheduled for 1985. A cooperative stock-assessment project (with the University of California, Davis) was completed during 1984 and a manuscript has been submitted for publication. This new method for rockfish stock assessment uses "search theory" and short-term catch-effort data. The cooperative parasite study (with Z. Kabata, Pacific Biological Station) involves the incidence of gill-raker cope-
pods with respect to stock delineation. Preliminary results are encouraging for some Pacific ocean perch stocks.

SABLEFISH

Field studies included: (1) monitoring the commercial fishery; (2) tagging juveniles; (3) trawl survey of juveniles; and (4) survey of pelagic larvac. Monitoring the fishery involved collecting biological data (length-frequencies by sex, otoliths, gonad condition, etc.) aboard commercial vessels (two 2-week cruises) and chartered commercial vessels (one 3-week cruise). Approximately 15,000 juvenile sablefish were tagged and released on the important fishing grounds off British Columbia. This experiment is an international commitment to determine the location of recruitment of juvenile sablefish to the commercial fisheries off North America. The trawl survey of juvenile sablefish in Queen Charlotte Sound and Hecate Strait was intended to provide an abundance index, but preliminary results suggest that this will not be feasible. Negative factors are the daily vertical migrations of juvenile sablefish, and the untrawlability of many index sites. Abundance and distribution of pelagic sablefish larvac was determined off west Vancouver Island in April, with a ship-of-opportunity. Subsequently, this study will continue as part of the La Perouse Project to determine the effect of physical oceanography on year-class abundance.

Laboratory studies involved: (1) stock assessment; (2) outlining a comprehensive international review of sablefish biology; (3) a cooperative parasite study; and (4) rearing of larval sablefish. Stock assessments involved yield-per-recruit and forward simulations. A strategy was developed for harvesting abundant year-classes. Work continued on the joint Canada-Japan-U.S. comprehensive review of sablefish biology. Effort in 1984 was directed at compilation of the all-nation tagging data base. The cooperative parasite study (with Z. Kabata, Pacific Biological Station) utilizes incidence of intestinal nematodes for stock delineation and delineating life history features of both host and parasite. Larval sablefish (15 to 30 mm) were reared at 4 ration levels to assess starvation, cannibalism and growth rates.

SPINY DOGFISH

Field studies involved continuing the tagging experiment in Georgia Strait, and beginning one off west Vancouver Island. Purpose of both experiments is to assess long-term movements. During 1984, approximately 7,000 spiny dogfish were tagged and released in Georgia Strait, and 3,000 off west Vancou-


Cass, A. J., and J. R. Scarsbrook. 1984. A preliminary study of variability in year-class abundance of...


B. REPORT ON RESEARCH BY JAPAN FOR THE INTERNATIONAL NORTH PACIFIC FISHERIES COMMISSION IN 1984

Fisheries Agency of Japan
March 1985

I. SALMON RESEARCH

1. Research on Board Motherships

The Japanese mothership salmon fishery operated in 1984 with four motherships and 172 catcher boats (43 catcher boats per mothership). The fleets sailed from Hakodate on May 26 for the fishing grounds and returned to Hakodate between July 29 and August 1.

Landings of salmon from catcher boats to motherships began June 2 and ended between July 24 and 26. During this period, a total of 194 operations were conducted by those fleets. On board four motherships, daily catch records were collected, fork length, body weight, gonad weight, and sex were recorded, and scales were collected for 60 sockeye and for 30 of each other salmon species on those days when salmon were landed. The following numbers of fish were measured on board the motherships in 1984:

<table>
<thead>
<tr>
<th>Species</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sockeye</td>
<td>11,380</td>
</tr>
<tr>
<td>Chum</td>
<td>5,737</td>
</tr>
<tr>
<td>Pink</td>
<td>5,755</td>
</tr>
<tr>
<td>Coho</td>
<td>1,398</td>
</tr>
<tr>
<td>Chinook</td>
<td>2,277</td>
</tr>
<tr>
<td>Total</td>
<td>26,547</td>
</tr>
</tbody>
</table>

2. Research on Board Research Vessels

Nine salmon research vessels conducted research operations from April to August in 1984, the same period as in 1983. The survey areas were mainly the North Pacific Ocean west of 168°W and the Bering Sea west of 175°W with some surveys conducted in the northeastern Pacific Ocean including the Gulf of Alaska.

The gears used were gillnets and longlines with types and numbers of gear varied according to the purpose of the research operations. Six vessels (Wakatake maru, Hokuko maru, Riasu maru No. 2, Hokushin maru, Iwaki maru, and Kumamoto maru) conducted research on distribution and abundance of salmonids in the northwestern Pacific Ocean, Aleutian region, and the Bering Sea using research gillnets which were composed of ten different mesh sizes and commercial-type gillnets.

Four vessels (Hokko maru, Wakatake maru, Hokuko maru, and Riasu maru No. 2) conducted tagging operations to clarify the continent of origin of salmonids migrating in the southern North Pacific Ocean including waters south of 46°N. The Wakatake maru and the Hokuko maru conducted tagging operations in the Bering Sea for the same purpose. These vessels used longlines to catch salmon for tagging as well as gillnets and conducted experiments to estimate sampling efficiencies of gillnets during portions of their research cruises.

Two vessels (Oshoro maru and Hokusai maru) collected information on pelagic fish including salmonids and squids using special research gillnets as well as regular research gillnets and commercial type gillnets. All nine vessels made oceanographic observations and conducted research on various animals (fishes, squids, sea birds, and marine mammals) incidentally taken during research. A total of 351 research operations were made with gillnets from April 23 to August 6 and 125 with longlines from April 29 to July 30. During the 125 longline operations, 123 tagging operations were conducted.

3. U.S. Observers on Board Motherships and Research Vessels

In 1984, a total of 16 U.S. scientific observers were on board four motherships and their catcher boats for a period of 37 to 39 days: total days on board was 152. On each mothership, one scientific observer conducted observations on the salmon fishery and one observer carried out research on marine mammals. Two other observers spent time on catcher boats attached to the motherships to conduct research on incidental catch of Dall's porpoise. In 1984, a total of six U.S. scientists were on board Japanese salmon research vessels to conduct research on marine mammals: four on the Oshoro maru, one on the Iwaki maru, and one on the Kumamoto maru. In addition to the above, three U.S. scientists were on board the Oshoro maru to conduct research on young salmon.

4. Results Obtained from Tagging Conducted in the High Seas

A total of eight research cruises were made in the North Pacific Ocean, the Bering Sea, and the northeastern Pacific Ocean from April to July in 1984 and of the 14,503 salmonids caught using longlines, 6,811...
fish were tagged.

The numbers of tagged salmonids released in 1984 were: sockeye-773; chum-2,882; pink-2,507; coho-569; chinook-32; and steelhead trout-48. The numbers of tagged salmonids released in waters south of 46°N in the North Pacific Ocean (4,405 fish) and the numbers released in the Bering Sea (1,728 fish) increased from the numbers released in these areas in the previous year (2,014 and 1,232 fish, respectively). A total of 95 new recoveries of salmonids released in the North Pacific Ocean and the Bering Sea in 1983 and 1984 were made. In addition, information was obtained on 59 recoveries from fish released in 1982 and 1983 (one recovered in 1982 and 58 recovered in 1983).

The significance of these recoveries is summarized by species as follows:

**Sockeye salmon**

Five sockeye salmon released in waters encompassed by 46°33′N, 171°24′W and 47°34′N, 173°33′W between May 3 and 5, 1984 were recovered in the Bristol Bay region during the period of July 8 and 17, 1984 and increased the previously limited knowledge on sockeye salmon in the central North Pacific Ocean. One sockeye salmon released at 44°29′N, 168°33′W on May 16, 1984 was recovered in the Johnstone Strait area, B.C. on August 7, 1984. This recovery extended southward the previous known southern limit (46°33′N, 173°34′W) of distribution of maturing sockeye salmon originating in Canada.

**Chum salmon**

An immature chum salmon released at 42°42′N, 179°32′W on May 29, 1980 was recovered at Minami Kayabe (southern Hokkaido) on November 14, 1983 and an immature chum salmon released at 45°30′N, 177°30′W on May 31, 1982 was recovered at Abashiri (Hokkaido) on December 28, 1983. These two recoveries extended southward the previously known southern limit (45°26′N–167°33′E, 47°26′N–171°29′E, 49°40′N–174°42′W, and 47°57′N–156°00′W) of distribution of immature chum salmon in the central and eastern North Pacific Ocean of Japanese origin. An immature chum salmon released at 46°30′N, 175°30′W on May 28, 1982 was recovered at the Poronay River (southeastern Sakhalin). This recovery extended eastward the previously known eastern limit (44°30′N, 165°30′E) of distribution of immature chum salmon of Sakhalin origin. A maturing chum salmon released at 58°30′N, 177°30′W on July 17, 1983 was recovered as an "Akizake" (fall salmon) in the Yasnomorka River (southwestern Sakhalin) on October 3, 1983. This recovery extended northward the previously known northern limit (56°40′N, 169°40′W) of distribution of maturing chum salmon of Sakhalin origin.

**Pink salmon**

A pink salmon released at 45°29′N, 178°29′E on June 24, 1983 was recovered at the Bol'shaya River. This recovery extended eastward the previously known eastern limit (45°26′N 169°14′E) of pink salmon of west Kamchatka origin.

**Coho salmon**

A coho salmon released at 44°30′N, 177°33′E on June 28, 1983 was recovered at the Mulchatna River in Bristol Bay in August 1983. This recovery extended westward the previously known western limit (45°24′N, 177°19′W) of distribution of coho salmon of western Alaska origin (Ito 1984).

5. **Analysis of Chum Salmon Scales**

Scale analyses studies were continued as in the previous year using four standard groups (Japan, U.S.S.R., U.S., and Canada) established from scale samples of mature chum salmon of age 0.3 years collected in 1972 and 1981. The analytical results indicated that individuals identified as of American origin appeared as far west as the northwestern Pacific Ocean and even further to the Okhotsk Sea which differed significantly from known findings based on tag recoveries. The subjects of analyses were maturing chum salmon and it is clearly wrong to assume that chum salmon of American origin would appear in the Okhotsk Sea in the period of June and July which is not long before their spawning season. On the other hand, it was observed that some certain specific river stocks were misidentified in fairly high percentages and the appearance of individuals identified as of American origin was divided inconsistently into two in the offshore samples.

The standard group was established on the basis of the stock composition of each river which is based on coastal catch. However, such a composition does not exist in the offshore area and it is considered that the finer the spatiotemporal division is made, the more the differentiation between the standard and the offshore sample is increased. If this assumption is correct, it is inevitable that the identification of offshore samples using this technique misidentified the conditions of distribution of each river stock (Ishida et al. 1985).
6. Study of Scale Patterns of Masu and Coho Salmon

Tagged masu salmon without an adipose fin released at the Shiribetsu River (Hokkaido) were recovered. The method of age determination of masu salmon in their freshwater period was reviewed using the scale samples of those masu salmon and criteria which can be applied to masu salmon in other coastal and river areas was established. The outside of a band in which more than two circuli intervals are closely spaced in the freshwater pattern of the scale is called an age mark. Among age marks are true age indications (F1, F2, and F3) and false age indications (F0 and Fm). Using both age indications, the numbers from the focus were counted. Assuming that the number of circuli from the focus to the first age indication is R1, from right after the first age indication to the second age indication is R2, and from right after the second age indication to the third age indication is R3, the values of R2/R1 or R3/R2 are recognized to be the determining criteria for true age marks and false age marks.

We attempted to determine the scale pattern of coho salmon using the age determination technique used for masu salmon. The numbers and distances of circuli from the focus to the F3 indication are in order: Kamchatka River > Okhotsk Sea > Bol’shaya River, and the numbers and distances of circuli from the focus to the ocean age indication are Okhotsk Sea > the Kamchatka River > Bol’shaya River. Results of analyses of scale characteristics of the Okhotsk Sea and the Bol’shaya River samples indicated a significant difference which was contrary to our expectation that they were similar. As to causes, differences in body position of scale sampling, diversities within the same area, and differences in area of origin are considered. We can conclude that it is difficult for Bol’shaya River samples only to represent the characteristics of scale patterns of coho salmon originating in the area facing the Okhotsk Sea (Kato 1984a, b).

7. Abundance of Immature Sockeye Salmon

The catch and biological data of immature sockeye salmon caught on the south side of the Aleutian Islands region using gillnets constructed with ten different mesh sizes in the period of July 5 and 21, 1984 were analyzed. The arithmetic mean CPUE value within the study area (fixed at 50°N, 175°E and 52°N, 175°W) was 1.44 for ocean age 1-year fish and 1.02 for ocean age 2-year fish. The occurrence of immature sockeye salmon in this season and area varies by year and it is difficult to obtain a good representation of estimated abundance with the research in the limited time and space. Research in waters east of 175°W which was first conducted this year confirmed the existence of fish groups with high density in waters north of 51°N and it was considered that most of them would appear eventually in the study area. The values of CPUE which included these fish were 1.67 for ocean age 1-year fish and 1.32 for ocean age 2-year fish (Takagi and Ito 1984).

8. Estimation of Biomass Using Salmon Gillnets

Parallel gillnet research and tagging was conducted by two research vessels in order to estimate the biomass of salmon. For chum salmon, which were the most abundant in the catch composition, it was assumed that their direction of movement was at right angles to the gillnet. It was attempted to determine the relationship between CPUE (fish/tan) and density D (fish/km²) and, taking into consideration the area of study, the estimated population numbers of chum salmon catchable by gillnets. Also considered were the effects of direction of movement, speed of movement, swimming depth, and mesh selectivity, etc. on the estimated values and the research required in the future.

II. Oceanography

Oceanographic conditions in the northwest Pacific Ocean in the summer of 1984 were examined. The eastward extension of Western Subarctic Water was strong and appeared to extend to waters east of 180°. The southward extension of this water mass was fairly strong and appeared to affect the abnormal cooling phenomenon of the Oyashio current. The westward extension of the Alaskan Stream was strong as in the previous year. There was a distinct boundary between the Western Subarctic Water mass and the Alaskan Stream and they were intruded alternately in wedge shape patterns. For surface water temperature, a sudden change between the cooling phenomenon to May and the warming phenomenon after June was observed. The surface water temperature in the summer of 1983 was low and the severe winter in 1984 increased the strength of cool water but the warm water strength increased after July (Matsumura 1984).

III. Research on Marine Mammals Taken Incidentally by Salmon Gillnets

1. Collection of Information on Incidental Catch of Marine Mammals

The incidental catch of marine mammals in 1984...
by the mothership and landbased salmon fisheries and salmon research vessels was as follows:

- Mothership-type salmon gillnet fishery: 2,670 Dall’s porpoises and five northern fur seals
- Landbased salmon gillnet fishery: 812 Dall’s porpoises and one northern right whale dolphin
- Salmon research vessels: 39 Dall’s porpoises, three saddleback dolphins, one Pacific whitesided dolphin, six northern fur seals, and one ringed seal (Fisheries Agency of Japan 1985 a, b)

2. Collection of Biological Samples

A total of 1,103 Dall’s porpoises incidentally caught by catcher boats was brought to the motherships as biological samples during the 1984 fishing season and U.S. scientific observers on board the motherships conducted biological research and sampling in cooperation with Japan.

In the landbased salmon gillnet fishery, the specimens obtained were 31 Dall’s porpoises and one northern right whale dolphin. Salmon research vessels obtained ten Dall’s porpoise and one harbor porpoise and specimens were analyzed at the National Science Museum together with those from the landbased salmon fishery.

3. Estimation of Abundance of Dall’s Porpoise

A total of ten research vessels (nine salmon research vessels mentioned above and the research vessel the Wakashio maru engaged in research in Japanese waters) conducted the marine mammals sighting survey in the northwest Pacific, Bering Sea, and Gulf of Alaska in the period between April and August.

From results of the survey, the estimated abundance of Dall’s porpoise in 1984 was 1,206 (0-2,462) x 10^3 (Fourier Series Estimator) and 1,440 (0-2,925) x 10^3 (Exponential Model). Although the vessel dedicated to marine mammal studies was also engaged in a sighting survey, its objective was to search for Dall’s porpoise as well so the data obtained by the dedicated vessel were somewhat different from that obtained by the salmon research vessels and the data were not included in the analyses (Kato 1985).

4. Research by the Vessel Dedicated for Dall’s Porpoise Research (Hoyo maru No. 53)

As a continuation of studies in 1982 and 1983, the capture of porpoise using electric harpoons and sighting surveys were conducted by a research vessel for Dall’s porpoise in 1984. In the previous two years, the research was conducted from August to September (immediately after birth of young) but in 1984 research was conducted from May to June (prior to the birth period). A total of 218 porpoises were caught:

- 187 Dall’s porpoises, 21 Pacific whitesided dolphins, and ten northern right whale dolphins. Males predominated in the sex ratio in both dalli-type and truei-type taken and males accounted for 79.1% of all Dall’s porpoises caught. The proportion of male dalli-type (76.2%) was an intermediate value between that of 1982 (83.3%) and 1983 (51.1%). With respect to latitude, males in 1984 accounted for 93.0% in waters south of 40°N which was extremely high compared with the 41.7% in waters north of 40°N. For maturity of males, a remarkable increase in testes weight was observed between 180 cm and 200 cm in body length which appeared to indicate that male porpoises reached sexual maturity around that body length. The composition of Dall’s porpoises groups was analyzed based on the catches and individuals observed classified into four group patterns (immature, mature male, breeding, and non-breeding groups). Their inter-relationships were considered (Miyazaki and Fujise 1985).

5. Age Determination of Dall’s Porpoise

At the scientific sub-committee meeting held in March 1984 it became clear that there was not adequate agreement among scientists concerned regarding the age determination of Dall’s porpoise. Therefore, it was agreed that slide samples of Dall’s porpoise’s teeth would be exchanged between Drs. Kasuya and Miyazaki of Japan and Dr. Jones of the United States and differences between age determinations and effects of preparation techniques would be examined. Ages of a total of 125 samples (65 female and 53 male dalli-type and two female and five male truei-type) were determined by Kasuya, Miyazaki, and Gosho. Differences in results from the three readers were observed, particularly for Dall’s porpoise of 170 cm and under in length where age determinations ranged from 1 to 2 layers to 2 to 4 layers. Small differences were also detected for older individuals.

Lack of agreement in age determination results in misunderstanding of the life history of Dall’s porpoise and it is thus necessary to establish the most appropriate method to clarify and convert the observed number of layers into the actual age (Jones et al. 1985).

6. Tank Holding and Acoustic Studies of Dall’s Porpoise

On May 7, 1984, pair purse seiners for mackerel caught three Dall’s porpoises (dalli-type) with a purse seine. Two died and one was transported to the Oarai Aquarium temporarily and subsequently transported to a water tank in the Kamogawa Sea World. Acoustic studies on this porpoise were conducted by
the National Research Institute of Fishery Engineering. Unfortunately, feeding with live bait and forced feeding was not successful and the porpoise died on May 18 (on the 12th day after capture). During that period clicks emitted by the porpoise were monitored and responses observed to offerings of sardines, hammer sounds on the inside wall of the water tank, rope stretched at different distances on the surface of the water, net threads suspended at fixed distances, and to hanging wires. Emissions of supersonic wave pulses of 20 to 50 kHz towards the Dall’s porpoise in short intervals resulted in a breathing rate increase by the Dall’s porpoise to four times faster than normal and lifting of its head above the water surface to avoid the supersonic pulses. The peak spectrum of clicks obtained from the porpoise during holding in the tank at Kamogawa Sea World was 100 to 115 kHz with interval of pulses 20 to 48 ms and number of pulses 64. The frequency emitted by the Dall’s porpoise was about 35 kHz lower than that of Dall’s porpoise in the ocean (Hatakeyama et al. 1985).

7. EMISSION OF SUPersonic WAVES TOWARDS DALL’S PORPOISE

Although emission experiments using supersonic wave pulses of relatively high frequencies of 75, 115, and 145 kHz were conducted in the Bering Sea in 1983, it is necessary to observe the responses to low frequency in order to develop effective sound generators for prevention of incidental catch. In the experiment conducted on the Okhotsk Sea coast of Hokkaido in August 1984, supersonic waves were emitted with three types of sound generators (24 kHz, 50 kHz, and the pseudo-echo location click generator of 20 to 50 kHz) towards free swimming Dall’s porpoises and their responses observed. Experiments were conducted twice each with the three types of supersonic waves at 200 to 700 m distances from the Dall’s porpoises. In each experiment, when the supersonic waves were emitted, the Dall’s porpoises moved away while sending up a cloud of spray and an intimidating effect was observed. The pseudo-echo location click generator had an intimidating effect, even at sound pressure of 18 dB and distance of 700 m, but the range for gaining attention and warning is probably two or three times greater (Taketomi et al. 1985).

8. REFLECTION DIRECtIVITY OF SUPersonic WAVES TO MATERIALS OF SALmon GILLNETS

It is considered that when Dall’s porpoise recognize the existence of a gillnet in the sea, when their approach to the net is at right angles the reflective wave from the net is at a maximum, and when their approach is diagonal, the reflective wave from the net decreases. In order to confirm this hypothesis, reflection directivity was measured using supersonic waves of 50 kHz and 100 kHz for various net materials (float, lead, and rope).

The maximum value (TS max) of target strength of each material and the angular width (α) at which the TS value decreased 6 dB from TS max was obtained. For each material, as frequency became higher and wave length became shorter, directivity became narrower. Although float and rope produce a large reflective wave (α is 10° or so), at greater angles the reflective wave becomes suddenly less and is hard to detect from diagonal angles. Judging from the relation between angle and detectable maximum distance based on reflection directivity of floats and leads at 100 kHz and the estimated auditory threshold value (about -51 dB) of Dall’s porpoise in the range of 50 to 100 kHz, it was found that for the float, if the angle was changed from 0° to 40°, the detectable maximum distance decreased from 40 m to 6 m but for lead did not decrease as rapidly. The question of directivity of the whole gillnet made with these materials is a future subject of study (Hatakeyama and Ishii 1985).

9. GEAR MODIFICATION TO AVOID THE INCIDENTAL TAKE OF DALL’S PORPOISE

Forty-four catcher boats (25.6% of the total 172 fishing vessels) were equipped with and used during the fishing season modified gears into which were woven three air tube threads at the central part of the net. The numbers of Dall’s porpoise incidentally caught per operation by the catcher boats using ordinary salmon gillnets and using air tube thread nets were 0.331 (1,479 individuals/4,462 operations) and 0.303 (647 individuals/2,134 operations), respectively, in the whole area during the whole season. This indicated that the ratio of incidental take of Dall’s porpoise by the catcher boats equipped with the air tube thread nets was about 8% lower than that by the catcher boats using ordinary salmon gillnets.

In order to determine more accurately the effectiveness of air tube thread nets, a comparison was made of only close operations of catcher boats with ordinary gillnets and those with air tube threads. Incidental take was 0.341 (824 individuals/2,413 operations) for catcher boats with ordinary gillnets and 0.295 (516 individuals/1,749 operations) for those using air tube thread nets and this difference was statistically significant. Operations by 12 catcher boats with gillnets equipped with supersonic sound generators were also conducted (Ogiwara et al. 1985).
IV. GROUNDFISH RESEARCH IN THE BERING SEA

1. Research on board Commercial Vessels

On board all the motherships, the North Pacific trawlers, and most of the North Pacific longline-gillnet vessels which operated in the Bering Sea and Aleutian region in 1984, the major catches were sampled for size composition and scales or otoliths were taken for age determination.

Catcher boats attached to the motherships with fish meal and surimi plants conducted trawl research activities at fixed stations in the spring and fall of 1984. The main objective of these surveys was to assess the abundance of stocks of young pollock. During the spring survey, nine Danish seiners and two stern trawlers conducted surveys at 102 fixed stations on the continental shelf on the north side of Unimak Pass during June 4 to 29, 1984. In the fall survey, and as a continuation of the 1983 survey, five Danish seiners and two stern trawlers conducted surveys at 154 fixed stations on the continental shelf from the north side of Unimak Pass to waters of 62°N during August 12 to September 4, 1984. In both spring and fall surveys, the weight and numbers of fish and body lengths of pollock caught per operation by Danish seiners (30-minute hauls for trawlers) at these stations were recorded and scales were collected. The trends in the abundance of young pollock were considered using these data (Yamaguchi 1984a).

2. Research on board Research Vessels

The following three groundfish research operations were conducted using fishing vessels by Japan in the Japan-U.S. cooperative research in 1984 (Fisheries Agency of Japan 1984a).

(a) Japan-U.S. joint longline survey on sablefish and Pacific cod stocks

The research on sablefish and Pacific cod stocks was conducted in the Aleutian region and the eastern Bering Sea in 1984 on the same scale as in 1983.

The longliner *Ryusho maru* No. 15 (495.38 gt; 630 hp), chartered by JAMARC (Japan Marine Fishery Resource Research Center), conducted 61 longline operations (one per day) for 66 days from May 15 to July 19. The main objectives were to determine distribution, density by area by depth, length composition of the major species, conduct research on halibut caught incidentally, collect biological samples, and tag sablefish.

The longline gear used was identical in structure to that used since 1978 with each 100 m groundline having 45 hooks at the end of 1.2 m gangions. Squid was the only bait used. At each station, 160 hachis were set in depths of 101 to 1,000 m at right angles to the isobath. Soaking time averaged five to six hours.

The total catch of fish during the research operations in the eastern Bering Sea and the Aleutian region was 140,603 individuals. The dominant species taken was Pacific cod (54,273 individuals or 38.6% of the total catch), followed by sablefish (35,739 or 25.4%), pectoral rattail (21,197 or 15.1%), halibut (3,569 or 2.5%), and Greenland turbot (3,503 or 2.5%). These five species constituted 84.1% of the total catch.

In the eastern Bering Sea the catch rate (catch per hachi) of sablefish was highest in Region II along the Aleutian Islands and lowest in Region IV in northern waters. The catch rate was high in the depth zone 501 to 700 m throughout the regions.

The catch rate of sablefish in the Aleutian region in 1984 was found to be high in eastern areas and low in western areas. Catch rate was high in the 501 to 700 m depth zone in eastern areas and low in the 401 to 500 m depth zone in western areas.

The catch rate of Pacific cod in the eastern Bering Sea was high in Region IV and low in Region III. Catch rate was generally high in the shallower depths of 101 to 300 m throughout the regions. Few Pacific cod were distributed in depth zones greater than 401 m.

The catch rate of Pacific cod in the Aleutian region in 1984 was high in the eastern area and low in the western area. The catch rate of Pacific cod was high in depth zones of 101 to 200 m and few Pacific cod were observed in depth zones greater than 401 m.

(b) Research on groundfish stocks using trawl gear

In the eastern Bering Sea, the chartered stern trawler *Fukushin maru* No. 5 (349.90 gt; 1,230 hp; Hokuten-type) conducted surveys with objectives of collecting stomachs to study feeding habits of major species, collecting data on diurnal changes in CPUE by area, and measuring distance between trawl net wings by using a mensuration system in order to improve accuracy of biomass estimation.

A total of 60 on-bottom hauls were made during the period May 28 to June 8.

Research areas were on the continental slope, continental shelf, and Bristol Bay. Trends in CPUE with lapses of time were not observed for flounders (Greenland turbot, Kamchatka flounder, yellowfin sole, and rock sole) because of the insufficient number of hauls. Analysis of stomach contents is now in progress.

Regarding measurement of distance between wings by the mensuration system, it was determined that it is possible to obtain accurate measurements by modi-
flying attitude of the sonic wave generator to obtain accurate reflections (Yamaguchi 1984a).

(c) Tests of modification of gears to reduce the incidental catch of prohibited species

Experiments in modification of gears and methods to reduce or avoid the incidental catch of prohibited species by trawl gear were conducted in 1984 as a continuation of 1983 studies.

The research was conducted using two Hokuten-type stern trawlers, the Tomi maru No. 51 (349.47 gt; 1,230 hp) and the Fukui maru No. 18 (349.88 gt; 1,230 hp) in side-by-side towing on the continental shelf and slope in the Bering Sea for 58 days from October 8 to December 4.

A total of 175 experimental operations were made using two types of standard gear (for pollock, 10 to 15 m height of net mouth and for flounders, 5 to 6 m height of net mouth) and three types of modified gear: with hanging ropes between the ground rope and fishing rope, with baiting of 2,000 mm mesh, and with large mesh (1,000 mm) inner wings. Test vessels conducted three to four 90-minute on-bottom trawls per day at speeds of 3.0 to 4.0 knots. The results of the comparative experiments are now being reviewed.

(d) Tagging experiments

In connection with the research on sablefish and Pacific cod stocks, a total of 4,890 sablefish caught with longlines by the Ryusho maru No. 15 were tagged and released in the Bering Sea and Aleutian waters from May 15 to July 19, 1984. Anchor-type tags were attached at the base of the first dorsal fin of the sablefish.

During groundfish research in the Bering Sea, a total of 1,000 yellowfin sole caught by trawl gear were tagged with Petersen-type tags and released. Tags were attached to the musculature below the dorsal fin.

V. GROUNDFISH RESEARCH IN THE NORTHEASTERN PACIFIC

1. Research on board Commercial Vessels

On board most of the Japanese trawl vessels operating in the northeast Pacific in 1984, the major species taken were measured and scales for age determination were collected.

2. Research on board the Research Vessels

Research on groundfish stocks by Japan in 1984 was conducted during the following two research activities as the Japan-U.S. cooperative survey (Fisheries Agency of Japan 1984b).

(a) Japan-U.S. joint longline survey on sablefish and Pacific cod stocks

As a continuation of the survey in 1983, research on sablefish and Pacific cod stocks was conducted jointly with the United States using the longliner Ryusho maru No. 15 in the Gulf of Alaska for a total of 50 days from July 23 to September 10 following the survey in the Bering Sea and Aleutian waters. The general objectives and methods were as noted for the Bering Sea.

Forty-seven longline operations were conducted at 47 stations (one per day) in the Shumagin-Southeastern Region.

The results obtained are summarized as follows: a total of 118,275 individuals were caught. Of those, the dominant species was sablefish (72,025 or 60.9% of the total) followed in order by Pacific cod (14,725 or 12.4%), pectoral rattails (12,573 or 10.6%), shortspine thornyhead (4,571 or 3.8%), and Kamchatka flounder (4,070 or 3.4%). These five species constituted 91.1% of the total catch.

The catch rate (catch number per hachi) of sablefish by INPFC area was found to be highest in the Southeastern Area, followed in order by Chirikof, Kodiak, Shumagin, and lowest in the Yakutat Area. The catch rate was highest in depths of 601 m and greater in Yakutat and Southeastern Areas of the eastern areas. In Shumagin and Chirikof Areas in the west however the depth of highest catch rate was shallower (201 to 500 m) than in eastern areas.

The catch rate of Pacific cod by INPFC area was high in the western areas (Shumagin and Chirikof) and lowest in the Southeastern Area. By depth, catch rate of Pacific cod was highest in depths of 101 to 200 m, followed by that in depths of 201 to 300 m. Few Pacific cod were found in depths of 401 m and greater.

(b) Research on groundfish stocks using trawl gear

The initial large scale Japan-U.S. joint survey (one Japanese trawler, three U.S. trawlers, and one Japanese longliner) was conducted with the objectives of estimating biomass and obtaining biological findings of groundfish stocks inhabiting the Gulf of Alaska from July to October.

The surveyed areas were in 11 to 800 m depths between 145°W and 170°W. Areas shallower than about 100 m were classified into 22 sub-areas according to bottom contours and trawling was conducted by establishing standard trawl stations at intervals of about 10 to 15 miles based on the density of fish data determined by past United States surveys. In areas deeper than 101 m, standard trawl stations were established in the following manner. The previously
established 29 survey lines for the Japan-U.S. longline survey were divided into five depth zones: 101 to 200 m, 201 to 300 m, 301 to 500 m, 501 to 700 m, and 701 to 800 m and in each depth zone about one station was established.

At each station 30-minute tows were planned and water temperatures were taken by XBT. The catches were weighed by species and major species in the catch were sampled for size composition by sex. In addition, scales or otoliths were taken for age determination and samples were collected for multi-item biological measurements and classifications.

The Daikichi maru No. 37 (349.96 GRT; 1,230 hp), chartered as a research vessel, Hokuten-type stern trawler similar to those chartered for the Japan-U.S. cooperative trawl surveys since 1979. Survey cruises were conducted for 103 days from July 5 to October 15 and the Daikichi maru No. 37 entered Kodiak from August 22 to 28. During the early survey period, the Daikichi maru No. 37 sailed with a Japanese longliner and a U.S. trawler and conducted mainly parallel operations in waters deeper than 101 m in order to obtain simultaneous trawl data. In the latter part of the survey, the Daikichi maru No. 37 conducted the surveys alone in waters shallower than 100 m. A total of 355 trawl operations were completed. The results of the survey are summarized as follows:

A total of 333 trawl station operations were conducted in order to obtain standardized catch per 30-minute tow by INPFC area, by depth zone, and by species. Twenty trawl tows were made for measurement of net mouth widths or were ineffective because of damage to the net. The catch rate was highest in the Shumagin Area, followed in order by the Chirikof and Kodiak Areas, and the catch rate in eastern areas was lower than in western areas. The catch rate was highest in depths of 201 to 300 m in the Shumagin Area, followed in order by 301 to 500 m in Chirikof, 101 to 200 m in Kodiak, 501 to 700 m in Shumagin, 101 to 200 m in Chirikof, and 301 to 500 m in Shumagin. The catch rate in waters shallower than 101 m was low. For major species, the catch rates of pollock and Kamchatka flounder were high in waters shallower than 200 m. The catch rates of sablefish, Pacific ocean perch, and rockfishes were high in waters deeper than 200 m and, in particular, the catch rate of rattails was high in waters of 301 m and greater (Wakabayashi 1984).

Halibut of 80 cm and greater in fork length constituted 31.6% (1,086 individuals) of the total caught (3,438 individuals). The catch rate of halibut was highest in depths of 100 m and shallower in the Kodiak Area, constituting 56.0% (1,927 individuals) of the total and was followed in order by 15.1% (519 individuals) in the Shumagin Area and 14.5% (497 individuals) in the Chirikof Area.

(c) Tagging experiments

During research on sablefish and Pacific cod stocks, a total of 3,391 sablefish caught with longlines in waters between the Shumagin and Southeast Areas from July 23 to September 10, 1984 were tagged and released. Anchor-type tags were attached at the base of the first dorsal fin.

(d) Recoveries of tagged fish

Since the recoveries noted in the INPFC Annual Report for 1983, a total of 614 sablefish have been reported recovered up to August 1984. Of these, 226 were sablefish tagged and recovered by Japan with trawl nets and longlines (Fisheries Agency of Japan 1984a).

REFERENCES


RESEARCH BY THE UNITED STATES

C. INVESTIGATIONS BY THE UNITED STATES FOR THE INTERNATIONAL NORTH PACIFIC FISHERIES COMMISSION IN 1984

National Marine Fisheries Service
National Oceanic and Atmospheric Administration
BIN C15700, Building 4
7600 Sand Point Way N. E.
Seattle, WA 98115
March 1985

SALMONID RESEARCH

This section of the report summarizes research on high seas salmonids conducted in 1984, largely in response to the research mandate included in Articles III 1(a) and III I (d) of the Protocol Amending the International Convention for the High Seas Fisheries of the North Pacific Ocean. The research was in five major areas: 1) sampling and tagging in the western North Pacific Ocean and central Bering Sea in cooperation with the U.S.S.R., 2) analysis of tag recovery data from 1984 and earlier tagging experiments, 3) scale pattern analysis to determine the stock origins of chinook salmon in the area of the Japanese mothership and landbased driftnet (LBDN) fisheries, 4) U.S. observer coverage of Japanese high seas salmon fisheries, and 5) sampling for coded-wire tagged salmonids.

U.S.-U.S.S.R. COOPERATIVE SALMONID TAGGING

The major research objectives and methodology of the cooperative research in 1984 were the same as those of 1983 (Harris 1984a, Harris et al. 1984). The sampling was divided into three cruises of the U.S.S.R.'s Pacific Scientific Research Institute of Fisheries and Oceanography (TINRO) research vessel R/V Nemirov. The first cruise (30 May-9 June) was in the North Pacific (south of 48°N), the second cruise (30 June-14 July) was in the North Pacific (48°-51°N) and Bering Sea (54°-58°N), and the third cruise (20 July-10 August) was in the Bering Sea (53°-58°N). All sampling occurred between 175°E and 180°. A U.S. scientist was present only on the last (third) cruise, but TINRO provided detailed catch, oceanographic, biological, tag release data, and scale samples for all three cruises.

The first cruise resulted in 20 seine sets, the second in 32 seine sets (16 in each study area), and the third in 48 seine sets. Catches were small, averaging 4.9 fish per set during the first cruise, 7.2 fish per set in the North Pacific and 4.6 fish per set in the Bering Sea during the second cruise, and 10.5 fish per set during the third cruise.

The total catch of salmonids for all three cruises (783 fish) was composed of 489 (62%) chum, 194 (25%) sockeye, 66 (8%) chinook, 32 (4%) pink, and 2 (<1%) steelhead. The total catch in 1984 was approximately half the size of the catch in 1983 (1,557 fish), and this was due primarily to much lower catches of pink salmon in the North Pacific study area in 1984. The lower abundances of predominantly Asian pink salmon in the central North Pacific Ocean in even-numbered years probably account for this difference. As in 1983, no coho salmon were caught in 1984. In 1983, exceptionally cold sea surface temperatures may have affected coho distribution. In 1984, however, temperatures were more typical, and the lack of coho was more likely due to the patchiness of coho distribution relative to the sampling effort.

The total tag releases for all three cruises (666 salmonids) was composed of 437 (66%) chum, 155 (23%) sockeye, 44 (7%) chinook, 28 (4%) pink, and 2 (<1%) steelhead. This was less than half the number of tag releases in 1983 (1,438), and is attributable to the greatly reduced catches and tag releases of pink salmon in 1984.

HIGH SEAS TAG RECOVERIES

There were 22 returns of U.S.-U.S.S.R. high seas salmon tags reported between 1 October 1983 and 30 September 1984 (Harris 1984b). The returns consisted of two 1984 recoveries of sockeye salmon and twenty 1983 recoveries of pink (3) and chum (17) salmon released in 1983. One of the sockeye was a Bristol Bay recovery of a fish released just south of Adak Island in 1982, and the other was a high seas recovery slightly northwest of the release site, only 11 days later. The pink salmon were all released in area E7548 from 21 to 27 June, and were recovered in the East Kamchatka / Karaginskii district of the U.S.S.R. One of the chum salmon was recovered in the Icha River of West Kamchatka, from a release in area E7548. All of the other chum salmon were recovered at various locations in or just offshore of Japan, in-
including the Pacific coast of Honshu, and the Okhotsk, Pacific, Japan Sea, and Nemuro Strait coasts of Hokkaido, and resulted from releases in the North Pacific Ocean and Bering Sea in areas E7546, E7548, E7552, E7554, and E7556 from 1 June to 30 July. These recoveries clearly indicate a broad north-south distribution of maturing chum of Japanese hatchery origin.

**Stock Origins of Chinook Salmon**

A three-year study completed in 1984 was designed to update and refine estimates of the stock origins of Japanese mothership chinook catches in Bering Sea (MS-BS) and North Pacific Ocean (MS-PAC) fishery areas to determine stock origins of chinook salmon in the area of the Japanese LBDN salmon fishery, and to provide information needed to assess the impact of high seas fishing on Alaskan chinook stocks (Myers et al. 1984). Linear discriminant analysis of scale pattern data was used to determine the stock origins of immature ages 1.2 and 1.3 chinook sampled on the high seas (40°–62°N, 160°E–175°W) in 1975–81. Samples were classified to region (Asia, western Alaska, central Alaska, southeast Alaska / British Columbia) and, when western Alaska was indicated to be the predominant regional stock, to western Alaskan stock (Yukon, Kuskokwim, Bristol Bay) of origin. Stock compositions of the 1975–81 catches were used to estimate the interceptions by the mothership and LBDN fisheries (1964–83), and estimated high seas catches of western Alaska chinook were apportioned to the year of inshore run (1965–83). The scale samples and stock composition and interception estimates for “western Alaska” and “Yukon” included Canadian Yukon stocks.

Western Alaska was the predominant stock in the MS-BS area and an important secondary stock in the MS-PAC and LBDN areas. Yukon was the predominant western Alaskan stock in the MS-BS, followed in order of abundance by Kuskokwim and Bristol Bay. Central Alaska was the predominant stock in the MS-PAC and LBDN areas, and was present in lower abundances in the MS-BS. Asia was an important secondary stock in all fishery areas. Estimated relative abundance of southeast Alaska / British Columbia chinook, though higher in the North Pacific Ocean than in the Bering Sea, was low compared to other stock groups in all fishery areas. These results are corroborated by tag recovery information.

Analysis of the estimated interceptions indicated that the high seas fisheries caught an average of 26% of the western Alaska chinook runs during the period 1965–77 and 14% since 1978, and suggested that a reduction in high seas catches in the MS-BS might benefit coastal chinook fisheries in western Alaska, but would probably result in increased catches of Bristol Bay sockeye and central Alaskan chinook in the MS-PAC if effort were simply shifted to that area. The lack of reliable estimates of age composition and run size for most major chinook stocks made assessment of the impact of high seas interceptions on U.S.-origin fish difficult.

**U.S. Observer Coverage of Japanese High Seas Salmon Fisheries**

Four U.S. observers were stationed aboard each of the four Japanese salmon motherships that fished in the U.S. Fishery Conservation Zone (FCZ) of the central Bering Sea in 1984. During the fishing season, all four motherships left the U.S. FCZ once and returned. The U.S. observers were transferred to Japanese patrol boats when the motherships left and transferred back to the motherships to continue sampling when the motherships returned into the FCZ.

The pattern of fishing for the fleets in 1984 was the same as in 1978–1983. Each fleet of 43 catcher boats set gillnets in late afternoon and retrieved them early the next morning. Catches were transferred daily to each of the four motherships. The catcher boats were moored at fore and aft weighing stations and catches were transferred in mesh bags. Each bag contained a single species of salmon. The U.S. salmon observer could not monitor all catch weights because the catcher boats off-loaded at both stations with about one-minute intervals between weighings and nine minutes between the arrival of consecutive catcher boats. In addition, six scout boats delivered fish on an irregular schedule and catches were not always weighed. Overall, 41% of the catcher-boat landings (5,676) were sampled by observers. Observers later compared their catch records with those furnished by the mothership business office. Few discrepancies were found between records.

The observers collected scales from 5,371 chinook salmon for use in continent-of-origin studies of chinook salmon in the mothership fishing area inside the U.S. FCZ, and scales from 395 steelhead trout. The steelhead trout were frozen in the round and returned to Seattle for additional biological studies.

Catcher boats (scout boats excluded) from the four fleets were sampled with nearly the same frequency except for one vessel which was slightly under sampled and a few which were seen relatively more frequently than the other vessels. The test of the hypothesis that all catcher boats were sampled uniformly in the four fleets was not rejected at $p=0.01$. 
**Sampling for Coded-wire Tags**


U.S. observers onboard Japanese salmon motherships examined 18,549 salmon for missing adipose fins in 1984. Only one chinook salmon without an adipose fin was recovered; it did not have a coded-wire tag. For the first time since the inception of the observer program in 1978, catcher boats were requested to return steelhead to the motherships for sampling by the observers. The observers examined 497 steelhead and found ten fish with missing adipose fins. Frozen samples of whole fish, including those with missing adipose fins, were returned to Seattle for further biological studies. Coded-wire tag recoveries from these fish yielded 7 tags.

Nine steelhead and two sockeye salmon without adipose fins were recovered on Japanese research vessels in 1983; coded-wire tags were detected in five of the steelhead. In 1984, an additional 13 coded-wire tags were recovered from steelhead landed on Japanese research vessels. Release and recovery data for all coded-wire tags recovered from Japanese research vessels in 1983 and through August 1984 were reported by Wertheimer and Dahlberg (1984). One tag (Agency 23, Data 16/01) was from a steelhead released in the Columbia River and recovered at 42°51'N latitude, 167°32'E longitude.

In 1983, U.S. groundfish observers examined 14,850 salmon for missing adipose fins; 43 were found to have missing adipose fins. From these samples, 40 tags were detected and decoded, including 38 from chinook salmon and two from coho salmon. Through July 1984, an additional 54 tags were recovered from salmon sampled on foreign groundfish vessels, including 44 chinook salmon and 10 from coho salmon. Release and recovery data for all coded-wire tags recovered in the foreign groundfish fishery in 1983 as well as those recovered through July 1984 were reported by Wertheimer and Dahlberg (1984). Several tags represent range extensions into the Bering Sea for chinook salmon stocks from particular regions of the eastern Pacific rim. A tag (Agency 60, Data 33/42) from Yaquina Bay on the Oregon coast, was recovered in 1983 from a fish sampled at 54°39'N latitude, 166°13'W longitude. Two tags were recovered in 1984 in the Bering Sea from fish released in southeastern Alaska: one from Little Port Walter (Agency 03, Data 17/16), recovered at 54°51'N latitude, 165°26'W longitude; and one from the Stikine River (Agency 04, Data 17/26), recovered at 54°40'N latitude, 165°21'W longitude.

**MARINE MAMMAL RESEARCH**

Research activities in 1984 included 1) collection and analysis of marine mammal sighting data, 2) study of the response of Dall's porpoise to vessels, 3) monitoring the incidental take of marine mammals, and 4) collection of biological samples and data from Dall's porpoise taken incidentally by the Japanese mothership salmon fishery.

Population estimates based on data collected in 1983 ranged from 1.0 (400 m survey strip width) to 1.6 million Dall's porpoise (200 m survey strip width), throughout their range in the North Pacific Ocean and Bering Sea. Using data pooled for the time period 1978 to 1983, the estimates were 1.1 to 1.5 million (Bouchet and Withrow 1984). Results from two years studies of porpoise response to vessels in Prince William Sound, Alaska, indicate a net movement of animals of 90 m toward the vessel (Bouchet et al. 1984). It also appears that animals may not behave the same in different geographic areas, times of day, environmental conditions, or at different life stages. This study of responses was continued in 1984, in offshore waters, as well as Prince William Sound.

A total of 363 out of 5,694 gillnet sets (6.4%) were monitored by U.S. and Japanese observers in the U.S. FCZ in 1984. The number of sets monitored in all mothership fishing areas was 486 out of 8,333 (5.8%). Modified gillnets with 3 strands of hollow tubes present along the center of the gillnet were used by 25% of the catcher boats in each mothership fleet. Both standard and modified gillnet operations were observed. Mean take rates for modified gillnets was 0.41 porpoise per operation (43 animals observed entangled in 106 sets) and 0.43 (105 out of 245 sets) for standard gillnets (Table 1, see also Jones and Bouchet 1984). There was no significant difference between these rates. Based on data collected by observers, the estimated incidental take of Dall's porpoise in the U.S. FCZ was 2,443 (95% C.L.: 1,971–2,832). Approximately 23% of the entangled porpoise were released alive: 28% were lost during retrieval.

A total of 1,101 Dall's porpoise (41% of the take) were returned to the motherships for collection of biological samples. Other species entangled but not dissected were northern fur seals (3) and 1 unidentified pinniped.
TABLE 1. Incidental take rates of Dall’s porpoise collected by observers in the Japanese salmon mothership driftnet fishery in 1984. Number of operations observed in parentheses.

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</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td></td>
<td>0.14</td>
<td>0.50</td>
<td>0.08</td>
<td>0.18</td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
<td>0.58</td>
<td>0.75</td>
<td>0.30</td>
<td>0.46</td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
<td>1.33</td>
<td>0.40</td>
<td>0.11</td>
<td>0.33</td>
</tr>
<tr>
<td>Mean</td>
<td></td>
<td></td>
<td>0.64</td>
<td>0.54</td>
<td>0.16</td>
<td>0.33</td>
</tr>
</tbody>
</table>

CRAB RESEARCH

Crab research in 1984 included the annual trawl survey for red king crab (Paralithodes camtschatica), blue king crab (P. platypus), tanner crabs (Chionoecetes bairdi and C. opilio) and Korean hair crab (Erimacrus isenbeckii). The 1984 EBS trawl survey (June 9 to August 10) was conducted aboard the NOAA R/V Chapman and the R/V Alaska (chartered from the University of Washington). This section of the report considers recent trends in abundance only. A more extensive account of the 1984 research is given in Otto et al. (1984).

Areas covered by the 1983 and 1984 surveys were similar and included all commercially important concentrations of crabs in the EBS. The survey consisted of 434 successful trawl tows and covered an area of approximately 132,000 square nautical miles. Sampling procedures were identical to those of previous surveys.

ABUNDANCE OF KING CRABS

Red King Crab—Estimated abundance for all size-sex groupings increased from 1983 levels (Table 2), but increases were statistically significant only for legal (>134 mm) males and large (>89 mm) females. The abundance of legal males, however, remains low in a historical sense. The abundance of females above the median size at maturity (89 mm) increased more dramatically but was still at historically low levels.

Blue King Crab—The abundance of Pribilof District blue king crab (Table 2) has been declining since 1981. While female abundance has been more stable during this period than male abundance, a severe and statistically significant decline was registered from 1983 to 1984. Declines in male abundance for size groups larger than 119 mm were also statistically significant. With the exception of small (<90 mm) females, all segments of the population are at their lowest recorded levels.

In the Northern District, declines in the abundance of males greater than 104 mm and large (>79 mm) females were statistically significant. These segments of the stock are now at or very near their lowest recorded levels.

Abundance of Tanner Crab

Chionoecetes bairdi—In southern districts, significant declines in abundance over the past year occurred for small (<85 mm) males, intermediate (85-129 mm) males and small (<85 mm) females (Table 3). More detailed size-frequency data indicated that declines in abundance of small males and females were largely associated with crabs less than 50 mm. The abundance of large males and females also declined but these declines were not statistically significant.

In the Northern District, there were significant declines in the abundance of small males, mid-size males
Table 2. Annual abundance estimates (millions of crabs) for *P. camtschatica* and *P. platypus* in the Pribilof, Bristol Bay and northern Districts from NMFS surveys.

### *P. camtschatica* (Pribilof and Bristol Bay)

<table>
<thead>
<tr>
<th>Size</th>
<th>&lt;110</th>
<th>110-134</th>
<th>&gt;134</th>
<th>Total</th>
<th>&lt;90</th>
<th>&gt;89</th>
<th>Total</th>
<th>Grand Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1981</td>
<td>56.6</td>
<td>18.4</td>
<td>11.3</td>
<td>86.3</td>
<td>36.3</td>
<td>67.3</td>
<td>103.6</td>
<td>189.9</td>
</tr>
<tr>
<td>1982</td>
<td>107.2</td>
<td>17.4</td>
<td>4.7</td>
<td>129.3</td>
<td>77.2</td>
<td>54.8</td>
<td>132.0</td>
<td>261.3</td>
</tr>
<tr>
<td>1983</td>
<td>43.3</td>
<td>10.4</td>
<td>1.5</td>
<td>55.2</td>
<td>24.3</td>
<td>9.7</td>
<td>34.0</td>
<td>89.2</td>
</tr>
<tr>
<td>1984</td>
<td>81.8</td>
<td>12.6</td>
<td>3.1</td>
<td>97.6</td>
<td>57.6</td>
<td>17.6</td>
<td>75.1</td>
<td>172.7</td>
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</table>

### *P. platypus* (Pribilof)

<table>
<thead>
<tr>
<th>Size</th>
<th>&lt;110</th>
<th>110-134</th>
<th>&gt;134</th>
<th>Total</th>
<th>&lt;90</th>
<th>&gt;89</th>
<th>Total</th>
<th>Grand Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1981</td>
<td>4.8</td>
<td>1.4</td>
<td>4.2</td>
<td>10.4</td>
<td>3.4</td>
<td>11.6</td>
<td>15.0</td>
<td>25.4</td>
</tr>
<tr>
<td>1982</td>
<td>1.2</td>
<td>0.7</td>
<td>2.2</td>
<td>4.1</td>
<td>0.7</td>
<td>8.6</td>
<td>9.3</td>
<td>13.4</td>
</tr>
<tr>
<td>1983</td>
<td>0.6</td>
<td>0.8</td>
<td>1.3</td>
<td>2.8</td>
<td>0.2</td>
<td>9.2</td>
<td>9.4</td>
<td>12.2</td>
</tr>
<tr>
<td>1984</td>
<td>0.5</td>
<td>0.3</td>
<td>0.6</td>
<td>1.3</td>
<td>0.3</td>
<td>3.1</td>
<td>3.4</td>
<td>4.8</td>
</tr>
</tbody>
</table>

### *P. platypus* (Northern)

<table>
<thead>
<tr>
<th>Size</th>
<th>&lt;105</th>
<th>105-119</th>
<th>&gt;119</th>
<th>Total</th>
<th>&lt;80</th>
<th>&gt;79</th>
<th>Total</th>
<th>Grand Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1981</td>
<td>1.2</td>
<td>1.8</td>
<td>3.1</td>
<td>6.3</td>
<td>0.0</td>
<td>0.5</td>
<td>0.5</td>
<td>6.8</td>
</tr>
<tr>
<td>1982</td>
<td>3.2</td>
<td>2.6</td>
<td>6.8</td>
<td>12.5</td>
<td>0.4</td>
<td>0.7</td>
<td>1.1</td>
<td>13.7</td>
</tr>
<tr>
<td>1983</td>
<td>1.8</td>
<td>1.6</td>
<td>3.5</td>
<td>6.9</td>
<td>0.2</td>
<td>2.4</td>
<td>2.7</td>
<td>9.6</td>
</tr>
<tr>
<td>1984</td>
<td>1.4</td>
<td>0.6</td>
<td>1.6</td>
<td>3.6</td>
<td>0.2</td>
<td>0.5</td>
<td>0.7</td>
<td>4.3</td>
</tr>
</tbody>
</table>

1 Carapace length (mm), categories reflect smaller average size in the Northern and Southern (Pribilof Bristol Bay) Districts from NMFS surveys.

and small females. Decreases in the abundance of large males and females were not significant. Due to the scarcity of small crab, a continued decline in abundance is expected.

*Chionoecetes opilio*—The abundance of small (<110 mm) males and small (<65 mm) females declined significantly in the southern districts, while the abundance of large (>109 mm) males increased significantly (Table 3). These trends probably reflects changes in distribution as well as recruitment. The abundance of legal (>77 mm) males decreased from 346 million crabs in 1983 to 240 million crabs in 1984. It is worth noting, however, that recruitment to the fishery currently takes place at 95 to 100 mm and that most of the catch consisted of crab larger than 109 mm.

In the Northern District, there was a significant increase in the abundance of large (>109 mm) males and a significant decrease in the abundance of large (>64 mm) females. The abundance of legal (>77 mm) males increased slightly but not significantly from 220 million crabs in 1983 to 238 million crabs in 1984.

### ABUNDANCE OF KOREAN HAIR CRAB

Korean hair crab occurred from the Pribilof Islands area to the north side of the Alaska Peninsula and into Bristol Bay. The distribution of large males shows a major center of abundance in the Pribilof Island area and a minor one just north of the Alaska Peninsula.

With the exception of small males the abundance of Korean hair crab declined in all areas (Table 4). Declines in male abundance were not statistically significant but seem to be a continuation of trends observed since 1981. Very few females have been taken during the survey and their abundance estimates have not been meaningful.

### GROUNDFISH RESEARCH

The Northwest and Alaska Fisheries Center (NWAFC) of the U.S. National Marine Fisheries Service (NMFS) conducted or cooperated in 20 groundfish-related surveys during 1984. These were composed of ten demersal trawl surveys, two hydroacous-
TABLE 3. Annual abundance estimates (millions of crabs) for tanner crabs in the Pribilof and Bristol Bay Districts from NMFS surveys.

<table>
<thead>
<tr>
<th></th>
<th>Males</th>
<th>Females</th>
<th>Grand Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>&lt;85</td>
<td>85-129</td>
<td>&gt;129</td>
</tr>
<tr>
<td><strong>C. bairdi</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Southern:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1981</td>
<td>106.0</td>
<td>213.2</td>
<td>22.7</td>
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<tr>
<td>1982</td>
<td>28.7</td>
<td>99.7</td>
<td>17.4</td>
</tr>
<tr>
<td>1983</td>
<td>116.0</td>
<td>57.1</td>
<td>11.9</td>
</tr>
<tr>
<td>1984</td>
<td>65.2</td>
<td>38.1</td>
<td>8.7</td>
</tr>
<tr>
<td>Northern:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1981</td>
<td>23.3</td>
<td>24.4</td>
<td>0.4</td>
</tr>
<tr>
<td>1982</td>
<td>12.6</td>
<td>39.4</td>
<td>2.6</td>
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<tr>
<td>1983</td>
<td>17.3</td>
<td>15.7</td>
<td>0.8</td>
</tr>
<tr>
<td>1984</td>
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<td>8.0</td>
<td>0.3</td>
</tr>
<tr>
<td><strong>C. opilio</strong></td>
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<tr>
<td>Southern:</td>
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</tr>
<tr>
<td>1981</td>
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<td>15.7</td>
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<td>770.1</td>
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</tr>
<tr>
<td>1984</td>
<td>286.7</td>
<td>54.0</td>
<td>340.6</td>
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<tr>
<td>Northern:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1981</td>
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<td>1,283.2</td>
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<tr>
<td>1984</td>
<td>1,030.1</td>
<td>20.0</td>
<td>1,050.0</td>
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</tbody>
</table>

* Carapace width (mm)

TABLE 4. Annual abundance estimates (millions of crabs) for Korean hair crabs (Erinastrus isenbeckii) from NMFS surveys in the Pribilof and Bristol Bay Districts

<table>
<thead>
<tr>
<th></th>
<th>Males</th>
<th>Females</th>
<th>Grand Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>&lt;90</td>
<td>&gt;89</td>
<td>Total</td>
</tr>
<tr>
<td><strong>Pribilof</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1981</td>
<td>5.1</td>
<td>13.1</td>
<td>18.1</td>
</tr>
<tr>
<td>1982</td>
<td>0.9</td>
<td>5.4</td>
<td>6.3</td>
</tr>
<tr>
<td>1983</td>
<td>0.3</td>
<td>2.5</td>
<td>2.8</td>
</tr>
<tr>
<td>1984</td>
<td>0.4</td>
<td>1.9</td>
<td>2.3</td>
</tr>
<tr>
<td><strong>Bristol Bay</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1981</td>
<td>1.0</td>
<td>2.7</td>
<td>3.7</td>
</tr>
<tr>
<td>1982</td>
<td>0.4</td>
<td>1.9</td>
<td>2.3</td>
</tr>
<tr>
<td>1983</td>
<td>0.3</td>
<td>1.6</td>
<td>1.9</td>
</tr>
<tr>
<td>1984</td>
<td>0.4</td>
<td>0.8</td>
<td>1.2</td>
</tr>
</tbody>
</table>

* Carapace length (mm)

tubic surveys, two sablefish trap surveys and two surveys dedicated to ichthyoplankton collections, plus several foreign cooperative trawl and ichthyoplankton surveys in which U.S. scientists were involved. Over 2,900 stations were sampled from Cortes Bank off San Diego, California to St. Matthew Island in the Ber-
TABLE 5. Groundfish research surveys conducted by the Northwest and Alaska Fisheries Center in the Bering Sea / Aleutian Islands region in 1984.

<table>
<thead>
<tr>
<th>Survey</th>
<th>Primary purpose</th>
<th>Area</th>
<th>Vessels</th>
<th>Survey period</th>
<th>Sampling information</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. Eastern Bering Sea crab/groundfish survey</td>
<td>Continuing annual survey to assess condition of crab/groundfish stocks</td>
<td>Eastern Bering Sea continental shelf waters, Unimak Pass, St. Matthew I. and Bristol Bay</td>
<td>Chapman*</td>
<td>June 5-Aug. 27</td>
<td>83/112' eastern otter trawl, CSTD, XBT, 400-mesh eastern otter trawl</td>
</tr>
<tr>
<td>B. Eastern Bering Sea hydroacoustic survey</td>
<td>Determine the distribution, abundance, and biological characteristics of age 0 pollock and the feasibility of monitoring them</td>
<td>Eastern Bering Sea, continental shelf and upper slope</td>
<td>Miller Freeman*</td>
<td>July 30-Aug. 20</td>
<td>Diamond and Marinovich midwater trawls, CSTD, and XBT</td>
</tr>
<tr>
<td>C. Eastern Bering Sea special studies</td>
<td>Study groundfish distribution and feeding in relation to ocean fronts, pollock cannibalism, tag Pacific cod</td>
<td>Central and western sections of the eastern Bering Sea</td>
<td>Miller Freeman*</td>
<td>Aug. 23-Sept. 14</td>
<td>83/112 eastern Diamond and Marinovich midwater, CSTD, XBT, bongo nets</td>
</tr>
</tbody>
</table>

* NOAA vessel
** Chartered vessel
CSTD = conductivity-salinity-temperature-depth
XBT = expendable bathythermographs
ing Sea. Results of the surveys had direct or indirect application to management of groundfish resources in U.S. waters.

Survey descriptions including purpose, area, vessels, dates, and general sampling methods by major geographical region (Bering Sea-Aleutian Islands, Gulf of Alaska, and the west coast of the U.S.) are summarized in Tables 5-7. A narrative description on a regional basis follows.

BERING SEA-ALEUTIAN ISLANDS REGION

Two demersal trawl surveys and one hydroacoustic survey were conducted in the eastern Bering Sea during 1984. No research was conducted in the Aleutian Islands region (Table 5).

A. Eastern Bering Sea Crab-Groundfish Survey—This was the latest in a series of annual surveys that began 14 years ago. Serving basically a monitoring function, these surveys supply data for annual updates of the status of all important groundfish and crab stocks found in the Bering Sea. In addition oceanographic data, primarily salinity and temperature at depth, were collected. Comparative fishing experiments were conducted to compare previously used gear configurations to that currently in use.

B. Eastern Bering Sea Hydroacoustics Survey—Baseline data on age 0 pollock collected during 1983 established first estimates of their abundance and distribution. The 1984 survey was the second to study the feasibility of monitoring young pollock for determination of year class strength.

C. Eastern Bering Sea Special Studies—Studies were conducted on the influence of ocean fronts on the distribution and feeding habits of groundfish, and the incidence of pollock cannibalism. Cod were tagged to study movements and to verify aging methods.

GULF OF ALASKA

Eight demersal trawl surveys, one hydroacoustic survey, one sablefish trap survey, and three ichthyoplankton surveys were conducted in the Gulf of Alaska (GOA) region in 1984 (Table 6).

A. Western Gulf of Alaska Pacific Cod Assessment Survey—Winter groundfish surveys in the area south of Kodiak Island from Albatross Bank to Chirikof Island have been performed six times since 1977. The earliest surveys detected concentrations of spawning Pacific cod leading to the hypothesis that cod abundance could be assessed quickly and accurately by locating and sampling those aggregations. The 1984 survey extended the area of investigation to the Shumagin Islands. Although plans had called for sampling westward to Unimak Pass, poor weather and icing conditions caused the sampling to fall behind schedule. Spawning concentrations were not located although cod were found throughout the area.

B. Shelikof Strait and GOA Hydroacoustics Survey—An annual spring survey to estimate the biomass and composition of prespawning and spawning pollock was continued in 1984 in the Shelikof region using acoustic techniques and pelagic trawl sampling. The survey was extended to Amatuli Trench, Prince William Sound and Resurrection Bay to detect the presence of other concentrations of spawning pollock. No large concentrations of pollock were found outside Shelikof Strait.

C. Ichthyoplankton Sampling in Shelikof Strait—Performed annually since the inception of the intense fishery for spawning walleye pollock in Shelikof Strait, this survey maps the distribution and abundance of pollock eggs. An attempt was made to estimate pollock egg survival.

D. Groundfish Surveys of the Eastern Gulf of Alaska—Specific sites were sampled as part of an ongoing effort to detect changes in the abundance and biological condition of Pacific Ocean Perch and other groundfish species. The Cape Ommaney and Yakutat groundfish abundance indexing sites were sampled. Perch and arrowtooth flounder were the primary species captured.

E. Sablefish Abundance in Coastal Waters of S. E. Alaska—An ongoing effort since 1978, this annual survey monitors the relative abundance (catch per trap) and size composition of sablefish at four sites in waters off southeastern Alaska using special fish traps.

F. Triennial GOA Groundfish Trawl Survey—This survey was conducted with extensive cooperation from the Japan Fisheries Agency (JFA). Encompassing virtually the entire continental shelf and upper slope, this was the most comprehensive groundfish survey completed there in recent years. Aside from the basic goals of assessing the condition of Gulf of Alaska groundfish, comparative fishing was conducted among three vessels, a U.S. trawler, a Japanese trawler, and a Japanese longliner.

G. U.S.-U.S.S.R. Cooperative Groundfish Survey—This cooperative research effort sponsored by NWAFSC and the Soviet Pacific Scientific Research Institute of Fisheries and Oceanography (TINRO) surveyed parts of the central and western Gulf of Alaska at groundfish abundance indexing sites sampled by Soviet and Korean vessels in past years.

H. Juvenile Groundfish Assessment Study—An exploratory survey was conducted to establish methodology for future surveys of juvenile groundfish in the Kodiak Island-Alaska Peninsula region. Detection and sam-
Table 6. Groundfish research surveys conducted by, or in cooperation with, the Northwest and Alaska Fisheries Center and the Auke Bay Laboratory in the Gulf of Alaska (GOA) region in 1984.

<table>
<thead>
<tr>
<th>Survey</th>
<th>Primary purpose</th>
<th>Area</th>
<th>Vessels</th>
<th>Survey period</th>
<th>Gear types</th>
<th>Hauls</th>
</tr>
</thead>
<tbody>
<tr>
<td>A.</td>
<td>Assess condition of winter cod stocks in the western Gulf of Alaska</td>
<td>Upper slope and outer shelf, Kodiak I. to Shumagin Gully</td>
<td>Miller Freeman*</td>
<td>Feb. 8-Feb. 29</td>
<td>90/105' Noreastern otter trawl, XBT</td>
<td>81</td>
</tr>
<tr>
<td>B.</td>
<td>Obtain age-specific estimates of the abundance of midwater pollock during their spawning period</td>
<td>Upper Shelikof Strait to Semidi I., Amatuli Trench-Middleton I., Prince Wm Sd. to Resurrection Bay</td>
<td>Miller Freeman*</td>
<td>Mar. 3-Apr. 7</td>
<td>Diamond midwater trawl, XBT</td>
<td>47</td>
</tr>
<tr>
<td>C.</td>
<td>Determine distribution and abundance of pollock eggs</td>
<td>Shelikof Strait</td>
<td>Chapman*</td>
<td>Mar. 12-April 19</td>
<td>Bongo nets, drogues</td>
<td>125</td>
</tr>
<tr>
<td>D.</td>
<td>Determine abundance and size composition of major groundfish stocks, primarily POP</td>
<td>Cape Ommaney and Cape Spencer to Salisbury Sound, Yakutat groundfish indexing sites</td>
<td>Chapman*</td>
<td>Apr. 21-May 6</td>
<td>Conical sablefish traps fished on a groundline, STD</td>
<td>189</td>
</tr>
<tr>
<td>E.</td>
<td>Monitor the relative abundance and size composition of sablefish</td>
<td>Cape Cross to Dixon Entrance</td>
<td>John N. Cobb*</td>
<td>June 20-Aug. 24</td>
<td>Conical sablefish traps fished on a groundline, STD</td>
<td>117</td>
</tr>
<tr>
<td>F.</td>
<td>Assess condition of groundfish resources in the central and western Gulf of Alaska</td>
<td>Islands of Four Mountains to Dixon Entrance, 27-823 m depth interval</td>
<td>Morning Star**, Ocean Spray**</td>
<td>July 14-Oct. 2</td>
<td>102/144' demersal trawl</td>
<td>528</td>
</tr>
<tr>
<td>G.</td>
<td>Assess condition of groundfish resources in the Gulf of Alaska</td>
<td>Kodiak, Chirikof and Shumagin INPFC areas</td>
<td>Shantar***</td>
<td>May 26-Aug. 14</td>
<td>102/144' demersal trawl</td>
<td>165</td>
</tr>
<tr>
<td>H.</td>
<td>An exploratory survey to establish methodology for the study of juvenile groundfish</td>
<td>East side of Kodiak Island</td>
<td>Chapman*</td>
<td>Sept. 3-Sept. 12</td>
<td>61' high-opening shrimp trawl, XBT</td>
<td>52</td>
</tr>
<tr>
<td>I.</td>
<td>Capture and tag juvenile sablefish</td>
<td>Inside waters of southeastern Alaska</td>
<td>Miller Freeman*</td>
<td>Oct. 18-Oct. 29</td>
<td>83/112' eastern otter trawl, Diamond midwater trawl</td>
<td>27</td>
</tr>
<tr>
<td>J.</td>
<td>Determine sablefish spawning period and study larval drift</td>
<td>Southern Chatham Strait</td>
<td>Marre II*</td>
<td>Nov. 13-Nov. 21</td>
<td>Bongo nets</td>
<td>393</td>
</tr>
<tr>
<td>K.</td>
<td>Monitor the distribution and relative abundance of ichthyoplankton</td>
<td>Western Gulf of Alaska</td>
<td>Shantar***</td>
<td>Apr. 4-May 20</td>
<td>Bongo nets and neuston nets</td>
<td>393</td>
</tr>
</tbody>
</table>

* NOAA vessel  
** Chartered vessel  
*** Foreign-cooperative vessel  
CSTD = conductivity-salinity-temperature-depth device  
XBT = expendable bathythermographs
plling of juvenile walleye pollock was emphasized.
I. **Juvenile Sablefish Tagging Study**—Juvenile sablefish were tagged in Clarence Strait, Behm Canal, and Chatham Strait in the inside waters of southeastern Alaska. Tag returns will be used to continue the study of sablefish migration patterns in the Gulf.
J. **Ichthyoplankton Sampling in Chatham Strait**—Transects across lower Chatham Strait in southeastern Alaska were sampled to detect sablefish larvae in the water column. Subsequent surveys will be conducted to more precisely delineate the sablefish spawning period.
K. **U.S.-U.S.S.R. Cooperative GOA Ichthyoplankton Survey**—Ichthyoplankton investigations were conducted from Shelikof Strait throughout the western Gulf of Alaska as part of a cooperative research effort between the U.S. and Soviet Union to monitor the relative abundance and distribution of selected species during their planktonic stages.

**WASHINGTON-OREGON-CALIFORNIA REGION**

Four surveys, a trawl survey, a sablefish trap survey, a foreign cooperative trawl survey, and a foreign cooperative ichthyoplankton survey were conducted off the West Coast by NWAFC in 1984 (Table 7).
A. **Upper Continental Slope Groundfish Survey**—This survey studied the feasibility of assessing the groundfish resources in the relatively deep waters of the upper continental slope utilizing demersal trawls. Vertically arrayed off-bottom fish traps were used to define the distribution of sablefish in the water column.
B. **Sablefish Abundance Indexing with Traps**—This ongoing study, with some modifications in sampling gear and a number of added fishing sites, has been conducted since 1979. Changes in catch per unit effort and size composition of sablefish are monitored at sites established off the coasts of Washington, Oregon, and California.
C. **U.S.-U.S.S.R. Cooperative Groundfish Survey**—This spring survey encompassed the upper continental slope and shelf off Oregon contributing data on the seasonal aspects of groundfish distribution and abundance. U.S. scientists aboard the vessel collected data in cooperation with their Soviet counterparts. The general area was resurveyed in September and October by a U.S. vessel.
D. **U.S.-U.S.S.R. Cooperative Ichthyoplankton Survey**—The seventh cooperative survey to investigate the seasonal distribution of ichthyoplankton off the coasts of Washington, Oregon, and northern California was conducted by Soviet and U.S. scientists aboard a Soviet vessel.

**U.S. OBSERVER COVERAGE OF FOREIGN AND JOINT-VENTURE GROUNDFISH FISHERIES**

The year 1983 was the eighth year that foreign and joint-venture fisheries have operated under the Magnuson Fishery Conservation and Management Act of 1976 (MFCMA) which required foreign vessels to accept observers. In 1983, the NWAFC sent 414 U.S. fisheries observers to sample aboard vessels from Japan, Republic of Korea (South Korea), U.S.S.R., Taiwan, and Federal Republic of Germany (West Germany). The purpose of placing scientific observers on foreign and joint-venture fishing vessels within the U.S. 200-mile FCZ was: to collect data that could be used to estimate the foreign and joint-venture groundfish catches; to determine the incidental catches of species whose retention is prohibited by U.S. regulations; to provide biological data needed to assess the status of the various stocks of fish; and to report on suspected violations of U.S. fishing regulations.

Funds were made available in 1983 to send many more observers than in 1982, so that it was possible to achieve an overall observer coverage of foreign vessel days (percentage of foreign vessel days sampled by observers) of 47%. This represented 19,302 days in which observers actually sampled aboard foreign vessels which spent a total of 41,111 vessel days on the fishing grounds in the Bering Sea, in the Gulf of Alaska, and off the Washington, Oregon, and California coasts. Observer coverage by major fishing region in 1983 was 44.2% in the Bering Sea/Aleutian region, 50.6% in the Gulf of Alaska region, and 86.4% in the Washington-Oregon-California region.

**BERING SEA/ALEUTIAN ISLAND GROUNDFISH FISHERY**

The estimated foreign catch of groundfish in 1983 was 1.125 million t, down 5.3% from the 1982 catch of 1.188 million t. Walleye pollock (*Theragra chalcogramma*) made up the dominant portion of the catch (79.2%). The combined catches of the three categories of flatfish—yellowfin sole (*Limanda aspera*), turbots and other flatfishes—accounted for 14.7% of the catches, and Pacific cod (*Gadus macrocephalus*) made up 3.7%. As in previous years, Japanese vessels landed the largest portion of the catch, 77.5%.

United States vessels delivered just over 211,100 t of groundfish to foreign processing vessels in jointventure fisheries. The 1983 catch represents a 94% increase over the 1982 catch. Walleye pollock (70.6%), yellowfin sole (10.7%), Pacific cod (6.8%),
<table>
<thead>
<tr>
<th>Survey</th>
<th>Primary purpose</th>
<th>Area</th>
<th>Vessels</th>
<th>Survey period</th>
<th>Sampling information</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. Upper continental slope groundfish survey</td>
<td>Study the feasibility of assessing groundfish stocks on the upper continental slope with trawls, midwater traps</td>
<td>Oregon Coast</td>
<td>Half Moon Bay**</td>
<td>Sept. 4–Oct. 14</td>
<td>90/105' trawl and experimental sablefish traps, XBT</td>
</tr>
<tr>
<td>B. Sablefish abundance indexing</td>
<td>Obtain catch per unit effort data at indexing sites to monitor population trends</td>
<td>Southern Oregon and California coasts</td>
<td>U.S. Dominator**</td>
<td>Sept. 20–Nov. 8</td>
<td>Conical and rectanguar 150 sablefish traps, XBT</td>
</tr>
<tr>
<td>C. U.S.—USSR cooperative groundfish survey</td>
<td>Survey groundfish on the continental shelf and upper slope</td>
<td>Oregon Coast</td>
<td>Poseydon***</td>
<td>April 20–May 3</td>
<td>141/199' demersal trawl</td>
</tr>
<tr>
<td>D. U.S.—USSR cooperative ichthyoplankton</td>
<td>Sample ichthyoplankton off the West Coast</td>
<td>Washington, Oregon, and northern California</td>
<td>Poseydon***</td>
<td>Mar. 11–April 4</td>
<td>Bongo nets</td>
</tr>
</tbody>
</table>

** Chartered vessel
*** Foreign-cooperative vessel
XBT = expendable bathythermographs.
other flatfishes (5.5%) and Atka mackerel (Pleuragramma monopterygius, 5.0%) were the five major species targeted on in the joint-venture fishery.

The incidental catch of salmon (Oncorhynchus spp.), Pacific halibut (Hippoglossus stenolepis), king crab (Lithodes and Paralithodes spp.), and tanner crab (Chionoecetes spp.) in the foreign and joint-venture groundfish fishery were estimated for 1983. It was estimated that about 18,200 salmon (66 t) were taken as incidental catch in the foreign fishery and that 24,500 salmon (54 t) were caught in the joint-venture fishery. The comparative incidental catches in the 1982 foreign and joint-venture fishery were 21,241 fish and 2,382 fish, respectively. Chinook salmon (O. tshawytscha) and chum salmon (O. keta) were the primary species of salmon taken in the foreign fishery comprising 54% and 45% of the catch, respectively. Chum salmon accounted for 98% of the incidental salmon catch in the joint-venture.

The estimated incidental catch of halibut in the foreign groundfish fishery was 515,600 fish (1,872 t) which represented a 22% increase over the 1982 incidental catch. In contrast, the incidental catch of halibut in the joint-venture fishery of 274,000 fish (438 t) was 33% lower than that taken in 1982.

The incidental catches of tanner crab in 1983 increased over those of 1982 in both the foreign and joint-venture fisheries. In the foreign fishery the estimated number of crab increased from about 2.3 million to 2.5 million and in the joint-venture fishery it increased from 78,200 to 543,900 crab. The foreign incidental catch was composed of C. opilio (56%), C. angulatus (23%), C. bairdi (15%), and C. tanneri (6%). The joint-venture incidental catch was composed of C. opilio (58%) and C. bairdi (42%).

As with tanner crab, the incidental catches of king crab increased from those of 1982 in both the foreign and joint-venture fisheries. The incidental catch of 404,000 crab in the foreign fishery represented a 6% increase while the 630,000 crab taken in the joint-venture fishery resulted in over a three-fold increase over 1982. Red king crab (P. camtschatica) composed nearly all (99.8%) of the incidental catch in the joint-venture fishery. In contrast, the foreign incidental catch was composed of golden king crab (L. aequisipina, 56%), red king crab (39%), blue king crab (P. platypus, 4%) and L. colesi (1%).

Gulf of Alaska Groundfish Fishery

The total estimated catch by foreign vessels in the Gulf of Alaska in 1983 was 147,500 t, down 4% from 1982 catches. Walleye pollock and Pacific cod were the predominant species caught accounting for 55% and 20% of the catch, respectively. Japanese vessels landed 67% of the catch and the remaining 33% was landed by South Korean vessels. The catch of groundfish by U.S. trawlers participating in joint-ventures was nearly 143,000 t which was about double the catch landed in 1982. Pollock accounted for almost 94% of the catch.

The incidental catch of salmon in the foreign groundfish fishery in 1983 was 9,620 fish or greater than that of 1982. The incidental catch of salmon also increased in the joint-venture fishery where it was estimated that 4,253 salmon were taken. The incidental salmon catch in the foreign fishery was composed primarily of chinook salmon (62%) and chum salmon (37%). The same two species were the predominant components of the joint-venture incidental catch with chinook salmon accounting for 85% of the catch and chum salmon 14%.

The foreign groundfish fishery had an incidental catch of approximately 689,700 halibut (3,235 t) in 1983. The 1983 catch was 23% greater than that of 1982. The incidental catch of 98,571 halibut by the joint-venture fishery in 1983 was substantially greater than the 2,371 fish caught in 1982.

The incidental catch of tanner crab by the foreign groundfish fishery in 1983 decreased 52% from that of 1982. The 1983 catch was 30,600 crab. In sharp contrast, the incidental catch in the joint-venture fishery increased from 364 crab in 1982 to 103,000 crab in 1983. Two species of tanner crab, C. bairdi and C. tanneri accounted for almost all the foreign incidental catch of tanner crab, 56% and 37% respectively. C. bairdi accounted for 99.95% of the joint-venture catch.

As with tanner crab, the incidental catch of king crab in the foreign fishery decreased, whereas, it increased in the joint-venture fishery. The estimated catch of 2,100 king crab in the foreign fishery was 39% lower than the 1982 catch. The catch of 4,454 king crab in the joint-venture fishery was substantially greater than the 1982 catch of 11 king crab. The foreign incidental catch of king crab was composed of red king crab (41%), golden king crab (34%), L. couesi (24%), and blue king crab (<1%). Red king crab composed essentially all (99.7%) of the incidental catch in the joint-venture fishery.

Washington-Oregon-California Pacific Whiting (Hake) Fishery

There was no foreign fishery for Pacific whiting (Merluccius productus) in 1983. The joint-venture fishery landed approximately 73,250 t of groundfish in 1983 of which about 98% or 72,100 t was Pacific.
whiting. The 1983 catch of Pacific whiting was almost 7% greater than that caught in 1982. The total incidental catch of salmon in the Pacific whiting fishery was 5,143 fish which was less than half the number taken in 1982. Chinook salmon composed 80% of the incidental catch. The remaining 20% was composed of coho salmon (O. kisutch, 15%), pink salmon (O. gorbuscha, 4%) and chum and sockeye salmon (O. nerka).

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