INTERNATIONAL NORTH PACIFIC FISHERIES COMMISSION

OFFICERS FOR 1987

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Clement V. Tillion

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Tojiro Nakabe (to January 1987)
Makoto Watanabe
Junzo Sasaki (from October 1987)
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Bernard E. Skud, Executive Director
Daishiro Nagahata, Assistant Director
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 33rd Annual Meeting on November 6, 1986 through the adjournment of its 34th Annual Meeting, held in Vancouver, from November 3 through November 5, 1987. It contains a summary of the 34th Annual Meeting, a brief resume of activities during the interim between annual meetings, and summaries of investigations which the three national fishery research agencies conducted 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.

Pierre Asselin
Chairman
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Publications of the International North Pacific Fisheries Commission
I. INTRODUCTION

The International Convention for the High Seas Fisheries of the North Pacific Ocean was brought into force by Canada, Japan and the United States on June 12, 1953. The purpose of the 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 conducts its business between meetings through its permanent Secretariat in Vancouver, Canada.

In April 1978 the Convention was amended by a Protocol that became effective February 15, 1979 and 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.

In 1986, the three Contracting Parties accepted the recommendation by the Commission to amend the Annex to the Convention. The details of the amendment, which became effective on May 23, 1985, were presented in the 1986 Annual Report and are summarized as follows:

1. Regarding the mothership salmon fishery: fishing in the eastern half of the Bering Sea high seas salmon fishery will be phased out in three years; in the western half of the Bering Sea high seas salmon fishery, it will be phased out completely by 1994. The total mothership fleet days in the U.S. 200 nautical mile fishery zone will be 140 for 1986 through 1993. For 1994 and thereafter, the mothership fleet days will be 144 with an earlier closure of the fishery.

2. Regarding the landbased fishery: the present eastern limit will be moved to the west by 1 degree. This limit may be modified in accordance with the result of strengthened scientific studies to be initiated with the beginning of the 1986 season.

Through Memoranda of Understanding, Canada, Japan and the United States of America also agreed to strengthen scientific research studies on anadromous Salmonidae in the Convention area as well as cooperation in the field of enforcement.
II. REPORT OF THE 34TH ANNUAL MEETING—1987

1. TIME AND PLACE OF MEETING

The 34th Annual Meeting of the International North Pacific Fisheries Commission was held in Vancouver, Canada, from November 3 to 5, 1987 under the chairmanship of Commissioner Pierre Asselin 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 Joseph A. Garcia of Canada chaired those meetings and Dr. Leo Margolis of Canada acted as scientific convener. The Standing Committee on Finance and Administration met November 1 to 5, with Commissioner Michael Z. Florian of Canada as Chairman.

2. PARTICIPANTS

Persons participating in the 34th 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 1987 (Part III 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 total number of participants was 121, including 37 from Canada, 33 from Japan, 40 from the United States, 4 staff members of the Secretariat, 2 consultant-observers, 4 interpreters, and a temporary employee.

3. AGENDA

The agenda for the 34th 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.

4. THE FIRST PLENARY SESSION

The first plenary session of the 34th Annual Meeting, chaired by Commissioner Pierre Asselin of Canada, was held on November 3, 1987 in the Hotel Vancouver, 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.

The Honorable Tom Siddon, Minister of Fisheries and Oceans, addressed the meeting and welcomed delegates to Canada:

Good morning and welcome to Canada, to British Columbia and to Vancouver for this the 34th Annual Meeting of the International North Pacific Fisheries Commission.

For over three decades INPFC has been an important forum for addressing issues of concern between the Contracting Parties and for the exchange of scientific information. Over the years, this exchange and advances in scientific knowledge have increased our fundamental understanding of the North Pacific Ocean and its fisheries resources.

The North Pacific is a vast ecosystem. Its future health is intimately tied to the future viability and the economic and social well-being of our coastal communities. Both our long and short term interests demand scientific knowledge to properly define and address important questions related to the use of our ocean resources. But our interests also demand that our knowledge base is translated into concrete, co-management initiatives on an international level, where conservation in international waters becomes an imperative.

In my own department we have recently restructured our scientific effort to unify our scientific programs and to provide a more effective study of the oceans. For example, we have recently initiated new studies of salmon migration and behavior on the high seas.

Over the years, INPFC has focussed on questions pertaining to the salmon fishery and the interception of North American salmonids in the Japanese salmon-directed fisheries.

We acknowledge the sacrifice Japan has been making under the recently amended INPFC Convention in reducing its salmon intercepting fisheries. We are extremely grateful to Japan for agreeing to phase out the mothership fishery in the Bering Sea by 1994.

However, there are other fisheries in the North Pacific Ocean, such as the squid driftnet fishery, where by-catch of salmonoids, marine mammals and seabirds has reached serious proportions.

For the past two years a small number of Canadian and Japanese vessels participated jointly in an experimental driftnet fishery off our Pacific coast. In 1987 the Canadian and Japanese vessels fished together for 49 days. In that time the Canadian vessel had a by-catch of 639 salmonids, 44 mammals and 112 seabirds. That works out to an average of 1 marine mammal, 13 salmon and more than two seabirds for every 30 kilometres of net, per day.

There are hundreds of vessels of several nations fishing an average of 30 kilometres of net each day in the North Pacific. At the risk of oversimplifying, the same by-catch ratio would predict over 30,000 marine mammals and 75,000 seabirds being accidentally caught by North Pacific driftnets each year.

Given our experience, I believe uncontrolled high seas driftnet fishing represents an unacceptable toll within the Canadian economic zone. For that reason I am announcing today that Canada will no longer sponsor a commercial driftnet fishery for squid
within our waters.

Simultaneously, I have decided to place a moratorium on the use of high seas squid driftnets inside the Canadian 200 mile zone, for the foreseeable future. We will however, continue to welcome proposals for the development of alternative fishing techniques to investigate the potential of the offshore flying squid resource.

I encourage you, as representatives of INPFC member countries to take more effective action to assess and regulate the use of driftnets, in international waters. To do this will require more accurate estimates of by-catch "kill" as percentage of estimated populations, especially for marginal (vulnerable) populations. This important data can best be obtained by placing INPFC observers on vessels engaged in commercial driftnet fishing.

I note that Japan may be proposing a new organization under Article 4 of the Convention that could result in better management of pollock in the North Pacific. Canada would endorse such a proposal. In fact, we feel it should be extended to all non-anadromous species including flying squid.

The problems we face are not only those of the members of the INPFC. Other nations are active in the North Pacific and we must seek ways of expanding discussions and agreements on these questions.

These problems ought to be international priorities. We urge all coastal nations to take immediate action with respect to regulation of driftnet fishing, initiatives to improve gear selectivity and programs to deal with lost and discarded nets and other marine debris.

All these initiatives add up to a more stable, economically predictable resource base within our oceans, for everyone's benefit. This is the essence of conservation.

Although China, Japan, the U.S.S.R., the U.S.A. and Canada conduct scientific research in the North Pacific, much of this valuable information is not fully available to the international scientific community.

With this in mind Canada has endorsed the establishment of a new international Pacific scientific organization. Canada has invited the aforementioned countries to attend a meeting next month in Ottawa to discuss this concept. We look forward to all invited parties agreeing to participate in this important meeting in response to Canada's invitation.

The international approach is a must for the questions of fishing methodologies and the marine debris problem in the North Pacific. I understand the U.S.A. has expressed interest in hosting a scientific meeting on the question of biological and oceanographic studies in this area sometime next spring.

Canada would support this initiative and would be prepared to actively participate in this meeting where we hope our more immediate concerns can be dealt with.

I have spoken so far of domestic, scientific and international efforts to gain new knowledge and to help to preserve the fisheries resources for future generations. But, in the final analysis, political leadership is essential to progress.

In order to ensure a future for our fishery, international cooperation must result in political decisions by all nations involved.

Accordingly, I propose to raise these issues with the responsible political leaders of Pacific Rim nations; to discuss the international action necessary to resolve the environmental problems identified by the scientific community—in particular, those associated with driftnets and marine debris.

At the appropriate time, Canada is prepared to host a conference of political leaders responsible for our common Pacific heritage—the objective being to translate science and information into concerted action.

Canada is determined to ensure that we have the right priorities, and we do the right things. Let us hope that future years will see increased cooperation and further planning at the international level to ensure that marine stocks thrive, that coastal communities prosper, and that the marine resource remains a heritage for future generations of the world.

The Honourable Bruce Hackett, Assistant Deputy Minister, B.C. Ministry of Agriculture and Fisheries, addressed the meeting and welcomed the delegates to the Province of British Columbia:

It is my pleasure to welcome the Commissioners and delegations from the member countries of Japan, the United States, and Canada to the 34th Annual Meeting of the International North Pacific Fisheries Commission.

As Minister of Agriculture and Fisheries for the Province of British Columbia, I have the responsibility of representing our Government's interest in our commercial fishing industry. This interest extends from our role in facilitation of product and market development to our interest in the Federal responsibility for effective management and conservation of stocks on which the economic viability of our industry rests. In this regard, I have recently taken action which I expect will assist this Commission in its undertaking of international cooperative conservation of North Pacific fish stocks.

Because of the Commission's concern about the impact of plastic ocean debris, I have requested the assistance of my Colleagues, the Honourable Bill Reid, Minister of Tourism and the Honourable W. Bruce Strachan, Minister of Environment and Parks to seek the cooperation of tour boat operators which ply the coastal waters of Washington, British Columbia and Alaska, to remove one identified source of ocean debris. I will be pleased to continue to use my office to assist the Commission with its efforts for international cooperation that will aid management and conservation of North Pacific resources.

The Province of British Columbia has a special and direct interest in the outcome of several functions of this Commission. As my predecessors have noted at previous Annual meetings, British Columbia has foregone major hydro electric and other industrial development projects on our major river systems in order to protect salmon spawning and nursery areas. The scientific exchanges structured under this Commission, the new Memoranda of Understanding on Research and Enforcement, the specific proposals generated by the Biology and Research Committee to better determine the geographic distribution of coho and chinook salmon and steelhead trout, all contribute to ensuring that the Province receives a good economic return for its protection of fresh water habitat. I would like to commend the participating Commissioners for their goodwill and cooperation, the scientists for their expertise, and each country—Japan, the United States and Canada—for their productive efforts in these fields and I encourage your continued good work.

I note with interest that, under the sponsorship of the INPFC
and the International Recruitment Investigations in the Subarctic, that scientists from the countries of the contracting parties and Russia and China participated in a scientific symposium prior to this Annual Meeting.

The Government of British Columbia has consistently supported international science symposium and was pleased to have hosted a reception for the first-ever scientific symposium associated with INPFC and held in Vancouver in 1981. This application of science and technology to the solution of complex management and conservation issues is much in keeping with the strategic approaches to economic development and resource management now being developed by the Government of British Columbia—most recently exemplified by the appointment of the Premier’s Advisory Council on Science and Technology.

In closing, I would like to reemphasize my support in principle for the work of this Commission and to reaffirm the support and cooperation of the Province of British Columbia in reaching the objectives of international cooperation and scientific exchanges of this Commission.

I wish the Commissioners, scientists and national delegates continued success in your efforts and I urge a continuing partnership between the United States, Japan and Canada that will enable all nations bordering the North Pacific to continue to enjoy the benefits of well managed fisheries for a long time to come.

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

Commissioner Clement V. Tillion, Chairman of the United States National Section, addressed the session as follows:

I am honored to have the opportunity, on behalf of the United States Section, to make a few remarks at this opening session of the Commission’s 34th Annual Meeting. I would like to express our appreciation for the warm words of welcome to this great city extended by our hosts. In addition, I wish to recognize and welcome two new Commissioners—Mr. Pierre Astelín of Canada, who is serving as Chairman of this Commission, and Mr. Junzo Sasaki of Japan. We look forward to working with these gentlemen in the coming days to address North Pacific fisheries issues of mutual concern. We also wish to offer our condolences regarding the passing of Mr. Tōjirō Nakabe, who served as Japanese Commissioner from 1978 to 1980 and again from 1984 until his death.

Two fishing seasons have now passed since our Governments mutually agreed to support the Commission’s recommendation to amend the INPFC Annex 10 so as to provide further protection for salmon of North American origin. The new conservation regime has provided opportunities to demonstrate our continuing commitment to conserve anadromous resources of mutual concern while recognizing legitimate national interests. In addition, the arrangements made by our Governments through two cooperative Memoranda of Understanding represent an important step toward resolving certain questions on North American salmon intercepions and addressing problems associated with enforcement of boundaries.

This is not to say that we have resolved the problems that we face or the problems relating to other fisheries issues that have arisen. The United States continues to have grave concerns regarding both anadromous and non-anadromous resource conservation issues involving Japan’s fisheries in the North Pacific. More recently, the United States has voiced growing concern about the incidental take and kill of other living marine resources, such as porpoise, fur seals, sea birds, and other non-target resources, incidental to high seas commercial fishing operations. These concerns were evidenced recently when certain environmental and fishery dependent groups were successful in obtaining a U.S. District Court order against the issuance of a marine mammal incidental take permit to Japanese mothership salmon fishermen operating within the U.S. exclusive economic zone. I am sure that our Governments will examine carefully the ramifications of this Court order even as legal actions continue regarding its status. I understand that U.S. Government attorneys are seeking to have the Court order rescinded.

The high seas interception of North American origin salmon remains a significant issue to be addressed by this Commission. The United States has long maintained that Japan’s salmon fisheries have been wasteful, and more importantly, represent a heavy economic burden to U.S. subsistence and commercial fishermen in Western Alaska. Therefore, we need accurate estimates of the catches of salmon in all high seas fisheries. With regard to validation of catch statistics, the U.S. Section is pleased with the results of the 1987 observer program on board motherships and looks forward to the same level of observer coverage in the future. However, we feel sampling effort must be increased in validating the location of catch and effort in the landbased salmon fishery.

In this regard, the U.S. Section wishes to express its concern at this time as to the scale pattern analysis work of our scientists that is being done in accordance with the 1986 Memorandum of Understanding for Salmon Fishery Research Measures. We understand that the progress of the research initiated in accordance with this agreement has been disappointingly slow, and we note that, at the present rate of work, there may not be sufficient results to address adequately continent-of-origin questions in the landbased fishing area to meet the three to five year goal of the agreement. This is not acceptable. We must collect more salmon scales, especially from chinook salmon, and proceed more quickly with research, including the timely exchange of scale samples.

U.S. concern about North American salmon interceptions, however, does not lie alone with Japan’s mothership and landbased salmon fisheries. There is increased apprehension regarding the effects of high seas squid driftnet fisheries on living marine resources. The high seas squid driftnet fishery is unquestionably one of the largest fisheries in the Convention area. It is also unquestionably one of the most controversial in terms of the impact this fishery has on salmon, steelhead, and marine mammal resources and the marine environment. Yet this fishery remains one of the least known and researched. Each year, at INPFC annual meetings, we express and hear statements of concern about the fishery; but a solution is woefully slow. This lack of progress is not acceptable to the United States. In the view of the United States, the time has arrived for all contracting parties of INPFC to agree on more active research and resolve the problems associated with the high seas squid driftnet fishery. As
such, we believe it imperative that we discuss at this meeting ways to further efforts on research and monitoring with regard to this fishery.

At this time, I wish to make some remarks regarding the recently developed fisheries in the international waters of the Bering Sea—the so-called Bering Sea "Donut" area. These fisheries, which cannot be regarded as "traditional" in nature, employ, for the most part, large mid-water trawl gear. They are both intensive and of an alarmingly large magnitude. The United States Section finds it discomforting to note that these fisheries are conducted in an area where we lack accurate scientific information to assess stocks. We need to obtain timely catch and effort data pertaining to these fisheries and identify the stocks and their relationship with other stocks in the North Pacific Ocean and Bering Sea. The effective conservation of this resource depends on cooperation by all of the participants. There is an urgent need for research to understand how the resources in this area are related to those in adjacent exclusive economic zones. Such research must also include the assessment of the effects these fisheries have upon target species, and also nontarget North American origin salmon, marine mammals, and other living marine resources.

Other issues that we intend to address with our Canadian and Japanese counterparts at this meeting include the issue of marine debris, a persistent problem that we all share, and consideration of progress under Article IV of the INPFC Convention regarding the establishment of an international organization dealing with non-anadromous species. The United States Section believes it important for us to cooperate to support increased scientific investigations and information exchanges concerning the fisheries and oceanography of the North Pacific Ocean and the Bering Sea. Such cooperation would be of great benefit to all parties concerned with North Pacific marine issues.

We are now entering our third year of operating under the amended annex to the INPFC, together with the arrangements made by our Governments regarding enforcement and salmon research issues. At the 1986 Annual Meeting, we began the process of altering the procedures of the Commission to complement the adjustments made under the amended annex and the Memoranda of Understanding. We have also since restructured committees to take into account other areas where adjustments were needed. The United States Section believes that the Parties must continue their efforts to make the Commission an effective and efficient model for international fisheries cooperation. A commitment to the free exchange of scientific information must be accompanied by a commitment to making available the information developed through the efforts of the scientists of all three countries to the scientific community at large. In closing, the United States Section looks forward to visiting our many friends here and to frank and productive meetings.

Commissioner Kenjiro Nishimura, Chairman of the Japanese National Section, addressed the session as follows:

It is my great pleasure to say a few words here today on behalf of the Japanese National Section on the occasion of the opening of the 34th Annual Meeting of the International North Pacific Fisheries Commission.

Now, representing the Japanese National Section, let me, first, express my heartfelt gratitude to The Honourable Tom Siddon, Minister of Fisheries and Oceans, and Mr. Bruce Hackett, Assistant Deputy Minister of Agriculture and Fisheries.

The Province of British Columbia is blessed with abundant fisheries resource. Considerable amount of marine products are exported to various parts of the world including Japan. I believe it is a significant event to hold the 34th Annual Meeting of the International North Pacific Fisheries Commission here in Vancouver that is the center of the fishing industries. British Columbia and Japan are closely tied not only in the field of fisheries but also in other fields of trade and sightseeing. Japan is honoured by visit of the Honorable William Vander Zalm, Premier of B.C., in October 1987. We are very pleased by his successful visit that has strengthened the friendly relationship between this Province and us.

The Japanese National Section welcomes the participation in the INPFC of a new Canadian Commissioner, Mr. Pierre Asselin. We will remember for long happy memories of former commissioners, Ms. A. Lefebvre-Anglin and Mr. D. Miller who have been cooperatively working with us. Taking this opportunity I would like to express our many thanks to Mr. Daishiro Nagahata, Assistant Executive Director of the Secretariat, who has made great contributions to the excellence of performance and growth of the Commission and now is going to finish up his three year tenure of office next March.

There have been some changes in the membership of the Japanese National Section. Mr. Tojiro Nakabe, who could not attend the last annual meeting but had been working with us as a commissioner for the past three years, suddenly passed away January this year, and Mr. Junzo Sasaki, President of Niihiro Fishery Co. Ltd., was appointed in his place. As Mr. Kenichi Unno is unable to attend the meeting this time owing to unavoidable circumstances, Mr. Kazuo Shima, Councilor of the Fisheries Agency is attending as an acting commissioner.

At the extraordinary meeting of the INPFC, which was held also here in Vancouver in April, last year, the Annex of the Convention was amended. This amendment includes very strict restrictions for the Japanese salmon fishery such as the phase-out of the mothership salmon fishery from the Bering high seas by 1994 and the westward movement of the eastern boundary of the landbased salmon fishery area. By accepting such amendment, Japan could retain the right to continue our salmon fishery in the Convention areas. Let me speak on a certificate of inclusion relating to the incidental taking of marine mammals of which acquisition is required under the Marine Mammal Protection Act for the mothership salmon fishery within the U.S. 200 nautical mile zone. Although it was reissued this year, Alaskan natives instituted a suit, claiming that Japanese fishing under the certificate is illegal since the incidental taking of fur seals and sea lions are not permitted in the certificate. United States District Court for the District of Columbia gave an order to temporarily stop fishing, though the fishing operation of this season has terminated before the date of its suspension. Japan's operation of mothership salmon fishery within the U. S. 200 nautical mile zone might become impossible to continue depending on the result of the suit. Should the order become conclusive, it will not only impede the smooth implementation of the Annex which was amended at the extraordinary meeting of the INPFC.
in April last year, but also deny the international cooperation system for the conservation and management of North American salmon which our three countries of Japan, the United States and Canada have been strenuously fostering since 1952.

Japan has a grave concern over catch and trade of salmon by non-contracting parties of INPFC. As the nation with a long history of high seas salmon fishery, Japan has cooperated for conservation and management of salmon stocks under INPFC. Recent illegal fishing activities for salmon by non-contracting parties can negate its foundation of the current INPFC regime, so that the Japanese National Section believes it critical for all three nations of INPFC to further intensify the present cooperation among all Contracting Parties to prevent the take of salmon by such non-contracting Parties from fishing in the Convention Area.

As for bottom fish fisheries, Japan has already lost its fish allocation within the Canadian Pacific 200 nautical mile zone in 1983, and fish allocation for Japan within the U.S. 200 nautical mile zone was greatly reduced to only 100,000 tons this year from 900,000 tons in 1985, and thus our country is getting expelled from the U.S. waters. On the other hand, the joint venture for the purchase of fish from the United States which started in 1981, has been rapidly expanding, and Japan already bought 670,000 tons of pollock this year. However, it is inevitable that this joint venture will be scaled down from next year under the U.S. policy of full utilization of their own resources by their own fishery industries.

Due to a rapid reduction of fish allocation by the United States, Japan has directed its attention to the Bering high seas as a fishing ground of bottom fish fishery, and fishing there has been remarkably expanding. It is said that pollock in the Bering high seas consists of several stocks and that their quantity is large, but, at present, our scientific knowledge on bottom fish resources in the waters is limited. Therefore, we think it is important to compile scientific knowledge by improving research studies and to establish at an early stage an international organization with broader membership dealing with non-anadromous species, as provided for in Article 4 of the Convention, and to throw an objective light on the resources by enhancing cooperation with regard to research, analysis and exchange of scientific information and knowledge on non-anadromous species in the North Pacific Ocean.

Japan’s squid driftnet fishery in the high seas of the North Pacific Ocean has been rapidly growing in recent years. Japan has been operating this fishery, setting month by month a northern boundary of the fishing ground to evade incidental taking of salmon of North American origin.

In this connection, I would like to add that Japan is making utmost efforts to take preventive measures against trespassing this northern boundary, including the construction of a new enforcement vessel for the squid fishery.

Recently, marine debris has become an issue of international attention, and Japan intends to continue actively to cope with this problem by improving sighting survey by research vessels and reinforcing guidance for fishermen. In this connection, I am delighted to know that the meeting of the Steering Committee of the INPFC held in Tokyo last summer decided that the INPFC would deal officially with squid driftnet and marine debris in addition to the question of marine mammals incidentally caught in salmon fishery.

In addition to movement to exclude Japan’s high seas salmon fishery, the United States and Canada have recently taken up a problem of marine mammals and seabirds incidentally taken in salmon fishing and squid driftnet fishing, etc. and a problem of marine debris caused by such fishing activities. In the United States, a bill of the Driftnet Impact Monitoring, Assessment and Control Act has been laid before the Congress.

It is our most ardent desire that this kind of legislation will never be materialized in the future.

I sincerely hope that at this annual meeting, frank and constructive views will be exchanged on these difficult problems with full understanding and close cooperation of commissioners of each country, the persons concerned and the Secretariat, and that good results would be produced.

Acting Commissioner John C. Davis, Spokesman for the Canadian National Section, addressed the session as follows:

It is a great pleasure for me to have an opportunity to make a few remarks on behalf of the Canadian National Section. First of all, I would like to join with my fellow Commissioners in thanking the Honourable Tom Siddon, Minister of the Federal Department of Fisheries and Oceans and Mr. Bruce Hackett, Assistant Deputy Minister of B.C. Ministry of Agriculture and Fisheries, for their encouragement, stimulating thoughts, and their warm words of welcome.

Canada wishes to note, with sadness, the death this year of Japanese Commissioner Tojiro Nakabe. Mr. Nakabe served with distinction from 1978 to 1980 and again from 1984 until his untimely death in January.

At this time, Canada would like to welcome the new Japanese Commissioner Mr. Junzo Sasaki, President of Nichiro Fishery Co. Ltd. and trust he will find his appointment to be a fruitful experience. As well, we would like to greet a familiar person to INPFC proceedings, Acting Commissioner, Mr. Kazuo Shima, a former Executive Director of INPFC, who is replacing Mr. Kenichi Unno.

It is with great pleasure that I acknowledge and welcome former Commissioners, Mr. Jim Cameron who served as a Commissioner for 25 years, and Mr. Donovan Miller, Mr. Miller, to the great loss of the Canadian delegation, resigned this year as Canadian Commissioner. Mr. Miller has been in the service of INPFC for 23 years. His dedication, experience, sound advice and pleasurable company will certainly be sorely missed by not only the Canadian delegation but also by the INPFC community.

We also welcome former Executive Director Dr. Clifton Forrester.

Canada would again like to emphasize the importance that we place on participation in this forum for the exchange of scientific information and for the opportunity to discuss issues that are of concern to all of the Contracting Parties. INPFC continues to be an excellent vehicle for the international exchange and cooperation that is essential for effective conservation and management of fishery resources.

Canada has particular concerns regarding the interception of British Columbia steelhead trout and Yukon River salmon. Therefore, we strongly support initiatives to improve stock
identification methodologies, as a means of better quantifying these interceptions. In this regard, Canada will continue to request information on the salmonid by-catch in the U.S. domestic groundfishery.

As we have heard, there are concerns with respect to the impact of high seas driftnet fisheries on fisheries resources and other marine life. Accordingly, Canada has pressed for discussion, on matters such as incidental catch, lost and discarded gear and other marine debris. We need to find ways to deal with these problems through international cooperation both within INPFC and outside INPFC.

As you have heard from the Minister, Canada strongly supports the formation of a new scientific organization for the North Pacific.

You have also been made aware of Canada’s concern and intent to provide a forum to examine risks associated with marine debris and the expanding international driftnet fishery. Canada’s concern has been placed into action by the announcement this morning regarding the moratorium on further high seas squid driftnet activity by Canada within our 200 mile limit.

Canada acknowledges the improved quantity and quality of scientific information that is now being generated as a result of the observer and port sampling programs; as well, the scientific exchanges and the contribution of oceanography and fisheries disciplines combined—that have resulted from the IRIS-INPFC sponsored symposium will most certainly benefit the interests of the contracting countries and ensure sustained benefits from North Pacific resources.

Finally, on behalf of the Canadian Section, we are pleased to host the 34th Annual Meeting in Vancouver and sincerely hope the Commissioners and other members of the delegations from Japan and the United States enjoy their stay. We look forward to the frank exchanges, cooperation and mutual benefits that these meetings will bring to all parties.

Mr. Pierre Asselin, Chairman of the Commission, addressed the meeting as follows:

As Chairman of the 34th Annual Meeting of the Commission, I would like to welcome you to Canada and to Vancouver. I trust you will enjoy your visit from the point of view of what this fine city has to offer and also from the frank discussion that will ensue regarding the fisheries of the North Pacific.

Although I have not participated in past meetings, all records I have reviewed and discussions with individuals I have had, indicate the great value that has been gathered from this meeting in the past and I’m sure will continue into the future.

On behalf of all the Commissioners I wish to welcome Mr. Junzo Sasaki as a new Japanese Commissioner. Mr. Sasaki is President of Nichiro Fishery Co. Ltd. I extend my congratulations and best wishes to Mr. Sasaki in his new role.

As has been mentioned I have replaced Ms. Aimée Lefebvre-Anglin as Canadian Commissioner. Alternate Commissioner John Davis is filling in for Mr. Don Miller who resigned earlier this year. After such a distinguished and lengthy tenure as Commissioner it is not an easy task to find a permanent replacement for Mr. Miller.

The technical discussions that have taken place over the last week have been a success. The cooperation between all our countries, in this forum, tends to continuously improve.

I look forward to a productive meeting, with the goal of attaining mutually beneficial results.

5. Procedures

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

6. Consideration of Administrative Matters

6 (a) Report of the Chairman

The Commission adopted the address given by Mr. Pierre Asselin of Canada at the opening plenary session as the Chairman’s report to the Commission for 1987.

6 (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:

ii. Details of items in the auditors’ report for the 1986/87 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, 1988 and budget forecast for the fiscal year beginning July 1, 1989.
   The Commission recommended that a budget totalling $407,400 (Canadian funds) be adopted for the fiscal year beginning July 1, 1988. Each Contracting Party is to contribute a one-third share ($135,800). The committee presented to the Commission a budget forecast totalling $438,000 (Canadian funds) for the fiscal year beginning July 1, 1989. The budget forecast is provided for the guidance of national sections and is not to be considered for adoption until the 35th Annual Meeting in 1988.
   The committee reviewed the Administrative Report submitted by the Secretariat (Section III 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.

6 (c) Other administrative actions

The Commission confirmed that the first plenary session of the 35th Annual Meeting of the Commission be held on Tuesday, November 1, 1988, in Tokyo, Japan, and endorsed the committee’s recommendation that the 36th Annual Meeting be held in Seattle,
Washington, with the first plenary session on Tuesday, November 7, 1989.

The Commission also endorsed the committee's recommendation that meetings of the Standing Committee on Finance and Administration associated with the 1988 Annual Meeting be convened on Monday, October 31, 1988.

7. 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 1987 Annual Meeting the committee utilized three sub-committees to assist in the conduct of its work. These were: the Sub-Committee on Salmon, the Sub-Committee on Marine Mammals, and the Sub-Committee on Non-Anadromous Species which included two panels (Bering Sea and Northeast Pacific) to consider matters related to groundfish, king and tanner crab and the marine debris. The 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 adopted at the third plenary session. 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.

8. Activities of the Commission Concerning Salmonids

8 (a) Background

Responsibilities with respect to salmon were assigned to the Commission through the Protocol amending the Convention. 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.

8 (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. 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 on distribution and continent of origin of salmonids

(a) Scale pattern analysis methodology

The Scale Pattern Analysis Working Group, formed during the 1986 Annual Meeting, met for three days in February and discussed several aspects of scale sample size requirements and statistical procedures. The Working Group recommended intensification of scale sampling in the high seas fishery area, which was accomplished during 1987 Japanese research vessel and commercial mothership fishery operations. In addition, a workshop on scale pattern analysis was held for two days in October, during which members of the Working Group, as well as a number of scientists outside of INPFC-related research, had opportunity to review pertinent research papers and to further discuss methodology. Papers discussed at the Workshop addressed several important aspects of methodology, including methods of scale data acquisition (particularly use of new image analysis equipment), variable selection, methods of constructing standard samples, use of classification and maximum likelihood techniques, and combined use of scale data and other stock discriminating information. The sub-committee agreed that much progress had been made through these two meetings toward the selection and standardization of appropriate methodology, and agreed that member nations can proceed with scale pattern studies in response to the research mandate in the 1986 MOU on Research.

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

The sub-committee reviewed research activities and new information on continent of origin of salmonids occurring in waters southwest of 46°N, 175°W, and, as in recent years, prepared an updated summary of information for each species. Tagging effort in these waters greatly increased in 1987. In the area south of 46°N and between 160°E and 175°W, which was given high research priority at the 1986 Annual Meeting, 4,775 salmonids were tagged and released in 1987 Japanese research operations, as compared to 907 in 1986. Japanese biological sampling of salmonids in this area more than doubled between 1986 and 1987. The United States has contributed to tagging in this area.
in recent years in cooperation with the U.S.S.R., but cooperative tagging in 1987 did not occur due to unavailability of a vessel. There were eight new Asian coastal recoveries of disc tags from 1987 and earlier releases southwest of 46°N, 175°W, including one sockeye, two chum, and five coho salmon. Effort to obtain information through coded wire tags increased on two fronts: (1) North American coded-wire tag releases have continued to increase in number, and (2) the Japanese landbased salmon fishery port sampling program was intensified in 1987. The port sampling program, which in 1986 focused only on steelhead but which in 1987 covered both steelhead and coho salmon, resulted in the first recoveries of coded-wire tags (from two steelhead) from landbased fishery catches. Coded-wire tag recovery from catches of research vessels in 1987 resulted in three new records of North American steelhead occurring in these waters.

Despite the new information gained in 1987, the sub-committee remains concerned about the level of research pertaining to the area southwest of 46°N, 175°W, and made several recommendations to draw this matter to the Commission’s attention and to encourage continued intensified research.

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

Considerable new information was reported on salmonids in waters north of 46°N and east of 175°W. The sub-committee noted that there was an increase in high seas tagging in these waters, effected by an increase in Japanese tagging operations (particularly in the mothership fishery area in the North Pacific and Bering Sea) and by renewed Canadian high seas tagging operations. There was also an increase in biological (i.e., scale) sampling for sockeye, coho and chinook salmon in catches by the mothership salmon fishery. New tag recoveries (from both disc- and coded-wire tagging) provided several significant records for areas adjacent (both north and east) to the pre-1978 landbased fishery area. The sub-committee recommended continued sampling and tagging in the mothership salmon fishery area.

The sub-committee reviewed five new documents providing information on salmonid and flying squid distributions, and two documents on oceanographic conditions in the North Pacific Ocean. The five documents mentioned present information on salmonid and squid distributions as indicated by Japanese, Canadian and Taiwanese research vessel operations. These studies together showed that salmonids occur within the authorized area of the Japanese squid driftnet fishery, but the frequency of capture of salmonids was generally low. The sub-committee agreed that while the extensive driftnet catch data from Japanese research vessel operations have provided much insight into the co-occurrence of squid and salmonids near the northern boundary of the Japanese squid fishery area, accumulated knowledge has indicated that such co-occurrence is not a simple function of surface temperature. The sub-committee recommended a diverse approach for future research on this issue.

(2) Exchange of scientists

In accordance with the 1986 MOU on Research, Japan hosted a Canadian scientist on a salmon research vessel that conducted operations in the land-based fishery area. The United States elected to place a scientist on another Japanese research vessel that conducted some operations southwest of 46°N, 175°W but worked mainly in the Bering Sea.

(3) Exchanges of statistics, data and samples

The sub-committee noted that eleven documented and additional informal exchanges of samples and information had taken place since the last annual meeting to support research analyses by member country scientists. Exchanges of fishery statistics and exchanges of basic data from research vessel operations are up to date.

(4) Publications on salmonids

The sub-committee reviewed the status of publications pertaining to salmonids. The status of preparation of two joint comprehensive reports (on continental origins of salmonids south of 46°N and on steelhead distribution and origins) was reviewed. Considerable progress on background studies toward the steelhead report has been made, and drafting of the steelhead report has begun. Completion of the report on continental origins must await results of new research by the national sections. Other publications, including the Statistical Yearbook and Bulletins pertaining to salmonids, are up to date, although the Japanese language version of Bulletin 46 was deferred.

(5) Other business

(a) Japanese activities pursuant to the 1986 MOU on Research

The program to educate Japanese fishermen about tag recovery was greatly increased in 1987; the Fisheries Agency of Japan held 16 meetings with mothership fishery and landbased fishery constituents and distributed leaflets detailing instructions for recovery of marked fish.

Japan described 1987 results of effort to validate landbased driftnet salmon fishery statistics by examining satellite navigation records. Generally the locations of sampled vessels as determined by the navigation records corresponded well with those in catch reports.

(b) 1987 Japanese landbased driftnet salmon fishery port sampling program

Japan described the 1987 port sampling program, noting the increased sampling level over 1986 and the first recovery of coded-wire tagged salmonids from landbased fishery catches. Japan agreed to provide results of the 1988 program in Document form.

(6) Research plans for 1988

Tentative research plans were reviewed. In accordance with Article X of the Convention and the 1986 MOU on Research, these plans represent a coordinated effort to determine continental origins of salmonids, with special emphasis on the mothership and landbased salmon fishery areas. Recommendations regarding research are summarized in the following section.

(7) Recommendations of the Sub-Committee on Salmon

The committee endorsed all of the sub-committee’s new recommendations, summarized below.

(a) Research on origins of salmonids south of 46°N

The sub-committee RECOMMENDED that the Standing Committee on Biology and Research convey to the Commission the concern that the level of research pertaining to these waters may, even after the increase in 1987, not be enough to provide sufficient information in accordance with the 1986 MOU on Research. Anticipating continuation of the Japanese landbased salmon fishery port sampling program, the sub-committee
RECOMMENDED that increased numbers of chinook and coho salmon and steelhead trout be coded-wire tagged by North American agencies. The sub-committee RECOMMENDED that tagging effort in the area south of 46°N and between 160°E and 175°W be maintained at least at the 1987 level. Also, the sub-committee RECOMMENDED that scale sampling south of 46°N remain at a high level and that special effort be made to increase scale sample sizes for chinook salmon.

(b) Research on origins of salmonids in the mothership fishery area
The sub-committee RECOMMENDED that sampling and tagging be continued in the area around the Aleutian Islands and in the Bering Sea.

(c) Standardization of scale pattern analysis methodology
The sub-committee RECOMMENDED:
(i) the use of either maximum likelihood or classification (with correction) as statistical procedures for estimating stock composition of fishery samples;
(ii) that scale data collection not be restricted to any particular method;
(iii) that national sections should continue efforts to obtain scale samples and other biological samples from the U.S.S.R.;
(iv) that stock composition estimates for any established stratum should be based on unknown-origin samples of at least 100
scales; and
(v) that national sections should proceed with studies on continental origins, based on i–iv above.

(d) Research on the distributional overlap between salmonids and squid in the North Pacific Ocean
The sub-committee RECOMMENDED that research effort on this subject be designed and conducted to assess how distributional overlap is affected by differing frontal zones, mesoscale fronts and eddies, vertical temperature structure, and distribution of plankton and prey species, and RECOMMENDED that more research priority be placed on the period September through December.

(e) Ad Hoc Salmon Research Coordinating Group
The sub-committee RECOMMENDED that the Ad Hoc Salmon Research Coordinating Group meet in March 1988 and confine its agenda to matters relating to research planning and coordination.

The Committee accepted the proposal by Japan that the Ad Hoc Salmon Research Coordinating Group meeting be held in Tokyo next year. Japan has provided meeting facilities and services in Tokyo and the committee noted that Japan will continue to do so.

Following the presentation of the Report of the Standing Committee on Biology and Research, a spokesman for each national section made comments respecting salmonid research and non-anadromous species as follows:

United States comments:

The United States Section has reviewed the report of the Standing Committee on Biology and Research and has the following comments to make.

The validation of catch statistics in the Japanese mothership and landbased driftnet salmon fisheries remains of great importance to the U.S. Section. We are pleased with the results of the 1987 salmon observer program on board motherships and look forward to maintaining the same level of coverage in 1988. The 1987 validation efforts reported by Japan at this meeting for the landbased driftnet fishery, however, again indicate that only a portion of the vessels are capable of providing records of fishing locations which can be validated with the Naval Navigation Satellite System (NNSS). The U.S. Section urges Japan to require all vessels to maintain NNSS records of daily fishing location which can be sampled to provide a means of ensuring the accuracy of logbook information.

The U.S. Section is also gravely concerned with the apparent failure of the mothership fleets to comply with the agreement that all steelhead caught by catcherboats be returned to the motherships for examination by a U.S. salmon observer. For the second consecutive year, not a single steelhead was returned to one mothership and only 14 steelhead were returned to another mothership for sampling in 1987. We request that this problem be corrected. In addition, the U.S. Section requests the cooperation and assistance of Japan in sampling scales and taking biological measurements from chinook, coho and sockeye salmon and steelhead on board motherships in 1988.

Participation of U.S. scientists in the research cruises of Japan and Canada in the landbased salmon and squid driftnet fishing areas in 1987 is greatly appreciated by the U.S. Section. We request the cooperation of Japan in placing a U.S. scientist on board a Japanese salmon research vessel in 1988 to undertake research on salmonids and marine mammals in the landbased fishing area. Our scientists wish to have the earliest opportunity to participate in the planning of the research cruise, development of its objectives and selection of areas of sampling, so that final arrangements can be completed at the meeting of the Ad Hoc Salmon Research Coordinating Group in Tokyo next March.

While progress has been made in standardizing the methods and analysis of scale patterns, our knowledge of the distribution of North American salmonids has not increased greatly in the past year. Without additional research, we will not be able to meet the three to five year objectives mandated under the 1986MOU on Research. The U.S. Section strongly urges that member countries expedite the exchange of scale samples and associated biological data among laboratories so that we can move ahead quickly with the agreed upon methodology and analytical techniques.

The new terms of reference for the B & R Committee have enabled discussions on information relating to the high seas squid driftnet fishery in the three sub-committees. The U.S. Section endorses this change and believes it is important that open discussions of the impact of the squid driftnet fishery on North American origin salmon and steelhead, marine mammals, and other marine resources be continued and expanded at future meetings.

The U.S. Section considers the incidental catch of salmon and steelhead of U.S. origin; and the incidental entanglement and kill of marine mammals, seabirds and other marine resources by all high seas driftnet fisheries to be of great concern. We know that Japan has almost 500 vessels licensed in its squid driftnet fishery and is also the only contracting party conducting such a fishery. Therefore we look to Japan to provide information and opportunities for cooperative research with member countries to
assess impacts of this fishery on living marine resources in the North Pacific.

It is our belief that there is a need to collect and provide detailed catch and effort data of this squid driftnet fishery by 20×50 statistical areas and 10-day periods. Such data must include the incidental catch of salmon, steelhead, marine mammals, seabirds, and other marine species. Adequate opportunities for scientific observer coverage of commercial operations in the entire fishing area must be provided. Adequate enforcement of the regulations must also take place. Finally, special scientific research designed cooperatively under the auspices of INPFC should be conducted, such as research on salmon-squid-oceanographic interactions. The United States has repeatedly urged Japan to work cooperatively on all of the aforementioned activities, but regrets that progress has been extremely slow. We hope that Japan will cooperate fully and actively in the immediate future so that sufficient data can be collected, assembled, and analyzed within the shortest possible time to resolve the problems we have outlined.

On other matters dealing with non-anadromous species, the U.S. Section is pleased with the degree of cooperation and progress on research discussed at this meeting and throughout the past year. We want to take special note that the high degree of cooperation on groundfish research has taken place because of the diligence of all our scientists who worked objectively to improve the status of the knowledge of groundfish resources.

We want to encourage this type of cooperation to take place with regard to the new research priorities that now confront the Commission. I am referring to the new research priorities on the pollock fisheries in the international waters of the Bering Sea Ocean. The rapid buildup of these fisheries must be of particular concern to INPFC; for they are being conducted with virtually no information on the status of the stocks. Besides, the U.S. Section is concerned that the squid driftnet fisheries have severe negative impacts on salmon, steelhead, marine mammals, seabirds, and other marine life. We have directed our scientists to work with all other national parties involved with these fisheries to study their impacts on marine resources. In this regard, our scientists will be contacting yours to exchange data and coordinate the necessary research. We hope that you will have your scientists cooperate fully in this common endeavor.

Finally, Mr. Chairman, the U.S. Section supports adoption of the B & R report and hope that all our suggestions can be carried out successfully in the coming year.

Japanese comments:

The Japanese National Section has carefully studied this report and it is a great pleasure to learn that the cooperation in the field of research amongst the three nations continues to be reinforced and that consistent results have been obtained. The Japanese National Section would like to express on this occasion our heartfelt gratitude to those scientists of the three nations and the members of International Pacific Halibut Commission who have participated in the deliberations of the Standing Committee on Biology and Research, as well as to the Secretariat and the interpreters who have worked very hard in order for our meeting to progress smoothly. And with these thanks we agree to support the adoption of this report.

Now, let me take this opportunity to make some comments on the contents of this report.

First of all, on anadromous species, this is the second year since the provisions of the Annex were amended in 1986, as well as the newly established Memorandum of Understanding on Research. The Japanese scientists have been making even greater effort than in the past to fulfill the stipulations of the INPFC Convention, including acceptance of the U.S. and Canadian scientific observers on board the Japanese research vessels and increases in the numbers of salmonids tagged and released in waters south of 46°N where particularly we have attempted to expand our research effort by adding a new research vessel.

With thanks to the people involved, I would like to emphasize that the number of salmonids tagged and released has shown a phenomenal increase in these waters, from 907 in 1986 to 4,775 in 1987. We also saw a phenomenal increase (more than double) the number of specimens for which biological measurements were made in 1986. We also would like to continue such cooperation as far as our human and financial resources will allow, including the items that have been studied at this year's annual meeting.

Next, on the research to determine the continent of origin, questions, such as standardized methods on scale pattern analysis, as well as the selection of characters, etc., have been discussed at this year's working group meeting and workshop. In this context, Japan would like to emphasize a need to validate the results from scale pattern analyses by other methodologies including parasite studies and isozyme analysis.

Regarding our port sampling program, the Japanese National Section will make every effort to exchange views through correspondence, so that the desires of the Canadian section may be fully reflected in our plans for the program for the next fishing season.

On non-anadromous species, we are particularly pleased that, as a result of the improved research efforts by the three nations, the scientific information has been dramatically increased in recent years, further closing the gap in views among the three nations concerning the status of groundfish stocks. Furthermore, it has become evident that the status of groundfish stocks in the eastern Bering Sea, Aleutian Islands region and Gulf of Alaska generally have been extremely good with the exception of some species. There are some signs of recovery on pollock resources in the Shelikof Strait of the Gulf of Alaska, where the status of the stock has been of some concern. In particular in the eastern Bering Sea, the most recent assessment has revealed that the stocks of pollock, Pacific cod, yellowfin sole and other small flatfish, etc., so that the abundance of these species has greatly increased, and therefore the total allowable catch of the groundfish species from the eastern Bering Sea and Aleutian Islands region now exceeds the level of 2 million tons, representing the upper level of the present optimum yield. Based on the views of the scientists of the three nations concerning the favorable state of the stocks, and from the point of view of the effective utilization of the resources, the Japanese National Section strongly urges that the result of such stock assessments for the respective species be fully reflected in the management of the groundfish resources within the U.S. 200 mile zone, particularly in the eastern Bering Sea and Aleutian Islands region. In other words, we would like the results of these studies to be taken into account and consideration be given for catch allocations of the said species to
the Japanese fisheries which first explored these groundfish stocks.

Regarding pelagic pollock stocks in the Aleutian Basin, including the international waters, because of lack of biological knowledge, Japan intends to make the greatest possible effort for carrying out further research on these stocks and for collecting information on the fishery in this region. However, we would like to point out that the number of the nations engaging in this fishery are several, including some non-contracting nations, and in order for us to carry out research on these stocks, cooperation of all the nations involved would be essential. Therefore, for this purpose we find it necessary that a new international organization be set up under INPFC Article IV, comprising those fishing nations that operate in these waters, as well as nations that have adjacent 200 mile zones.

Furthermore, at this annual meeting, flying squid resources in the high seas and marine debris have been taken up as new subjects of study by the Sub-Committee on Non-anadromous Species.

As for the flying squid resources in the high seas, the Japanese National Section already has been intensifying its research effort for several years. The number of research- vessel days expended for flying squid was 48 in 1985, increased to 144 in 1986 and 193 in 1987, and thus we have been expanding our research effort year after year, and through these studies detailed knowledge on the relationship between flying squid distribution and oceanographic conditions is being accumulated.

The results of these studies have already been reported to this Commission, and we intend to continue to make effort to improve our research as well as to collect information on this fishery, so that we may achieve a rational management of this stock and of the squid drift fishery.

As for marine debris, this has been taken up as a new global issue in recent years, and in the North Pacific as well this has become an important issue. The Japanese section also considers that it is essential to maintain the healthy state of marine environment to secure the rich production from marine biological resources, and we think it is urgent to establish some research framework under international cooperation, including intensified systematic sighting surveys on marine debris. In this regard, Japan has conducted sighting surveys in 1986, using 20 vessels and we plan to carry out similar surveys using over 40 vessels in 1987.

Finally, we hope that the various recommendations contained in the report of the Standing Committee on Biology and Research be smoothly implemented, so that scientific knowledge will continue to be accumulated.

Canadian comments:

Mr. Chairman, Canada has examined in detail the report of the Standing Committee on Biology and Research and wishes to make several comments concerning matters covered in the report.

With respect to salmon, we were pleased to note that there was increased research effort in 1987 to address the question of the origins of salmon occurring in the waters south of 46°N and west of 175°W. Nevertheless, we note the Committee's concern that the present level of research may still be insufficient to provide the information necessary for a decision by the Commission in accordance with the 1986 Memorandum of Understanding on Research. Therefore, we urge that tagging south of 46°N be further increased and that other continent of origin studies pertaining to this area be emphasized and expanded, including increased efforts to recover coded-wire tagged salmonids.

In this regard, we were pleased to participate in a Japanese research vessel cruise in 1987 in the area south of 46°N, and look forward to participating again in 1988, including involvement in the design of the program.

The port sampling program in Japan is another matter of considerable interest to Canada and we were pleased to note the expansion of the sampling to include coho salmon as well as a greater number of steelhead trout. We would like to see further expansion of the program to include chinook salmon and would welcome the opportunity to have input into the sampling design. Canada notes, with great pleasure, Japan's support for discussing the design of the port sampling program and attempting to address Canadian concerns.

We note the success of the scale pattern workshop held in Nanaimo and anticipate that the agreements reached on scale pattern methodology will lead to more precise estimates of stock origins in high seas salmon catches.

The additional recoveries in the Yukon River of salmonids tagged in the Bering Sea add to our knowledge of the ocean distribution of these stocks. This information is important to Canada's interests and concerns about Yukon River salmon and we urge continuation of tagging salmonids in the Bering Sea.

The overlap in distribution of squid and salmonids is a question of great interest to Canada. We fully support and expect to take action on the recommendation to design and conduct studies to assess how this overlap is affected by certain oceanographic features.

With regard to marine mammals, Canada urges the Contracting Parties to collect information on the incidental catch of all species from all high seas drift net fisheries.

The matter of ocean debris, including lost or discarded nets, and its effect on the living resources of the North Pacific Ocean, is also of great concern to Canada. We are pleased to note the involvement of all three countries in addressing the issue of ocean debris. We urge expansion of surveys to assess the magnitude of this problem and we support the initiative to develop methods for quantifying ocean debris.

We are pleased to note, Mr. Chairman, the enormous success of the IRIS-INPFC symposium and the importance of this event in bringing oceanographers and fisheries scientists together to address issues related to the effects of oceanographic variability on fish stocks. We also consider this symposium a significant step in recognizing the value of establishing a broad scientific organization to address questions pertaining to the fisheries resources of the North Pacific Ocean. We will comment further on this latter subject under agenda item 13.

We note that the restructuring of the Committee on Biology and Research has increased the efficiency with which matters pertaining to all species of concern to the Commission are handled. We look forward to further increases in efficiency with implementation of the proposed revision in the scheduling of subcommittee meetings.

Finally, Mr. Chairman, we endorse the many recommendations contained in the report, and express our thanks and appreciation to the many scientists who contributed to its prepara-
tion, as well as to the Secretariat and the interpreters for their assistance.

We support the adoption of the report.

During a discussion of scientific studies to determine the continent of origin of anadromous species, Article III 1. (d), spokesmen from each national section presented the following statements:

**United States comments:**

Provisions of Article III 1. (d) are more specifically addressed in the 1986 Memorandum of Understanding on Research, which provides for a three to five year period of study, commencing in 1986, on the continent of origin of salmonids migrating south of 46°N.

Discussions leading to the 1986 Amended Annex and agreed MOU on Research highlighted the insufficiency of data on origins of salmon and steelhead trout in the area of the landbased drift net fishery of Japan, south of 46°N. At last year’s annual meeting, the B & R Committee called to our attention the need to expand the cooperative research program in order to meet the three to five year time schedule outlined in the MOU on Research. In this regard, the United States is pleased to learn of major accomplishments toward the goal in 1987.

Looking forward now to the 1988 research program, we note that the B & R Committee has concerns that the level of the expanded research may still be insufficient to provide the information required in accordance with the 1986 MOU on Research. We therefore wish to encourage the following activities as referred to in the report of the Sub-Committee on Salmon.

First, we request that the level of tagging south of 46°N be maintained or increased, and that more coded-wire tagged salmon and steelhead be released by the U.S. and Canada. Second, we request that plans be developed as soon as possible to increase the 1988 scale sample sizes for chinook salmon in the area south of 46°N. We suggest that this might be accomplished by (1) increased gillnet sampling by research vessels, (2) sampling aboard landbased salmon vessels, and/or (3) collection of chinook salmon scales during port sampling of landbased vessels. We urge that these plans be reviewed at the Ad Hoc Salmon Research Coordinating Group meeting in March. Finally, we support the Canadian Section’s proposal to expand port sampling on chinook and coho salmon and steelhead to search for fish with fin clips and coded-wire tags.

**Canadian comments:**

Canada has commented in part on this agenda item in our statement on agenda item 7. We would like to elaborate on those comments. We noted under agenda item 7 that we are concerned with the statement of the Standing Committee on Biology and Research that even with the 1987 increase in research activities by the national sections, the level of research may still be insufficient to provide the information necessary for a decision by the Commission in accordance with the stipulations of the 1986 MOU on Research. Canada believes that this problem can be overcome by focusing research efforts on those programs that are providing the most relevant and accurate information.

In particular, Canada endorses the continuation and expansion of the Japanese Port Sampling Program. We commend Japan for initiating this program two years ago for steelhead trout and expanding it this year to include both steelhead trout and coho salmon. We believe, however, that it is critical to include chinook salmon in the Port Sampling Program and that sampling be conducted at all ports where fish from the Japanese landbased fishery are landed. Such an expansion of the Port Sampling Program in 1988 would be consistent with the 1986 recommendations from the Biology and Research Committee and would provide information that is essential to meet the Commission's commitments under the Memorandum of Understanding on Research.

We are appreciative of Japan's agreement to provide Canada with the proposed design of the 1988 Port Sampling Program for our review and comment prior to the meeting of the Ad Hoc Salmon Coordinating Group in Tokyo in 1988. We ask that Japan give further consideration to our request for Canadian participation in the port sampling. In our opinion this would assist Japan in increasing the sampling effort at no additional cost.

Canada is very pleased with the progress made at the Scale Pattern Analysis Workshop in 1987. All major statistical and methodology problems were resolved and the sole outstanding issue relates to acquiring sufficient scale samples, primarily for
chinook salmon, from the high seas fisheries and Asian spawning stocks. In this regard, we recommend that all three countries make every reasonable effort to increase the sampling rate of the high seas catch and to pursue bilateral arrangements with the Soviet Union to gain access to scale samples from Asian stocks.

We are pleased with the increase in high seas tagging effort by Japan south of 46°N in 1987 and would like to see this level of effort increased further in 1988.

We again thank Japan for the opportunity to place a Canadian scientist on one of their salmon research vessels in 1987. We request that this practice continue and also that Canada be permitted to have input into the objectives and design of cruises that will involve the participation of Canadian scientists.

A responsibility of the Commission, under Article III 1.(c) of the Convention, is to recommend, when necessary, amendment of the Annex to the Convention. The Annex deals primarily with aspects of the Japanese salmon fishery operations in waters of the Convention area. Comments were made by each national section on this agenda item:

**United States comments:**

The United States Section is encouraged by the actions taken by Japan under the 1986 MOU on Enforcement during the 1987 fishing season. The United States fishery patrol units did not observe any violations of the time-area restrictions by the Japanese salmon fleets.

With regards to the 1986 MOU on Research, the comments of the U.S. Section have already been expressed in Agenda Items 7 and 8.

**Japanese comments:**

This year was the second year in which Japan's salmon fishing operations were conducted under the Annex which was reviewed at the Extraordinary Meeting of April, 1986 and was amended prior to the 1986 fishing season, and the two Memoranda of Understanding which were signed in conjunction with that Extraordinary Meeting.

We believe that Japan has made its very best effort to implement provisions stipulated in the Annex to the Convention, and fulfilled the requirements in a faithful manner. However, the marine mammal incidental take permit, which is required for the U.S. 200 mile zone, was issued by the U.S. Government in May this year in an incomplete manner without having any incidental take quota for fur seals or sea lions. As a result, a lawsuit was filed against the effectiveness of the permit, and there is a concern that a situation might arise where the implementation of the Annex 1 (d) might not be possible in the next year and thereafter.

We would point out that these difficulties have been caused by circumstances within the United States and that an amendment to the current Annex would be required if the situation should not allow the implementation of provisions of the Annex 1 (d).

We recognize that the scientific research needed to determine the continental origin of salmon in the Convention Area in accordance with the Memorandum of Understanding on Research has made good progress, thanks to the effort of the scientists of all the countries. Particularly we take pride ourselves in Japan's effort to increase the number of salmonids which were tagged and released and believe this increased effort is noteworthy.

We also express our intent to continue our effort in research and hope that this research on the continental origin of salmon will make greater progress.

We believe that Japan has implemented the Memorandum of Understanding on Enforcement faithfully and also consider that the contents of the Memorandum of Understanding on Enforcement have been implemented in a satisfactory manner with a few exceptions.

**Canadian comments:**

Canada's comments pertaining to the 1986 Memorandum of Understanding on Research were largely incorporated in our statements on agenda items 7 and 8.

With respect to the Japanese mothership salmon fishery, Canada thanks Japan for providing salmon catch estimates from the 1987 mothership fishery. We believe some minor modifications to the existing observer program, including observing the off-loading of all catcher boats, may be required to allow complete confidence in the catch information. We suggest that these changes be discussed at the 1988 meeting of the Ad Hoc Salmon Research Coordinating Group. We are concerned about the low number of steelhead trout returned to the motherships in 1987 and request that every effort be made to retain these fish and make them available for sampling by the observers.

The Commission considered other fisheries in the Convention area and their effect on anadromous species. Comments were made by each national section as follow:

**United States comments:**

At last year's annual meeting of INPFC, the United States Section expressed concerns over the actual and potential interceptions of North American origin salmonids by high seas driftnet fisheries for squid and other non-anadromous species. We remain convinced that this Commission must increase its efforts to eliminate high seas interceptions of salmonids and incidental take of marine mammals and seabirds in these fisheries.

On enforcement matters, the U.S. Section is disturbed to note that for the fifth straight year Japanese squid driftnet vessels have violated the boundaries of the squid driftnet fishery as established under domestic Japanese regulations. These boundaries were supposed designed and enacted to restrict driftnet vessels from fishing in colder water areas where North American origin salmon and steelhead are found. During 1987, U.S. fishery patrols documented 96 squid driftnet vessels found either north or east of the prescribed fishery boundaries. About 43 of these vessels were conducting fishing activities in flagrant violation of Japanese domestic regulations. Furthermore, many of these vessels had covered their permit numbers and names in an obvious and deliberate attempt to prevent identification. Details regarding these activities, including photographic evidence, have already
been supplied to the Japanese side by the United States.

The U.S. Section is very concerned by the sightings made by the U.S. fishery patrols. We wish to discuss their implications and seek ways to address the problem. Specifically, we believe it imperative that Japan employ adequate numbers of patrol vessels to enforce the northern and eastern boundaries of the squid drift net fishery and to guarantee that there be no violations of these boundaries. Such patrols should be dedicated to serve along these boundaries for the duration of the fishing season. We believe that Japan is obligated to improve compliance by the Japanese drift net fleet with these boundaries. We would also like Japan to report on actions taken upon the information supplied to them by the United States regarding the 1987 violations.

**Japanese comments:**

The squid drift net fishery has expanded rapidly in recent years in the North Pacific Ocean and it proceeded faster than research and enforcement activities. However, the Government of Japan has given careful consideration to the strengthening of research and management activities.

Our Government has a great interest in the issue of incidental take of salmon by this fishery. Based on the available scientific knowledge of the time, in 1981 Japan established the northern and eastern boundaries for the squid fishery for the purpose of preventing the incidental take of salmon.

Traditionally in the INPFC the topic of squid fishery has been discussed mainly in the Sub-Committee on Salmon of the Standing Committee on Biology and Research from the view of incidental take of salmon by this fishery. However, starting this year's annual meeting issues on this fishery have been officially incorporated in the terms of reference to the Sub-Committee on Non-Anadromous Species of this Committee. As a result, squid fishery issues are discussed in the two sub-committees. We believe that knowledge on this fishery will increase rapidly through this arrangement.

In the INPFC, the issue of trespassing of the northern and eastern boundaries was first pointed out by the United States in 1984, and the number of alleged violations decreased greatly in 1985 to 13, through the intensified enforcement activities and strengthened guidance to the fishermen in this fishery. However, regrettably it increased again in 1986 and we are sorry to note that this year, the United States has alleged that 96 vessels were in violation.

We understand that this was attributable to the fact that this summer a good squid fishing ground developed further north than in previous years. However, the alleged vessels will be penalized according to the Japanese regulations, when the violation is identified. According to the results of our investigation so far, it has been confirmed that most of the vessels which trespassed the northern boundaries remained within one degree latitude from the northern boundaries and that there was no salmon on board.

The current northern boundaries have been drawn mainly relating to the surface water temperature of 15°C, but this includes a safety margin of 2°C, as the boundary separating the distribution of flying squid and salmonids is at 13°C. That is why the violation tends to occur. We believe that the damage on salmon was minimal, if there was any at all.

This year's research on flying squid covered the area between 25° and 47°30' north latitude, and 135° east longitude and 150° west longitude which includes the area of the squid distribution, and three research cruises were carried out from June to December. Japan has been intensifying research activities on flying squid year after year. This endeavor can be traced by reviewing the increase in the vessel days expended for flying squid research: 48 vessel days in 1985, 144 in 1986 and 193 in 1987.

At the same time, regarding the enforcement activities, the number of Japanese patrol boats was increased from three in 1986 to five in 1987. The days expended for enforcement also increased by 26% from the previous year to 191 this year. In addition, in the light of the importance of this fishery, we plan to further intensify the enforcement activities by adding a new large patrol boat of high speed.

We are greatly concerned about the catches of salmon in the North Pacific Ocean and their sale by non-contracting parties. We would like to make every possible effort to prevent such activity by non-contracting parties through the cooperation of our three countries—the traditional salmon fishing nations.

I would like to reply to the question raised in the U.S. Statement, under this agenda item, concerning the U.S. contact for reporting the results of Japan's investigations on the alleged violations by squid drift net fishing vessels. Notice of this issue was provided through the U.S. State Department, not through the United States National Section. So Japan's response will be made to the U.S. State Department rather than to the U.S. National Section.

**Canadian comments:**

Canada remains concerned about the interception of salmonids in the high seas fisheries for squid and other species. We are pleased with attempts made by Japan to restrict their fishery to areas of the North Pacific Ocean to minimize the catch of salmonids, and with studies undertaken by Contracting Parties to investigate areas of overlap in distribution of squid and salmonids. We continue to be concerned, however, that the squid fishing activities in the North Pacific Ocean of non-Contracting Parties may also take salmonids of North American origin. We urge that all Contracting Parties attempt to get information on the by-catch from these fisheries. Canada also would like to pursue the possibility of placing observers aboard Japanese squid fishing vessels.

Information on the incidental catch of salmonids in the rapidly expanding mid-water trawl fishery for pollock in the Aleutian Basin of the Bering Sea is required. The potential for taking salmonids of Canadian origin in this fishery, particularly Yukon River chinook salmon, is recognized by Canada as a threat to the measures already initiated to minimize salmonid interceptions in the Bering Sea. Participation in this fishery by non-Contracting Parties reinforces the need for an organization to address research and management of resources in this area.

Canada reiterates its concern that full evaluation of measures initiated to reduce interceptions requires complete data on the salmonid catch in all groundfish fisheries, including U.S. domestic fisheries.

On another matter, the alarming buildup of the pollock fisheries in the international waters of the Bering Sea has increased concerns that they may be negatively impacting salmon stocks.
of North American origin that are known to migrate through the area. The pollock fisheries are now starting earlier, as early as September, and ending later, as late as June. At both ends of this fishing season, we anticipate that salmon are more likely to be intercepted in the pelagic trawl pollock fisheries. We are particularly concerned that chinook and chum salmon of western Alaska and Yukon Territory origin may be vulnerable to the gear. Therefore, we are looking to Japan, as the major participant of this pollock fishery, to supply detailed catch and effort data in a timely manner, including all incidentally caught species, so that the Commission can fully assess the impact of the fishery.

9. 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 all relevant factors affecting the stocks of non-anadromous species of the Convention area, the problems associated with marine debris, the promotion of scientific research designed to fill gaps in knowledge and the compilation and dissemination of statistics and records.

The forum within the Commission for consideration of non-anadromous species is the Sub-Committee on Non-Anadromous Species. Within this sub-committee two panels deal with matters concerning the Bering Sea and the northeast Pacific.

At its 1987 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

The Bering Sea Panel reviewed results of commercial fisheries, stock assessments, and research on groundfish in the eastern Bering Sea and Aleutian Islands region, and king and Tanner crab and other species of crab of potential commercial importance in the Bering Sea.

The committee noted that the following points were emphasized in the panel’s report:

(a) Nature of the fishery

(i) In 1977 the United States extended its fishery jurisdiction and assumed responsibility for management of fishery resources within a 200-mile fishery conservation zone bordering its coastline. Under terms of extended jurisdiction, all fisheries in the Bering Sea operate under a number of area-time and catch restrictions. Nations other than the United States are not allowed to fish for crab and halibut in the U.S. fishery zone. Optimum yields established by the North Pacific Fishery Management Council for groundfish (other than halibut) and squid for the eastern Bering Sea and Aleutian Islands region have increased from 1.4 million t in 1977 to 2.0 million t in 1984-87.

(ii) Total estimated catches of groundfish and squid taken by all fisheries in the eastern Bering Sea and Aleutian Islands region, excluding international waters, during 1986 were 1,733,000 t, about 30,000 t less than in 1985. All-species catches by nation were: U.S. (domestic and joint-venture) 1,258,000 t, Japan 369,000 t, Republic of Korea 97,000 t, Poland 7,000 t, and People’s Republic of China 2,000 t. Pollock accounted for over 70% of the catch, followed by yellowfin sole (12%) and Pacific cod (8%).

(iii) Since 1980, a midwater trawl fishery for pelagic pollock has rapidly expanded in the Aleutian Basin of the Bering Sea. In recent years, the international waters lying in the central part of the basin became the most important fishing ground in the North Pacific Ocean for the non-U.S. far-seas trawl fisheries, coincident with drastic reductions in catch quotas to non-domestic fisheries in the U.S. and Soviet FCZ’s. The vessels of Japan, Republic of Korea, Poland, and People’s Republic of China have operated in these international waters. Japan alone caught 698,000 t of pollock in 1986 from this area.

(iv) United States groundfish fisheries (and catches) in the Bering Sea in 1986 were primarily a longline fishery for Pacific halibut (1,943 t), a trawl fishery for pollock (46,140 t) and Pacific cod (37,010 t), and joint-venture fisheries with non-U.S. processing vessels for pollock (835,103 t), yellowfin sole (151,400 t), Pacific cod (63,942 t), other flatfish (62,043 t) and Atka mackerel (31,584 t). Total catches of 101,841 t by the U.S. domestic fishery represents a 9% increase over 1985. Joint-venture catches increased to 1,155,500 t, an increase of 82% over 1985.

(v) Incidental catches of Pacific halibut in the non-U.S. and joint-venture fisheries in 1986 were 889,969 fish or 2,903 t, almost the same as 1985. The incidental catch decreased nearly 40% in the non-U.S. fishery but increased by a third in the joint-venture fisheries.

(vi) Three Japanese North Pacific trawlers and 22 longliners have operated in the U.S. zone from January-July 1987. The total catch was 23,100 t, down 81% from the same period in 1986.

(vii) The 1987 fishery for red and blue king crab opened in September with guideline harvest of 8.5-17.7 and 0.6-1.3 million pounds, respectively. Based on low abundance of C. bairdi Tanner crab in 1985, there was no fishery in 1987. No statistics for the 1987 fishery for C. opilio are available.
(viii) Total incidental catches of crabs in 1986 were 275,066
king crab (a decrease of 78% from 1985).

(b) Status of Stocks

(i) The halibut resource in the eastern Bering Sea and Aleu-
tian Islands regions remains significantly below the bio-
mass required to produce MSY. The constant exploita-
tion yield for the setline fishery was 9,500 t for the eastern
Bering Sea and Aleutian Islands region in 1987.

(ii) Estimates of acceptable biological catches (ABC) for prin-
cipal groundfish by U.S. and Japanese scientists for the
combined eastern Bering Sea (EBS) and Aleutian Islands
region were compared.

(iii) The condition of groundfish stocks, with the exception
of Greenland turbot and Atka mackerel was considered to
be good or improved. The status of other rockfish species
are no: well determined.

(iv) Pollock abundance remains relatively high and the moder-
ately strong 1982 year-class should help maintain the
biomass at this level through 1988. Abundance of the
1983–65 year-classes appears to be below average. The
Bering Sea Panel noted the dramatically increasing pol-
lock fishery in the international zone, and urged that
research be directed at this resource.

(v) Pacific cod abundance has increased substantially since
the mid-1970s. Abundance remained at a peak level in
1987 because of the continuing contribution of the strong
1977 and 1978 year-classes and recruitment of good year-
classes produced from 1982 to 1985.

(vi) Abundance of yellowfin sole has recently declined after a
long period of increase which started in the early 1970s.
Abundance in 1987 remains only moderately below peak
levels.

(vii) A decline in abundance of juvenile Greenland turbot due
to poor recruitment is of concern to the Panel. Although
there is no evidence as yet of a decline in the adult stock,
it is anticipated that the abundance of the adult stock will
decline over the next several years due to reduced re-

cruitment.

(viii) Arrowtooth flounder abundance has increased since 1975
and continues to rise. Recent catches have decreased in
conjunction with catch restrictions on Greenland turbot.

(ix) Abundance of “other flatfish” has been at a high level
since the early 1980s primarily because of a substantial
increase in abundance of the three principal species.

(x) Sablefish abundance has improved in recent years and
may now approximate levels that produce MSY.

(xi) Survey data indicate that the abundance of Pacific ocean
perch is increasing in both the eastern Bering Sea and
Aleutians region after being at a low level for a number of
years.

(xii) Atka mackerel catches have recently been at record high
levels, averaging 35,000 t annually from 1984 to 1986.
Biomass estimates were made after the 1986 U.S.-Japan
cooperative survey, but are very imprecise because of
sampling problems. The stock is considered to be in only
fair condition.

(xiii) The abundance of legal male red king crab and Pribilof
Island blue king crab increased by non-significant amounts
between 1986 and 1987. St. Matthew Island blue king
crab males increased by a factor of 1.9. The only female
king crab to show a significant change was an increase in
large female red king crab by a factor of 3.4. Post-recruit
red king crab were the only smaller-sized king crab to
show significant changes (increased by a factor of 2.4).
All sizes of male and female haidirn tanner crabs increased
by significant amounts. Near-term recruitment to the
fishery shows definite signs of improvement. All sizes of
male and female opilio tanner crabs also increased by
significant amounts.

(c) Research activities

(i) Japan conducted a longline survey in cooperation with
the United States in 1987. They also conducted a pre-
liminary survey of the Aleutian Basin using hydroacoustic
methods. The United States conducted a summer
groundfish survey in the eastern Bering Sea and a trawl
performance survey in cooperation with the fishing indus-
try.

(ii) During the course of surveys in 1986 and 1987, 556 hal-
but, 700 Pacific cod, 5,504 sablefish, and 212 Greenland
turbot were tagged and released in the eastern Bering Sea
and Aleutian Islands region.

(iii) Japan plans three surveys in 1988: (1) a sablefish and
Pacific cod longline survey, (2) a summer hydroacoustic-
trawl survey for pollock in the Aleutian basin and eastern
Bering Sea, and (3) a winter hydroacoustic-trawl survey
of pollock in the Aleutian basin.

(iv) The U.S. plans two surveys in 1988: (1) The triennial
crab-groundfish survey of the eastern Bering Sea, and (2)
a winter hydroacoustic-midwater trawl survey of the
Aleutian basin.

(2) Northeast Pacific

The Northeast Pacific Panel reviewed results of
commercial fisheries and research on groundfish in
the northeast Pacific.

The committee noted that the following points are
emphasized in the panel’s report:

(a) Nature of the Fishery

(i) Under the provisions of the 1977 Territorial Seas and
Fishing Zones Act, Canada has allocated production sur-
plus to Canadian needs to other nations, subject to area
and catch limitations. Catch limitations of 50,000 t and
80,000 t of hake were in effect during 1986 and 1987,
respectively. No limitations were in effect for U.S. ves-

(ii) Provisions for the allocation of production surplus to U.S.
needs are contained in the Fishing Conservation and
Management Act of 1977. Total optimum yields estab-
lished by the North Pacific Fishery Management Council
for groundfish in the Gulf of Alaska were 255,900 t in
1986 and 216,600 t in 1987. Total allowable catches off
Washington-Oregon-California, set by the Pacific Fishery
Management Council were 436,800 t in 1986 and 338,100
in 1987.
(iii) In 1986, the Japanese fishing fleet operating in the Northeast Pacific Ocean consisted of 22 longliners. Longline effort increased 85% from 1985. Total groundfish catch was 15,373 t in 1986, a decrease of 52% from 1985. Principal species caught was Pacific cod (98%).

(iv) In 1987, Japanese fishing vessels could not operate within the U.S. 200-mile zone because there was no allocation of catch quotas. They also had not operated in high sea areas by July.


(vi) Canadian landings other than halibut increased 16% to 52,182 t in 1986. Trawl landings were 44,688 t. Principal species were rockfishes (23,485 t), hake (6,802 t), lingcod (2,924 t), flatfish (3,738 t), and Pacific cod (3,637 t). Total landing by other gear (trap, longline, and handline) was 7,494 t. Principal species were sablefish (4,125 t), dogfish (947 t), and lingcod (903 t). Canadian catch of shrimp in 1986 was 1,297 t, an increase of 8.8% from 1985; crab landings were 1,324 t, an increase of 13.9% from 1985; and tuna landings were 30 t, a decrease of 46.4% from 1985.

(vii) Poland received 13,494 t of hake from Canadian vessels in the joint-venture fishery in 1986. In addition, Polish vessels caught 15,605 t of hake in the Canadian portion of the Vancouver Area.

(viii) The USSR received 16,642 t of hake from Canadian vessels in the joint-venture fishery in 1986. In addition, Russian vessels caught 8,137 t of hake in the Canadian portion of the Vancouver Area.

(ix) Polish catches in 1986 were estimated to be 70,752 t off Washington-California (99% hake).

(x) The total estimated catch in the U.S. joint-venture fishery in 1986 was 65,300 t in the Gulf of Alaska and 82,827 t off the Washington-Oregon-California coast.

(b) Status of stock

(i) Total longline effort by North American halibut vessels increased to 512,100 skates in 1986. The total catch in the Northeast Pacific increased 7,370 t to 40,063 t in 1986. In the Gulf of Alaska, the estimated incidental catch of halibut in numbers in non-U.S. and joint-venture fisheries in 1986 was 143,652 fish, a decrease of 29.3% from the 1985 estimated catch. Survey CPUE in 1986 for adult halibut decreased 15% in the Charlotte Area; decreased 18% in the Kodiak Area; and increased 8% in the Southeastern Area; in relation to 1985 catch rates. Juvenile survey catches decreased slightly in the Northeast Pacific in 1986.

(ii) In 1986 there was 71 t of rockfish taken in foreign and joint-venture fisheries in the Gulf of Alaska. These species were declared prohibited species for the non-U.S. and joint-venture fisheries operating within the U.S. fishing zone. Both Japanese and U.S. scientists agree that Pacific ocean perch stocks in the Gulf of Alaska remain at a low level of abundance. Canadian scientists report that there has been no substantive reconstruction of stocks in the Canadian zone and recommended yields ranging from 3,400–5,800 t. Japanese and U.S. scientists feel there are insufficient data to develop appropriate EY levels for most of the “other rockfish” stocks in the Gulf of Alaska. U.S. scientists suggest OY for thornyheads remain at 3,750 t. Recommended yields of “other” rockfishes off Canada range from 3,900 to 8,700 t.

(iii) The all-nation catch of sablefish in the Shumagin-Vancouver region during 1986 was 25,462 t of which 20,794 t was from the Gulf of Alaska and 4,668 t from Canadian waters. Both Japanese and U.S. scientists agree that the sablefish resource in the Gulf of Alaska is at a high level of abundance as a result of recruitment and growth of the 1977 year-class. Based on recent biomass estimates by Japan (531,100–718,700 t) and the U.S. (520,000 t) and indications of good recruitment of the 1980 and 1981 year-classes, both countries’ scientists agree that sablefish are at a historic high level of abundance. Japanese scientists suggest EY for the Gulf of Alaska is 26,600 t and U.S. scientists suggest that ABC is 33,300 t. Canadian scientists reported that sablefish CPUE values in the Vancouver-Charlotte Region have remained relatively stable since 1979 and that yields of 3,400 t to 4,500 t have been recommended for 1987. The lowered yields recommended reflect the decay of the strong 1977 year-class.

(iv) The all-nation catch of pollock in the Gulf of Alaska during 1986 was estimated at 72,793 t, while off Canada a total of 561 t was taken. The biomass for 1987 was projected at 687,000 t by U.S. scientists. During the 1987 survey, the 1984 year-class appeared strong, and the 1985 year-class above average. An annual harvest of 90,000 t to 120,000 t would keep the population above minimum spawning biomass suggested by U.S. scientists.

(v) The 1986 all-nation catch of Pacific cod in the Gulf of Alaska increased to 21,911 t, of which 15,373 t was landed by Japan and 6,700 t by the U.S. The 1986 joint-venture catch was 1,357 t. Canadian scientists reported that 3,650 t was taken by the domestic fleet in 1986 and 10,322 t have been taken in 1987, to September 1. Japanese scientists feel that the Pacific cod stock in the Gulf of Alaska is in relatively stable condition. However, U.S. scientists have indicated that abundance appears to have been decreasing since 1984. Canadian scientists reported that the abundance of Pacific cod is now increasing due to the strong 1985 year-class. Preliminary observations indicate that the 1986 year-class is also strong.

(vi) The 1986 catch of Atka mackerel in the Gulf of Alaska decreased to 4 t from 1,848 t in 1985. All of the catch was taken by the joint-venture fishery. MSY was estimated at 7,800 t. U.S. scientists feel that MSY is no longer attainable and EY should remain lower than MSY. The U.S. scientists recommended that OY be set as close to zero as practical and the fishery to remain in control of the fishery.

(vii) The total catch of flatfish in the Gulf of Alaska in 1986 was 2,441 t; 71 t were taken by Japanese longliners. The major species caught in the flatfish fisheries were rock sole (40%), and arrowtooth flounder (27%). U.S. scientists report that the estimated 1986 flatfish biomass (halibut excluded) in the Gulf of Alaska was 2,056,800 t. They estimate MSY at 48,200 t, 162,400 t, and 41,000 t for the
western, central, and eastern Gulf of Alaska respectively. The 1986 Canadian landings of flatfish increased to 3,740 t (31% Dover sole). Canadian scientists estimate MSY for arrowtooth flounder for the Charlotte-Vancouver Region at 10,000–12,000 t.

(viii) Density levels of giant grenadiers still remains below the 1981 level. Pacific grenadiers density level in 1986 was also fairly low compared to previous years.

(ix) U.S. scientists believe there is a large standing stock of squid (Berjynsidis spp. and Gonatus spp.), in the Gulf of Alaska, and MSY is believed to be greater than 5,000 t. Therefore, OY has been set at 5,000 t.

(x) The catch of squid by the Japanese squid driftnet fishery in the central and western North Pacific Ocean was 152,226 t in 1986. Japan conducted driftnet and jig surveys in the central and western North Pacific in 1986 to examine the distribution of flying squid (Ommastrephes bartrami) in relation to temperature and salinity. In particular, the relationship between squid and salmonid distribution patterns was assessed. Japanese scientists think that, based on this and past surveys, there is a distinct segregation in the main areas of distribution between flying squid and salmonids during the summer.

(xi) Canadian scientists report that the abundance of Pacific herring in the Charlotte Area continued to decline through 1986, in most districts. In the Vancouver Area, abundance decreased in all districts. The projected biomass for 1987 is 161,160 t for the Charlotte-Vancouver Region. Canadian scientists recommend an annual harvest rate of 20% of the estimated biomass.

(c) Marine Debris

Japan, the United States, and Canada recognize the threat of marine debris to marine life and to safety at sea. All three countries have implemented sighting surveys or observer programs for the purpose of recording and observing marine debris at sea and on beaches. The data collected will be used to assess the magnitude of this problem as well as to formulate solutions to the problem. The Committee noted a resolution resulting from a fishermen’s conference on marine debris held in October 1987 at Kailua-Kona, Hawaii. The Committee recognizes the importance of the marine debris issue and supports the resolution of the conference (INPFC Doc. No. 324B).

(d) Research Activities

(i) During 1987, Japan participated with the United States in a cooperative longline survey to estimate abundance by depth and collect biological samples of major groundfish species, particularly sablefish and Pacific cod. In addition, a joint Japan-U.S. groundfish survey (similar to that completed in 1984) was conducted from May to September using bottom trawl gear.

(ii) A summary of the surveys conducted by the United States in the Gulf of Alaska in 1987 is as follows: walleye pollock hydroacoustic survey; juvenile pollock distribution and abundance survey; pollock ichthyoplankton surveys and cooperative fishery—oceanographic studies; sablefish early life history study; sablefish longline gear experiment; rockfish hydroacoustic survey. In addition, the U.S. conducted cooperative ichthyoplankton and hydroacoustic surveys with the USSR, and longline and trawl surveys with Japan.

(iii) Off Washington-California the United States conducted an ichthyoplankton/hydrographic survey of groundfish resources using hydroacoustic/plankton gear; and a sablefish abundance survey at standard index sites using trap gear.

(v) Canadian field research studies were directed primarily at projects involving rockfishes, sablefish, hake, lingcod, Pacific cod and dogfish. Field studies to develop a multispecies assemblage approach to fisheries management of Hecate Strait, in the Charlotte Area were continued, as were field studies to investigate groundfish and herring interactions on La Pérouse Bank, in the Vancouver Area.

(vi) Research activities during 1987 by the International Pacific Halibut Commission were as follows: collection of fishery statistics and biological samples from the commercial catches; exploratory fishing for 0- and 1-year-old halibut and the standardized longline survey of adult halibut.

(vii) Field research planned for 1988 by the Japanese is to continue the longline survey of sablefish and Pacific cod as completed in previous years in the Gulf of Alaska. However, factors such as budget considerations may necessitate some revisions.

(viii) During 1988, the United States plans to conduct the following studies: juvenile pollock survey; pollock ichthyoplankton survey; continue the sablefish longline gear experiments and the annual trap index survey; initiate sablefish habitat and feeding studies; conduct a sablefish larval survey, a rockfish hydroacoustics survey, and pollock hydroacoustic survey. In addition, the United States plans to participate in a longline survey conducted by Japan, and a cooperative pollock ichthyoplankton survey with the USSR.

(ix) Off Washington-California the United States plans for 1988 include a bottom-trawl survey to study groundfish resources on the slope off the coast of Washington; a sablefish abundance survey is planned off the California coast; and tagging of juvenile sablefish will be continued.

Canadian research plans for 1988 are not finalized.

(3) Recommendations from the Sub-Committee on Non-Anadromous Species

The Standing Committee on Biology and Research approved the recommendations of the Sub-Committee on Non-Anadromous Species pertaining to working group meetings and other aspects of its responsibilities and noted particularly the sub-committee’s concern over delay and/or deferment in publication of scientific material.

(4) International Symposia

The committee noted that the papers presented at the 1985 Symposium in Tokyo had been published in Bulletin 47, which was distributed early in 1987.

The Sub-Committee on Non-Anadromous Species
discussed the joint INPFC-IRIS Symposium which was held in Vancouver, British Columbia, October 27–29, 1987. The Committee noted the success of this important international scientific event pertaining to fisheries resources of the North Pacific Ocean. The Committee endorsed the comments of the Subcommittee concerning the high quality of the presentations on a wide variety of issues related to the central topics of the symposium. It was also noted that the Proceedings of the symposium will be published in the Canadian Journal of Fisheries and Aquatic Sciences.

The Committee endorsed the recommendation of the Subcommittee on Non-Anadromous Species that the symposia schedule continue on a 2-year cycle and that the next symposium be held in 1989.

Statesmen by the national sections on non-anadromous species were included in each sections comments on the Report of the Standing Committee on Biology and Research. In addition, a spokesman from each national section commented on Agenda Item 13 (Consideration of progress under Article IV in respect to the establishment of an international organization dealing with non-anadromous species).

**Japanese comments:**

Under the provisions of Article IV of the INPFC Convention, Canada, Japan and the United States have agreed to make an effort for the establishment of a new international organization which consists of extended membership of nations, dealing with non-anadromous species in the Convention area. This concept was reaffirmed by all national sections at the 33rd Annual Meeting in 1986.

Recently, Japan has fished for pelagic pollock in the international waters of the Bering Sea and caught about 700,000 tons of pollock in 1986. The vessels of the Republic of Korea, Poland, and the People’s Republic of China have also operated in these international waters. However, the fishery in these waters has developed very recently, and biological knowledge is limited, so there is an urgent need to accumulate information needed for stock assessment.

The Japanese National Section makes the following proposal to hold an international preparatory conference to discuss the establishment of the INPFC Article IV organization dealing with pollock in the North Pacific Ocean with focus on the Aleutian Basin. The Japanese section also proposes that Japan, Canada, and the United States jointly request participation of all nations concerned in this conference. The Japanese section must stress that the participation of Korea and Poland in this conference is indispensable, considering the scale of their fishing activities in the international waters. The outline of the conference is as follows:

1. Date of conference: February, 1988
2. Place for conference: Tokyo
3. Countries to be invited: Canada, China, Japan, Korea, Poland, U.S.A., U.S.S.R.
4. Objective resource: Pollock
5. Object of the Article IV organization: Cooperation for study, analysis and exchange of scientific information and views concerning pollock in the North Pacific Ocean.

**United States comments:**

The United States Section continues to support the concept of establishing an international scientific organization with broader membership dealing with species other than anadromous species as stated in Article IV of the revised INPFC Convention. The recent symposium sponsored by INPFC and the IRIS organization attests to the full support and desires of the scientific community to establish such an organization. We were impressed with the diversity and high quality of the papers presented at the symposium and the wide representation of scientists working on North Pacific marine research. We believe their activities will accelerate the progress of marine science in the North Pacific and provide a permanent stimulating forum for research interactions.

The phenomenal buildup of the pollock fisheries in the international zone of the Bering Sea and the squid drift net fisheries in the North Pacific, all of them within the INPFC Convention area, have added impetus for us to move towards greater multinational cooperation on these fisheries issues.

We appreciate the role taken by Canada in hosting a meeting to consider the establishment of a Pacific Science Organization. The United States intends to participate in the December 8–9 meeting in Ottawa and looks forward to a full exchange of ideas at that time.

The U.S. Section is also reviewing Japan’s recent proposal regarding pollock fisheries in the international waters of the Bering Sea as well as the Canadian proposal to add the issue of the high seas squid drift net fisheries. The United States is considering a number of options on these issues and is interested in studying the Japanese and Canadian proposals more fully before making a formal response.

The U.S. Section does have a few preliminary comments regarding the Japanese proposal on the Bering Sea. We feel that, in addition to pollock, harvests of other species and incidental take of non-target resources should be included in any discussions on this issue. The United States believes that both countries whose exclusive economic zones are adjacent to the Bering Sea should be involved in the preparation of arrangements on this issue. Because of the need to address this matter at an early date, the United States proposes a meeting of Government Representatives in Washington D.C. in early to mid-December to further consider the proposals on this matter.

**Canadian comments:**

Canada supports the implementation of Article IV because we recognize that a broader forum for scientific discussion is needed to deal with the expansion of fisheries in the North Pacific Ocean. Major new fisheries have developed since INPFC was

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1 IRIS is an abbreviation for International Recruitment Investigations in the Subarctic, a group of approximately 20 senior scientists in fisheries and oceanography from laboratories and universities on the west coast of Canada and the United States.
first established and fishing technology has advanced to such an extent that the stability of fisheries can be affected in a relatively short time. Modern fisheries management science requires accurate and timely information on ocean conditions and fisheries statistics.

At this meeting, Japan has proposed to implement Article IV. We support this proposal provided it would result in an organization that would fully implement Article IV of the Convention by including all non-anadromous species of interest to participating parties.

Canada is prepared to attend the proposed meeting in Japan in February 1988. We request that the Contracting Parties make available their proposals well in advance of the meeting.

We are also interested in considering the U.S.A. proposal for a meeting in Washington and suggest that we confer on this matter between the three governments by normal channels.

10. ACTIVITIES OF THE COMMISSION CONCERNING MARINE MAMMALS

At the 33rd Annual Meeting, the Commission decided to discontinue the Ad Hoc Committee on Marine Mammals and instructed B & R to assume the responsibility for matters concerning marine mammals and marine debris. The Steering Committee for the Standing Committee on Biology and Research met in Tokyo, Japan on August 17-18 and adopted the following amended terms of reference as working procedures for matters concerning marine mammals at the 1987 Annual Meeting. (The Steering Committee also recommended that the proposed terms of reference be adopted as working procedures for future years and that a Sub-Committee on Marine Mammals be created to deal with these matters).

Reviews and coordinate scientific studies and the collection, exchange, and analysis of scientific data on marine mammals with respect to Article X of the Convention and the Memorandum of Understanding on Marine Mammals between Japan and United States. Such marine mammals incidentally caught in the squid drift net fishery may be included to assist the above-mentioned scientific studies.

At the 1987 Annual Meeting the Sub-Committee on Marine Mammals reviewed and discussed 1987 research on marine mammals in accordance with its terms of reference. The sub-committee report summarized research conducted by member nations and research coordinating activities and emphasized the following:

(1) Studies Pertinent to Article X

The United States reported that the average incidental take of Dall's porpoise in the 1987 Japanese salmon mothership fishery while operating within the U.S. exclusive economic zone (EEZ) was 0.26 per gillnet set. Gillnets with multifilament thread had a somewhat higher observed incidental catch of porpoise than hollow tube nets.

Japan reported a total of 801 Dall's porpoise were taken by the Japanese mothership salmon fishery inside and outside the U.S. EEZ in 1987. A review of Japanese studies on entanglement of Dall's porpoise indicated the incidental catch of porpoise was lower for multifilament than hollow tube gillnets.

(2) Research Plans for 1988

Japan will continue to keep records of the incidental take of marine mammals in the mothership and landbased salmon fisheries and by salmon research vessels and to study those marine mammals in the squid gillnet fishery area in 1988. Japan will also continue to collect biological specimens from Dall's porpoise taken by the landbased salmon fishery and salmon research vessels. In addition, sighting surveys to develop estimates of the abundance of Dall's porpoise and acoustic studies on Dall's and harbour porpoises will be carried out.

United States will monitor the incidental take of marine mammals in the Japanese salmon mothership fishery and carry out sighting surveys in the north-west Pacific Ocean and in the area of the Japanese squid fishery. Additional studies will focus on methods to improve abundance estimates of marine mammals. Collection will be made of biological specimens of Dall's porpoise taken in the salmon fisheries and by research vessels. In addition there will be studies of the distribution of marine mammals in the squid gillnet fishery area, particularly in relation to oceanographic conditions and fishing effort.

Spokesmen from the National Sections presented the following comments on the Commission's activities concerning marine mammals:

United States comments:

The United States Section is greatly concerned that the high seas salmon fisheries and the extensive multinational high seas squid drift net fisheries of the North Pacific Ocean may be killing large numbers of marine mammals. This concern has been strengthened as a result of Canada's experimental squid drift net fishery, which had an alarmingly high incidental catch of marine mammals. Research to identify and quantify the marine mammal species taken incidentally by the high seas squid drift net fishery must be carried out at an early date, before populations are affected.

The U.S. Section urges the Contracting Parties to provide strong leadership in the conservation of marine mammals in the INPFC Convention area by developing an effective research program in these high seas drift net fisheries.

Japanese comments:

Before proceeding to Japan's prepared statement for this agenda item, I would like to make a few comments in response to the comment made earlier by Commissioner McVey, U.S. National Section. That is, I would like to point out that the Canadian experimental squid drift net fishery was conducted in a rather limited area, i.e. only in coastal waters. Therefore, it would be very dangerous to extrapolate the results of those experiments to arrive at any conclusion concerning the high seas fishery. I also would like to point out that the incidental take of marine mammals is not limited to squid drift net fisheries. Other fisheries such as those in the IATTC waters, etc. also
catch marine mammals incidentally. Another aspect that I would like to point out is the fact that many animals were caught and this would seem to indicate a very high abundance of those animals. The Japanese National Section regrets that Canada has suspended their experiments which were conducted for a rather short period and in a limited area.

The Japanese National Section is pleased to note that much scientific knowledge is being accumulated on the marine mammals, including Dall's porpoise. In May of this year a permit was issued for incidental take of marine mammal as required for the mothership salmon fishery operation within the U.S. 200 mile zone. However, because this permit was issued in an incomplete manner, unlike the previous ones, and did not specify a quota for the incidental take of northern fur seal and sea lion, U.S. native people's groups filed a lawsuit. We are concerned that if the present situation remains, that mothership salmon fishery operations in the next year and future years would become impossible. If this should happen, I would like to emphasize that not only the scientific research activities on marine mammal that have been carried out within the framework of INPFC over many years may come to a complete halt, but also the continued existence of the present INPFC framework itself may be endangered.

We strongly urge that the United States make every effort to resolve this situation so that our mothership salmon fishery operations may continue next year and for future years. In the event that this fishery does continue, we intend to continue to concentrate our effort in the research of marine mammals. In particular, we intend to develop and apply technologies in the actual commercial operations to avoid the incidental take of marine mammals, centered mainly on modifications of fishing gear based on the knowledge accumulated through acoustic surveys.

Also in response to the interest by the United States and Canada, we intend to continue to collect scientific information on the marine mammals incidentally taken by the squid driftnet fishery and to present the information to this Commission.

At this year's meeting it has been decided to set up a forum for study on marine mammals under the Standing Committee on Biology and Research, and it is our greatest pleasure to see the decision to hold a scientific meeting on marine mammals next spring in Tokyo. The Japanese National Section would like to wholeheartedly welcome those who would be attending this meeting.

Canadian comments:

The Canadian Section is pleased with the establishment of the Sub-Committee on Marine Mammals under the Standing Committee on Biology and Research. It is hoped that the Sub-Committee's activities and the research initiatives that develop from these activities will result in modifications to fishing gear that will substantially reduce the by-catch of marine mammals in all high seas driftnet fisheries. We also have grave concerns regarding the overall effects of high seas driftnet gear and, as stated in this meeting, fully support expanded international efforts to address this matter.

11. 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. 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.

12. Officers Elected for 1988

The Commission elected the following officers for 1988 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
Mr. Pierre Asselin of Canada

Chairman of the Standing Committee on Biology and Research
Mr. Kenichi Unno of Japan

Chairman of the Standing Committee on Finance and Administration
Mr. Makoto Watanabe 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.

13. Nomination of Assistant Director

Each national section expressed its appreciation to Mr. Daishiro Nagahata, Assistant Director, who will complete his second term in March 1988. The Commission confirmed the nomination of Mr. Katsuma Hanafusa as Mr. Nagahata's replacement.

14. Closing Remarks at the Final Plenary

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

Closing remarks by Commissioner Clement V. Tillion on behalf of the U.S. National Section:

On behalf of the United States Section, I am pleased to make some closing remarks at this 34th Annual Meeting. Many issues important to the U.S. Section have been raised at this meeting. We appreciated the opportunity to again enter into frank and productive discussions with our Canadian and Japanese colleagues on these issues. At this time, we would like to express our thanks to the Executive Secretary, the Secretariat staff, and the interpreters for working so hard to contribute to the success of our meetings.

This Commission serves an important role in strengthening cooperation between the Parties and encouraging a broader exchange of scientific knowledge. In this regard, we need to especially point out the fine efforts of our scientists and technical experts, not only during this meeting but throughout the entire year. Their hard work serves this Commission well.

Important matters reviewed at this meeting included signifi-
cant discussions regarding (1) the observer program in the mothership fleet, (2) increased attention for greater scientific data in the international waters of the Bering Sea, (3) implications of the expanded squid fisheries in the Convention waters, and (4) the acceleration of the research program in the land-based drift net fishery area.

At this point, I would like to extend our special appreciation to Mr. Nagahata, who is leaving the Secretariat staff this year. He has been of great service and assistance to the Secretariat. We wish him well.

Finally, the United States Section looks forward to next year's meeting where we will, once again, gather together with our INPFC colleagues in Tokyo to discuss matters of mutual concern on the fisheries of the North Pacific.

Closing remarks by Commissioner Junzo Sasaki on behalf of the Japanese National Section:

At the closing session of the 34th Annual Meeting of the International North Pacific Fisheries Commission I would like to make some remarks.

This year represents the second year of the implementation of the amended Annex to the Convention and the 1986 Memoranda of Understanding. In accordance with these agreements, Japan has not only rendered further cooperation for conservation and management of the North American salmon, but also has made considerable effort in the areas of research and enforcement. As a result, scientific knowledge for determination of continental origin of Asian and North American salmon stocks has been accumulated and this fact has been reported by the Standing Committee on Biology and Research at this annual meeting.

On the other hand, this year has marked the beginning of another hardship for the Japanese mothership salmon fishery. As you know, 70% of the total catch by the Japanese mothership salmon fishery depends on operations within the U.S. 200 mile zone. In order to operate within this U.S. 200 mile zone, the U.S. domestic law requires the fishery to obtain a permit for the incidental take of marine mammals. However, because the permit issued by the NOAA of the U.S. Department of Commerce in May of this year did not establish a quota for the incidental take of northern fur seals or sea lions, both of which used to be included in previous permits, groups of Native and other Alaskan residents filed a lawsuit and the Court has issued an injunction ordering NOAA to suspend the issuance of permits. We are concerned, if the present situation continues, that it would become impossible for the Japanese mothership salmon fishery to operate within the U.S. 200 mile zone. We therefore strongly request that the Government of the United States adopt every possible measure to secure operations of the Japanese mothership salmon fishery and through such effort, to assure the continuation of the current INPFC framework which is beneficial to all three nations.

Next, I would like to touch upon squid drift net fishery issues. The Government of Japan introduced an approval system to the Japanese squid drift net fishery in 1981, and at the same time in order to avoid incidental catches of salmon, also introduced domestic regulations including establishment of the northern boundaries for this fishery. The northern boundaries were determined by referring to the 15°C isotherms on the sea surface temperatures. The temperature of 15°C includes a safety margin of 2°C to the temperature of 13°C which is considered to form a boundary separating the distribution of flying squid and salmonids.

Through these measures, the incidental catch of salmonids by our squid drift net fishery has been virtually nil. According to the knowledge obtained so far, the incidental take of marine mammals by this fishery has also been at negligible levels, so small that it has no adverse impact on the stocks. Therefore, the Japanese National Section is convinced that the domestic regulations adopted by the Government of Japan have been working effectively in a satisfactory manner.

As a country that is pursuing a rational development of this fishery, Japan regrets very much that the Government of Canada has abandoned the Canadian drift net fishery with only limited experimentation. As has been made clear, the waters in which the Japanese squid drift net fishery operates are not abundant in marine mammals or salmonids, unlike the coastal waters of Canada.

As we have already expressed at the Standing Committee on Biology and Research this year, we would like to once again emphasize that we are prepared to make an even greater effort to carry out research on the squid drift net fishery.

Regarding marine debris issues, we pay high regard to the commencement of full-scale scientific review this year by the Standing Committee on Biology and Research. In this context, we believe it is imperative for the fishermen and scientists of three member countries to take the initiative to cope with marine debris issues by expending effort to preserve the marine environment in which our fishing activities take place.

As the Japanese trawl fishery is gradually being eliminated from the U.S. 200 mile zone, catches in the international waters of the Bering Sea have shown large increases. It goes without saying that this fishing ground is one of the remaining important ones for Japanese fisheries. Therefore, an accumulation of scientific knowledge on this area, as well as conservation and maintenance of its resources, are a matter of great interest to Japan.

We think that the establishment of an international organization that would deal with the research on resources of this area would be useful, not only to Japan, but also to other countries involved, including the United States and Canada, and we have requested at this year's Annual Meeting that the Commission consider action necessary to set up an organization under the INPFC Convention Article IV. We intend to continue our effort towards the establishment of such an international organization.

At this year's Annual Meeting perhaps needless for me to say, a review of issues relating to the salmon fisheries has been actively conducted, but in contrast to past meetings, discussions on non-anadromous species, including the squid drift net fishery, and the trawl fishery in the international waters of the Bering Sea, have also been extremely active. A number of noteworthy events have taken place in the INPFC Annual Meetings since the enactment of this Convention in 1952 and I believe that our deliberations at this year's Annual Meeting can also be considered as noteworthy.

I would like to express my heartfelt thank you to the members of the Canadian delegation for their warm hospitality, to the Secretariat staff, as well as the interpreters, for having worked
extremely hard for us day and night, and to our Chairman, Mr. Asselin, the Chairmen of the committees and of the sub-committees, as well as all the others that were involved.

In closing, I am looking forward to returning in three years to this City of Vancouver, which has welcomed us warmly. The Japanese National Section would like to invite the members of Canada and the United States to Tokyo in November of 1988 for our next annual meeting.

Closing remarks by Commissioner John C. Davis on behalf of the Canadian National Section:

As we look back on the proceedings of this the 34th Annual Meeting we can without any hesitation agree that this session was a success. Thanks to the hard work of the scientists and advisers and the frank discussions that took place regarding the issues good progress has been made to narrow the differences that exist between us.

We are pleased with the progress being made to better monitor the high seas fisheries. The continuation and expansion of port sampling programs, scale pattern analysis, tagging efforts and observer programs are all providing important and relevant information. Canada is prepared to provide additional observers so that we can facilitate the collection of information that is needed to meet the stipulations of the Memorandum of Understanding on Research.

The elimination of interceptions of North American salmonid stocks, in particular British Columbia steelhead trout and Yukon River salmon on the high seas continues to be an important objective of the Canadian Section. We have noted, Mr. Chairman, that increased research efforts have taken place but we are confident that more rapid progress would be achieved if more concerted efforts were made in all initiatives to further this objective.

Mr. Chairman, this annual meeting has again proven to be a useful forum to encourage an exchange of scientific knowledge and to strengthen cooperation between the parties. The quality of the documents presented this year were of the highest calibre and have contributed greatly towards progress on finding solutions to issues of mutual concern. Canada reaffirms its commitment to INPFC and is confident that the other member parties will continue to work cooperatively to solve our common problems.

Canada, Mr. Chairman, looks forward to hosting, next month in Ottawa, a meeting to discuss formation of a new Pacific Science Organization. The intent of the organization would be to foster an information exchange, cooperation and program coordination in the field of fisheries science and oceanography amongst an expanded group of participants. The great success of the IRIS-INPFC symposium last week is the most recent measure of the value of bringing oceanographers and fisheries scientists together under a broad scientific organization.

Canada is prepared to participate in discussion on Article IV in Tokyo in February provided the proposed organization would implement Article IV by including discussion on all non-anadromous species. To ensure the best progress is made at these discussions we urge the Contracting Parties to distribute their proposals prior to arriving in Tokyo.

Mr. Chairman, the matter of driftnet fishery activities of non-member countries and their impact on salmon, remains a concern to all Contracting Parties. We commend the commitments of the national sections to take necessary actions to combat this problem.

The re-structuring of the Committee of Biology and Research has increased the efficiency with which matters pertaining to all species of concern to the Commission are handled. We applaud these efforts to improve efficiency and look forward to further revision in scheduling.

Canada is pleased to note the commitment of all three countries in addressing the issue of ocean debris. The matter of ocean debris, including lost or discarded nets, and their effect on the living resources of the North Pacific Ocean remain a concern to Canada. We urge expansion of surveys to assess the magnitude of this problem and we support the initiatives to develop methods for quantifying ocean debris.

Canada is pleased with the establishment of the Sub-Committee on Marine Mammals and would like to see the sub-committee provide by-catch information from all high seas drift-net fisheries. The experiments to reduce incidental catch of marine mammals are encouraging and we look forward to hearing continuing results of these studies.

At this time, Mr. Chairman, I would like to express our appreciation to the Executive Secretary, the Secretariat staff, and the interpreters for their hard work which has contributed to the success of this meeting.

Finally, the Canadian Section looks forward to next year's meeting where we will again continue our discussion of matters related to the North Pacific. We wish you all a safe journey home and trust you have enjoyed your stay in Vancouver.
APPENDIX 1

LIST OF PARTICIPANTS
34th ANNUAL MEETING—1987
Vancouver, Canada, November 3 to 5, 1987

OFFICERS OF THE MEETING

Chairman ........................................ Pierre Asselin
Vice-Chairman ................................. Kenjiro Nishimura
Secretary ....................................... Clement V. Tillion

CANADA

Commissioners

Pierre Asselin
Ottawa
Joseph A. Garcia
Bamfield

Michael Z. Florian
Prince Rupert
John C. Davis (Acting)
Sidney

Advisory Committee

M. Friesen
D. L. Kowal
C. G. Graham
D. J. Meerburg
T. G. Halsey
R. Steinbäck
M. Hoffman
R. Thomas

Advisers and Experts

C. Atleo
L. Iverson
L. Richards
T. Beacham
G. Jamieson
W. L. Saunders
R. J. Beamish
B. M. Leaman
L. Souza
M. Bigg
R. LeBrasuer
R. Stanley
J. Fargo
G. A. McFarlane
A. V. Tyler
R. Fowler
L. Margolis
S. J. Westheim
R. Hargreaves
D. Meerburg
C. Wood
M. A. Henderson
R. Morley
M. Hunter
B. Procopation

JAPAN

Commissioners

Kenjiro Nishimura
Tokyo
Makoto Watansabe
Tokyo

Junzo Sasaki
Tokyo
Kazuo Shirra (Acting)
Tokyo

Alternate Commissioners

Kenzo Kawakami
Takehisa Nogami
Special Adviser
Shunji Maruyama
Consul General of Japan, Vancouver

Advisers and Experts
Ministry of Foreign Affairs
Satoshi Ida
Hitomu Kawai

Fisheries Agency of Japan
Satoshi Shimizu
Masayuki Komatsu
Tsutomu Nakamura
Kenji Kagawa
Sigeiti Hayasi
Kenji Takagi
Jun Ito
Takashi Sasaki
Kei-ichi Mito

Others
Daihachi Misawa
Ko Fuyuki
Tohru Hayakawa
Hidehiko Hirai
Seki-ichi Kanai
Kazuya Koando
Kiyoshi Kurita
Hiromitsu Nomura
Zenji Sato
Naofumi Yoshiike
Kunio Suno
Hiroyuki Takagi
Nobuyoshi Takeuchi
Takayuki Tanaka

UNITED STATES
Commissioners
Clement V. Tillion
Halibut Cove
Robert W. McVey
Juneau
Dayton L. Alverson
Seattle
Richard B. Lauber
Juneau

Advisory Committee
D. L. Allison
R. Alverson
J. L. Bergy
R. Blake
A. Burch
M. T. Coles
J. Easley
J. Gilbert
W. F. Gilbert
J. Hanson
P. Isleib
G. Jensen
G. H. Meacham
H. Mitchell
R. Moss
H. Reilly
K. Specking
J. Stephan
A. Sturgulewski
F. Zharoff

Advisers and Experts
W. Aron
J. W. Balsiger
R. L. Burgner
M. L. Dahlberg
D. Eggers
J. Gissburg
R. Ford
J. C. Hammond
C. K. Harris
G. Herrfurth
S. Ignell
L. L. Jones
L. L. Low
J. Orlando
S. Penoyer
J. Salisbury

CONSULTANT—OBSERVER
International Pacific Halibut Commission
G. H. Williams
S. Kaimmer
# LIST OF PARTICIPANTS—1987 ANNUAL MEETING

## SECRETARIAT

<table>
<thead>
<tr>
<th>Permanent</th>
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<tr>
<td>Bernard E. Skud</td>
<td>Debbie Cousineau</td>
<td>Toshiko Adilman</td>
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<td>Daishiro Nagahata</td>
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<td>Sue Cann</td>
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<td>Sumi Nakamura-Brunet</td>
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## MEMBERSHIP OF COMMITTEES

1. **Standing Committee on Finance and Administration**
   - **Canada**
     - Commissioner-member: M. Z. Florian
     - Commissioner-adviser: J. C. Davis
     - Advisers: C. B. Graham, M. A. Friesen, R. Steinbock
   - **Japan**
     - Commissioner-member: Makoto Watanabe
     - Commissioner-adviser: Kenjiro Nishimura, Kenzo Kawakami, Takehisa Nogami
     - Advisers: Hiromu Kawai, Masayuki Komatsu
     - Observers: Kenji Kagawa, Kazuyasu Kando, Tsutomu Nakamura, Zenji Sato, Daihachi Misawa, Satoshi Shimizu
   - **United States**
     - Commissioner-member: R. B. Lauber
     - Commissioner-adviser: R. W. McVey
   - **Secretariat**
     - Ex officio: Bernard E. Skud, Daishiro Nagahata

2. **Standing Committee on Biology and Research**
   - **Canada**
     - Commissioner-member: J. A. Garcia
     - Commissioner-adviser: M. Z. Florian
     - Scientist-members: R. J. Beamish, L. Margolis
| JAPAN       | Commissioner-member: | Junzo Sasaki  |
|            | Commissioner-adviser: | Kazuo Shima   |
|            | Scientist-members:   | Sigeiti Hayasi|
|            | Advisers:            | Kenji Takagi  |
|            | Takashi Sasaki       | Kunio Suno    |
|            | Jun Ito              | Kazuyasu Kando|
|            | Kei-ichi Mito        | Seki-ichi Kanai|
|            | Satoshi Shimizu      | Toru Hayakawa |
|            | Masayuki Komatsu     | Ko Fuyuki     |
|            | Tsutomu Nakamura     | Hiromitsu Nomura|
|            | Kenji Kagawa         | Nobuyoshi Takeuchi|
|            | Daihachi Misawa      | Naofumi Yoshiike|
|            | Zenji Sato           | Hidehiko Hirai|
|            | Takayuki Tanaka      | Hiroyuki Takagi|

| UNITED STATES | Commissioner-member: | D. L. Alverson |
|              | Commissioner-adviser: | C. V. Tillion |
|              | Scientist-members:   | R. L. Burgner |
|              | Advisers:            | L. L. Low     |
|              | D. L. Allison        | M. E. Isleio  |
|              | W. Aron              | G. Jensen     |
|              | J. Balsiger          | L. L. Jones   |
|              | J. Bergy             | C. H. Meacham |
|              | A. Burch             | H. Mitchell   |
|              | M. Dahlberg          | R. H. Moss    |
|              | J. Easley            | S. Pennoyer   |
|              | D. Eggers            | H. Reilly     |
|              | J. Gilbert           | J. R. Stephan |
|              | C. K. Harris         | A. Sturgulewski|
|              | S. Ignell            |               |

| SECRETARIAT  | Ex officio:          | Bernard E. Skud|
|             |                      | Daishiro Nagahata|
AGENDA AS ADOPTED

APPENDIX 2

AGENDA AS ADOPTED

34th ANNUAL MEETING—1987

Vancouver, Canada, November 3 to 5, 1987

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. Research results, research planning, and publications
   (a) Salmonids and oceanography
   (b) Non-anadromous species (groundfish, squid, king and tanner crab) and
       marine debris in the Convention Area
   (c) Marine mammals
   (d) Publication of research results and statistics
   (e) International symposia
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 (d) with respect to anadromous
    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) and the Memoranda of Under-
    standing on Research and Enforcement, including discussions regarding the
    effectiveness of these measures
12. Status of implementation of Articles III 1. (e) and IX 2.
13. Progress in the establishment of an international organization dealing with
    non-anadromous species (Article IV)
14. Administrative and fiscal matters
    (a) Accounts and audit
    (b) Financial situation in current fiscal year
    (c) Budget estimate for fiscal year beginning July 1, 1988
    (d) Budget forecast for fiscal year beginning July 1, 1989
    (e) Administrative report for 1987
    (f) Levy, administrative guidelines and salaries
    (g) Schedule of future meetings
    (h) Other matters
15. Election of officers
16. Other business
17. Closing remarks
APPENDIX 3

AUDITOR’S REPORT TO THE COMMISSION

KPMG PEAT MARWICK
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, 1987 and the statements of income and expenditure and changes in funds 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, 1987 and the results of its operations, changes in funds and changes in cash for the year then ended in accordance with accounting principles described in Note 1 to the financial statements applied, after giving retroactive effect to the change in the method of recording fixed assets as explained in Note 2 to the financial statements, on a basis consistent with that of the preceding year.

KPMG PEAT MARWICK
Chartered Accountants

Vancouver, Canada
July 31, 1987

STATEMENT OF ASSETS AND LIABILITIES
June 30, 1987
(With comparative figures for 1986)

<table>
<thead>
<tr>
<th></th>
<th>1987</th>
<th>1986</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(Note 2)</td>
<td></td>
</tr>
<tr>
<td><strong>Assets</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cash and term deposits</td>
<td>$259,583</td>
<td>150,235</td>
</tr>
<tr>
<td>Interest receivable</td>
<td>805</td>
<td>179</td>
</tr>
<tr>
<td>British Columbia sales tax receivable</td>
<td>734</td>
<td>—</td>
</tr>
<tr>
<td>Advances to executive and assistant directors</td>
<td>5,310</td>
<td>16,940</td>
</tr>
<tr>
<td></td>
<td>$266,432</td>
<td>107,354</td>
</tr>
<tr>
<td><strong>Liabilities and Fund Balances</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Accrued expenses</td>
<td>$78,081</td>
<td>86,210</td>
</tr>
<tr>
<td>Contributions received in advance from Contracting Parties</td>
<td>142,320</td>
<td>67,780</td>
</tr>
<tr>
<td>Advances from Contracting Parties representing the Working Capital Fund:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Contingency fund</td>
<td>20,190</td>
<td>7,758</td>
</tr>
<tr>
<td>Severance fund</td>
<td>7,341</td>
<td>5,606</td>
</tr>
<tr>
<td>Moving fund</td>
<td>18,500</td>
<td>—</td>
</tr>
<tr>
<td></td>
<td>46,031</td>
<td>13,354</td>
</tr>
<tr>
<td>Commitments and contingency (Notes 3 and 4).</td>
<td>$266,432</td>
<td>107,354</td>
</tr>
</tbody>
</table>

See accompanying notes to financial statements.
## STATEMENT OF INCOME AND EXPENDITURE AND CHANGES IN FUNDS

Year ended June 30, 1987  
(With comparative figures for 1986)

<table>
<thead>
<tr>
<th>General fund</th>
<th>Working capital fund</th>
<th>1987 Total</th>
<th>1986 Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Contingency</td>
<td>Severance</td>
<td>Moving</td>
</tr>
<tr>
<td>Income:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Contributions from</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Contracting Parties</td>
<td>$406,680</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Interest earned</td>
<td>11,063</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Levies</td>
<td></td>
<td>8,012</td>
<td>1,735</td>
</tr>
<tr>
<td>Other (Note 5)</td>
<td></td>
<td>5,000</td>
<td></td>
</tr>
<tr>
<td></td>
<td>417,743</td>
<td>13,012</td>
<td>1,735</td>
</tr>
<tr>
<td>Expenditures:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Personnel services:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Permanent</td>
<td>179,262</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Temporary</td>
<td>796</td>
<td>796</td>
<td>10,681</td>
</tr>
<tr>
<td>Benefits</td>
<td>25,950</td>
<td>25,950</td>
<td>29,166</td>
</tr>
<tr>
<td>Overtime</td>
<td>1,035</td>
<td>1,035</td>
<td>4,729</td>
</tr>
<tr>
<td>Severance</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>207,043</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Travel</td>
<td>19,946</td>
<td>19,946</td>
<td>45,455</td>
</tr>
<tr>
<td>Communications</td>
<td>20,560</td>
<td>20,560</td>
<td>11,192</td>
</tr>
<tr>
<td>Contracts</td>
<td>62,992</td>
<td>62,992</td>
<td>65,249</td>
</tr>
<tr>
<td>Printing</td>
<td>58,670</td>
<td>58,670</td>
<td>84,570</td>
</tr>
<tr>
<td>Rentals</td>
<td>38,149</td>
<td>38,149</td>
<td>26,730</td>
</tr>
<tr>
<td>Supplies</td>
<td>6,292</td>
<td>6,292</td>
<td>5,586</td>
</tr>
<tr>
<td>Equipment</td>
<td>2,716</td>
<td>2,716</td>
<td>1,368</td>
</tr>
<tr>
<td>Moving expenses</td>
<td></td>
<td></td>
<td>16,116</td>
</tr>
<tr>
<td>Miscellaneous</td>
<td>1,955</td>
<td>1,955</td>
<td>2,725</td>
</tr>
<tr>
<td></td>
<td>211,280</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Excess (deficiency) of income</td>
<td>418,323</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- Excess (deficiency) of income over expenditures  
  (580) 13,012 1,735 16,500 32,667 (59,199)  

- Fund balances, beginning of year  
  | 7,758 | 5,606 | 13,364 | 72,563 |

- Transfers  
  580 (580) |  |

- Fund balances, end of year  
  $ 20,190 7,341 18,500 46,031 13,364 |

See accompanying notes to financial statements.
# Statement of Changes in Cash

Year ended June 30, 1987  
(With comparative figures for 1986)

<table>
<thead>
<tr>
<th>Source of cash:</th>
<th>1987</th>
<th>1986</th>
</tr>
</thead>
<tbody>
<tr>
<td>Contributions from Contracting Parties</td>
<td>$343,900</td>
<td>312,500</td>
</tr>
<tr>
<td>Contributions received in advance</td>
<td>142,320</td>
<td>67,780</td>
</tr>
<tr>
<td>Interest</td>
<td>10,437</td>
<td>12,305</td>
</tr>
<tr>
<td>Repayment of advances to executive and assistant directors</td>
<td>11,630</td>
<td>7,252</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>508,287</td>
<td>399,837</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Use of cash:</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Advances to executive and assistant directors</td>
<td>—</td>
<td>14,182</td>
</tr>
<tr>
<td>Personnel services</td>
<td>179,862</td>
<td>187,750</td>
</tr>
<tr>
<td>Travel</td>
<td>19,946</td>
<td>45,455</td>
</tr>
<tr>
<td>Communications</td>
<td>20,560</td>
<td>11,192</td>
</tr>
<tr>
<td>Contracts</td>
<td>61,032</td>
<td>62,743</td>
</tr>
<tr>
<td>Printing</td>
<td>72,627</td>
<td>27,521</td>
</tr>
<tr>
<td>Rentals</td>
<td>34,063</td>
<td>26,730</td>
</tr>
<tr>
<td>Supplies</td>
<td>6,016</td>
<td>5,586</td>
</tr>
<tr>
<td>Equipment purchase</td>
<td>2,878</td>
<td>1,368</td>
</tr>
<tr>
<td>Moving expenses</td>
<td>—</td>
<td>16,116</td>
</tr>
<tr>
<td>Miscellaneous</td>
<td>1,955</td>
<td>2,725</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>398,999</td>
<td>401,373</td>
</tr>
</tbody>
</table>

Excess (deficiency) of source of cash over use of cash  
109,348 (1,536)

Cash balance, beginning of year  
150,235 151,771

Cash balance, end of year  
$259,583 $150,235

See accompanying notes to financial statements.
AUDITOR’S REPORT

NOTES TO FINANCIAL STATEMENTS
June 30, 1987

1. Accounting policies:
   The financial statements are prepared in accordance with the Handbook of the International
North Pacific Fisheries Commission (the “Commission”). With the exception of accounting
for levies, capital leases and fixed assets, in all other respects these financial statements
are prepared in accordance with generally accepted accounting principles. The following
is a summary of the significant accounting policies used in the preparation of these financial
statements.

(a) Fund accounting:
   The Working Capital Fund represents the accumulated excess of funds provided
by the Contracting Parties over expenditures and income from levies.

(b) Levies:
   In accordance with the provisions in the Commission’s Handbook an amount is
calculated, based on salaries and wages of all employees, which is estimated to
be equal to the liability for Canadian income taxes. The amount so calculated
is recorded by the Commission in the Working Capital Fund under the caption
“levies”.

(c) Fixed assets:
   Fixed assets acquired by the Commission are expensed in the year of acquisition
(Note 2).

(d) Leases:
   Assets acquired by the Commission under the terms of leases which would be clas-
sified as capital leases under generally accepted accounting principles are not
capitalized, and the leases are recorded as if they were operating leases and the
payments are included with operating expenditures.

(e) Income tax:
   The Commission is a non-taxable organization under the Privileges and Immuni-
ties (International Organizations) Act (Canada).

(f) Foreign exchange:
   Transactions originating in foreign currencies are translated at the exchange rate
prevailing at the transaction dates. Assets and liabilities denominated in for-
gn currency at the balance sheet date are translated to equivalent Canadian
amounts at the current rate of exchange.

2. Change in accounting policy:
   During the year the Commission changed its accounting policy for fixed assets from capitalizing
and depreciating these assets to expensing them in the year of acquisition. This change has
been retroactively applied and has resulted in the elimination of the Equipment Fund which,
at June 30, 1986, was $5,713.
   At June 30, 1987, fixed assets on hand and their original purchase price are as follows:

<table>
<thead>
<tr>
<th>Original cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Furniture and fixtures, purchased between 1976 and 1986</td>
</tr>
<tr>
<td>Appliances, purchased in 1979</td>
</tr>
<tr>
<td>Office equipment, purchased between 1979 and 1987</td>
</tr>
<tr>
<td><strong>Total</strong></td>
</tr>
</tbody>
</table>

3. Commitments:
   (a) As at June 30, 1987, the Commission is obligated under equipment leases to minimum
   annual payments as follows:

<table>
<thead>
<tr>
<th>Year</th>
<th>Payment</th>
</tr>
</thead>
<tbody>
<tr>
<td>1988</td>
<td>$14,795</td>
</tr>
<tr>
<td>1989</td>
<td>14,795</td>
</tr>
<tr>
<td>1990</td>
<td>4,412</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>$34,002</strong></td>
</tr>
</tbody>
</table>
Office space is supplied to the Commission by the Government of Canada—Department of Fisheries and Oceans, at no charge.

(b) Pension plan commitment:

Based on an actuarial re-evaluation, as at October 1, 1986, the Commission had an unfunded past service liability of approximately $45,000. The Commission is funding this liability over a period of 12 years with annual payments of $5,460.

4. Contingency:

A legal action for wrongful dismissal has been brought by a former employee against the Commission. The amount of the claim is not known and the outcome of the action cannot be determined at this time. No provision has been made in the accounts at June 30, 1987 for this claim.

5. Commitment by Contracting Parties for 1986 extraordinary meeting:

In 1987 the Contracting Parties agreed to contribute an additional $5,000 each to cover the cost of the extraordinary meeting held in 1986. The contributions are payable during any of the 1987, 1988 or 1989 fiscal years. The Canadian payment of $5,000 was received in 1987. The remaining payments will be recorded as other income when received.

6. Comparative figures:

Certain comparative figures have been reclassified to conform with the presentation adopted in the current year.

### Status of General Fund Appropriations

Year ended June 30, 1987

<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></td>
<td></td>
</tr>
<tr>
<td>Permanent</td>
<td>$182,026</td>
<td>179,262</td>
</tr>
<tr>
<td>Temporary</td>
<td>8,873</td>
<td>796</td>
</tr>
<tr>
<td>Benefits</td>
<td>90,300</td>
<td>25,950</td>
</tr>
<tr>
<td>Overtime</td>
<td>2,430</td>
<td>1,035</td>
</tr>
<tr>
<td></td>
<td>223,629</td>
<td>207,043</td>
</tr>
<tr>
<td>Other:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Travel</td>
<td>22,134</td>
<td>19,946</td>
</tr>
<tr>
<td>Communications</td>
<td>12,500</td>
<td>20,560</td>
</tr>
<tr>
<td>Contracts</td>
<td>52,071</td>
<td>62,992</td>
</tr>
<tr>
<td>Printing</td>
<td>64,000</td>
<td>58,670</td>
</tr>
<tr>
<td>Rentals</td>
<td>35,661</td>
<td>38,149</td>
</tr>
<tr>
<td>Supplies</td>
<td>6,400</td>
<td>6,292</td>
</tr>
<tr>
<td>Equipment</td>
<td></td>
<td>2,716</td>
</tr>
<tr>
<td>Miscellaneous</td>
<td>2,050</td>
<td>1,955</td>
</tr>
<tr>
<td></td>
<td>194,816</td>
<td>211,280</td>
</tr>
<tr>
<td></td>
<td>$418,445</td>
<td>418,323</td>
</tr>
</tbody>
</table>

Note: The original budget appropriations have been revised to reflect the presentation adopted in the current year.

See also accompanying notes to financial statements.
III. ADMINISTRATIVE REPORT FOR 1987

Bernard E. Skud
Executive Director

1. Content of the Report

This report provides information on actions of the Commission between the 33rd (1986) and 34th (1987) Annual Meetings, describes actions taken with respect to decisions made at the 33rd Annual Meeting and summarizes activities of the Secretariat. The period covered is from the adjournment of the 33rd Annual Meeting, 1986 November 6, to 1987 October 1.

2. Members

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

Canada

Aimée Lefebvre-Anglin
(to March 31)
Pierre Asselin
(from April 1)
Donovan F. Miller
Michael Z. Florian
Joseph A. Garcia
Kenjiro Nishimura
Tojiro Nakabe
(to January 29, 1987)
Makoto Watanabe
Kenichi Unno
Junzo Sasaki
(from September 25, 1987)
Yushiro Amatsu
(acting at 1986 Annual Meeting)

Japan


United States

Clement V. Tillion
Robert W. McVey
Dayton L. Alversen
Richard B. Lauber

Chairman of the Standing Committee on Finance and Administration
Michael Z. Florian of Canada

4. Editorial Referees

Editorial Referees, as of 1987 October 1, are—

Canada
Dr. Richard J. Beamish
Japan
Dr. Sigeiti Hayasi
United States
Dr. Loh-Lee Low

5. Staff

Bernard E. Skud and Daishiro Nagahata continued as Executive Director and Assistant Director, respectively. Wakako Morris’ status as Administrative Assistant was changed from temporary to permanent on December 1, 1986. Jonathan T. Yokayama continued as Clerk-Translator. Annette Hansen resigned as Secretary on May 29, 1987 and Sue Cann was hired as her replacement on June 19, 1987.

Administrative guidelines for the permanent staff were reviewed and the recommended changes presented to the Finance and Administration Committee.

6. Interim Approvals of the Commission

From the adjournment of the 33rd Annual Meeting (1986) through 1987 October 1, the following Commission approvals were obtained by correspondence—

(1) Publications

(c) Bulletin No. 48: Aleutian Groundfish Survey (Circular Letter No. 1572, December 16, 1986).

(2) Proceedings of the 33rd Annual Meeting

(a) Summary minutes of the Third and Fourth (final) Plenary Sessions and Distribution List (Circular Letter No. 1578, April 21, 1986). Approval for these minutes was obtained from the U.S. on May 12, Japan on June 2 and Canada on July 7, 1987.

(3) Matters concerning the 34th Annual Meeting

(a) Tentative agenda (Circular Letter No. 1588, July 31, 1987).
(b) 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. 1585, July 10, 1986. No requests were received.

7. Interim Meetings
   The following meetings were held—

(1) Working Group on Joint Surveys of the Sub-Committee on Non-Anadromous Species
   The reports of these meetings were submitted to the Sub-Committee on Non-Anadromous Species.

(2) Ad Hoc Salmon Research Coordinating Group
   The tenth meeting of the group was held in Tokyo, March 4 to 7, 1987 with participants from each country. K. Takagi of Japan chaired the meeting, the report of which was submitted to the Sub-Committee on Salmon (INPFC Doc. 3151 Rev. 1).

(3) Scientific Working Meeting on Marine Mammals
   The ninth meeting of this group (previously called the Scientific Sub-Committee of the Ad Hoc Committee on Marine Mammals) was held in Tokyo, March 10 to 14, 1987 with participants from Japan and the United States. K. Takagi of Japan chaired the meeting, the report of which was submitted to the Sub-Committee on Marine Mammals of the Standing Committee on Biology and Research (INPFC Doc. 3159).

8. Actions Taken by the Secretariat According to Decisions at the 33rd Annual Meeting of the Commission

(1) Information from non-member countries
   Contained in a report on publications submitted to the 1987 Annual Meeting (INPFC Docs. 3162, 3163).

(2) Tabling of conventions and treaties concerned with the Convention area
   A report on new information tabled with the Secretariat was submitted to the 1987 Annual Meeting (INPFC Doc. 3172).

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 1986, similar to that submitted annually since 1970, and prepared a report summarizing the data (INPFC Doc. 3170).

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 (INPFC Doc. 3171).

(1) Annual Reports
   The 1986 Annual Report in English is in press and will be distributed late in 1987.
   Early publication of the Annual Reports depends upon early submission of research summaries and early approval of the manuscript by each national section.

(2) Bulletin
   The English version of Bulletin No. 46 (Juvenile salmon) was distributed in January, 1987.
   The English version of Bulletin No. 48 (Aleutian Groundfish Survey) was distributed in June, 1987.

(3) Statistical Yearbook
   The 1983 Statistical Yearbook was published in March, 1987. The 1984 Statistical Yearbook is awaiting Japanese approval. Most of the material has been received for the 1985 Yearbook and some for the 1986 Yearbook.

(4) Proceedings of the 33rd Annual Meeting
   "Proceedings of the 33rd Annual Meeting—1986" (362 pages) in English was prepared and distributed in August, 1987.
   The Japanese version of the Proceedings (258 pages) was prepared and distributed in September, 1987.
(5) Proceedings of the Extraordinary Meeting


(6) INPFC Handbook

The Handbook will be revised to incorporate amendments to the Annex and new Memoranda of Understanding. The revised version is scheduled for publication in 1989.

11. Fiscal Matters

(1) Accounts and audit

The report of the Commission's auditors, KPMG Peat Marwick for the fiscal year ending June 30, 1987 (INPFC Doc. 3165) was transmitted to the Commission with Circular Letter No. 1593 on September 4, 1987 together with a report prepared by the Secretariat giving details of items in the auditors' report (INPFC Doc. 3166).

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

As approved at last year's Annual Meeting, the Secretariat met with auditors from KPMG Peat Marwick and financial personnel from the Department of Fisheries and Oceans to change some accounting procedures and the format of financial reports, which have been instituted in this year's presentation. On the recommendation of these consultants, some of the budget items have been reclassified. All changes will be discussed in detail at the F & A meeting.

(2) Working Capital Fund

The Commission's Working Capital Fund at 1986 June 30 totalled $13,364 which was the lowest in 10 years. The total included reserves for the contingency fund ($7,758) and severance pay ($5,606). The Working Capital Fund increased from $13,364.00 at June 30, 1986 to $46,611.00 during the fiscal year by the addition of $33,247.00, the amount which accrued from levies on staff salaries and decreased to $46,031.00 by a net transfer of $580.00 which was the deficiency of income over expenditures during the year. Within the $46,031.00 cash at June 30, 1987, the Contingency Fund was $20,190.00 and the balance was severance pay reserve of $7,341.00 and moving expense reserve of $18,500.00.

(3) 1987/88 budget

The budget estimate for the 1987/88 fiscal year adopted by the Commission at the 1986 Annual Meeting was sent to the Contracting Parties on November 21, 1986 with the request that $426,900 be provided in three equal shares. Contributions for the first half of the fiscal year ($71,150) have been received from all countries:
Canada—received June 30, 1987
Japan—received June 23, 1987
United States—received May 6, 1987

(4) Budget Estimate (1988/89) and Forecast (1989/90)

In accordance with Financial Regulation 7, the Secretariat sent to all Commissioners 60 days in advance of the 34th Annual Meeting a Budget Estimate for 1988/89 and a Budget Forecast for 1989/90 (INPFC Doc. 3168, Circular Letter No. 1592, September 4, 1987).

(5) Extraordinary Meeting Costs

At last year's Annual Meeting, the national sections agreed to contribute $5,000 each (by fiscal 1988-89) to cover costs of the 1986 Extraordinary Meeting in Vancouver. Canada's contribution was received on January 5, 1987, the United States contribution was received on October 16, 1987. These funds were assigned to the Contingency Fund.

12. Agenda for the 34th Annual Meeting

A tentative agenda for the 34th Annual Meeting, prepared by the Executive Director in consultation with the Chairman, was sent to the three national sections on July 31, 1987 (Circular Letter No. 1588), with a request for approval and comments. Japan proposed that Agenda Item 7(d) marine debris be deleted and that this topic should be added to the listing in Agenda Item 7(b). The Steering Committee of B & R also recommended changes concerning the terms of reference for B & R and its sub-committees and scheduling for the Sub-Committee on Marine Mammals.

13. Facilities

As described last year, the Canadian Department of Fisheries and Oceans (DFO) plans to relinquish ownership of its buildings on the University of British Columbia (UBC) campus. One of these buildings serves as the INPFC Headquarters. The new "owner" apparently will be either UBC or the Canadian Department of Agriculture, but a final decision has yet to be announced. DFO has given the Secretariat verbal assurance that the building presently serving as INPFC Headquarters will continue to be available and the Secretariat assumes that DFO will make arrangements with the new owner for heat, light, and
janitorial and maintenance services for the building and grounds. It also is assumed that these arrangements will rectify the inadequacies experienced in the past two years.

The INPFC library has been moved to the second floor to provide the needed space and the INPFC publications stored at headquarters have been reorganized and relocated in the former library space.

14. 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 the following laboratories and/or offices: Canada Department of Fisheries and Oceans in Vancouver; the U.S. National Marine Fisheries Service in Seattle; the International Pacific Halibut Commission in Seattle; and the Fisheries Research Institute of the University of Washington in Seattle.

INPFC was invited to prepare a display for the Open House held by the University of British Columbia and to participate in related functions. The Executive Director presented an award on behalf of the American Institute of Fishery Research Biologists to Dr. Peter Larkin of UBC's Department of Animal Resource Ecology.

The Executive Director attended a meeting of the Pacific Salmon Commission in Vancouver, B.C. on November 18, 1986.

The Assistant Director attended the U.S. Public Hearing in Seattle for renewal of the General Permit for the incidental take of marine mammals by the Japanese salmon mothership fishery on December 1-2, 1986.

The Executive Director was a Panel member at a workshop on the Biological Objectives of Fisheries Management sponsored by the Institute of Marine Studies of the University of Washington, Seattle, Washington from January 7-9, 1987.


The Executive Director and Administrative Assistant attended the 1987 Annual Meeting of the International Fisheries Commissions Pension Society in Vancouver on May 12 to 14, 1987.

The Executive Director and Assistant Director attended the NONA Working Group on Joint Surveys in Seattle on June 1, 1987.

The Executive Director participated as the reviewer of a symposium on fisheries management at the American Fisheries Society meeting in Winston-Salem, N.C. on September 13-16, 1987 and enroute met with Mr. Kefauver (U.S. State Department, Washington, D.C.) to discuss fiscal and pension matters.

The Executive Director attended the Open House of the Pacific Salmon Commission on October 6, 1987 in Vancouver.

The Executive Director served as Chairman of the American Fisheries Society's Publication Awards Committee and was appointed to the Affiliate Faculty of Western Washington University (Bellingham).

The Commission was invited to be represented by observers at (a) the Annual Meeting of the Inter-American Tropical Tuna Commission, (b) the Regular Meeting of the International Commission for the Conservation of Atlantic Tunas. No INPFC observers were designated to represent the Commission at these meetings.

The Secretariat has responded to enquiries on a variety of fishery matters and was visited by students, scientists, administrators, and others, including members of the Pension Society.
IV. THE RESEARCH PROGRAM

A. REPORT ON RESEARCH BY CANADA FOR THE INTERNATIONAL NORTH PACIFIC FISHERIES COMMISSION IN 1987

Department of Fisheries and Oceans
Biological Sciences Branch
Pacific Biological Station
February 1988

Anadromous

INTRODUCTION

Numerous research and stock assessment projects are undertaken by the Biological Sciences Branch and some research related to salmon enhancement and habitat issues is undertaken by other Branches of the Department of Fisheries and Oceans. Summaries included in this report relate to research projects of direct interest to I.N.P.F.C.

SALMONIDS

HIGH SEA SAMPLING AND TAGGING

High sea sampling and tagging of salmonids and oceanographic surveys were conducted during a cruise by the R/V W. E. Ricker from May 25 to July 5, 1987, in the area bounded by 34°N–50°N and 145°W–162°W (LeBrasseur et al. 1987). Eleven gillnet sets and five longline sets were made during two sampling legs. Oceanographic observations and zooplankton and mesopelagic fish sampling were also conducted. Salmonids were caught in three gillnet and four longline sets, from 39°37’N to 50°N. Of the total catch of 158 salmonids, 124 were caught by longlines. Forty-six sockeye, 32 chum, 16 pink, 7 coho, and 2 chinook salmon, and 2 steelhead trout were tagged and released. Three steelhead caught in one set near 41°N, 160°W contained coded-wire tags, from which it was determined that they came from separate releases of summer-run smolts from hatcheries on the Columbia River system in Washington and Idaho. Flying squid were caught in all gillnet sets and were abundant in the three gillnet sets that also caught salmonids. These three sets were made in June between 39°37’N and 41°19’N and between 157°20’W and 161°04’W, where the surface temperatures were less than 12°C. The Pacific pomfret was the most abundant fish species in the gillnet catches. The rate of drop-out of pomfrets from the gillnets indicated that the loss of pomfret due to driftnet fishing in the area would be large.

CANADIAN PARTICIPATION IN A JAPANESE RESEARCH VESSEL CRUISE

A Canadian scientist participated in the cruise of the Japanese salmon research vessel Hokko maru from June 1 to June 22, 1987, and made observations on fishing activities, catches, tagging effort, and oceanographic conditions, and conducted sighting surveys for marine mammals and man-made debris (Hargreaves 1987a). Sampling consisted of 21 longline sets made in the area bounded by 42°30’N–45°N and 164°E–177°E. The fraction of fish tagged was considerably lower than in earlier Canadian high seas longline operations. The first five fish tagged in each set were held for varying periods of time after tagging for observations on condition. The vast majority of the fish recovered quickly from the handling stress. The adipose fin was missing from nine of 23 steelhead and two of 267 coho salmon. Snouts of these fish were sent by the Fisheries Agency of Japan to the United States for processing. A coded-wire tag was recovered from one of the nine steelhead. Incidental catches tended to be low and consisted of 17 pomfret and about 52 sea birds. Most of the sea birds were released without apparent serious injury. Fur seals were frequently observed near the longlines, but no marine mammals were caught by or entangled in the gear.

LOST AND DISCARDED DRIFTNETS

A program, initiated in 1986 and continued in 1987, documented the occurrence in coastal Canadian waters of lost and discarded driftnets. The gear was reported and retrieved on a voluntary basis by industry and government personnel.

A total of 25 samples of gillnet were reported through September 1, 1987 (Hargreaves 1987b). All but one sample consisted of monofilament mesh, ranging from 96 to 147 mm stretched mesh. Three of the 25 samples were found drifting over deep waters while the remainder were located on beaches.
CHINOOK AND SOCKEYE SALMON STOCK IDENTIFICATION

Adult and juvenile chinook salmon were sampled throughout the Canadian portion of the Yukon River watershed. The samples are being used to determine if there are significant differences in electrophoretic patterns between stocks that can be employed to identify the stock of origin in mixed stock fisheries. Ten major spawning areas were sampled including those in the Big Salmon, Ross, and Nisutlin rivers and in the mainstem of the Yukon River. Comparable samples for electrophoretic analyses were collected in the U.S. portion of the Yukon River.

Twenty British Columbia sockeye salmon stocks were sampled to determine their electrophoretic, parasitic, and scale characteristics for the purpose of stock identification in British Columbia and Alaskan fisheries. The 1987 samples complete the baseline characteristics for all major sockeye stocks in British Columbia.

EARLY SEA LIFE OF SALMON

The main objectives of the 1987 research were to determine the abundance, distribution, and mortality of juvenile sockeye, coho, and chinook salmon during their early sea life period. Salmon originating from Alberni Inlet (southwest coast of Vancouver Island) were chosen as the study population, due to the commercial importance of these stocks and the decline in the number of adult salmon of these species returning to this area in recent years.

The abundance and distribution of juvenile salmon in Alberni Inlet and Barkley Sound were assessed by extensive sampling with purse seines and beach seines during April-July. The results indicate that juvenile sockeye began to enter Alberni Inlet in mid-April, with the peak abundance occurring during the last two weeks of June. The abundance of sockeye peaked approximately two weeks later in Barkley Sound, and decreased rapidly thereafter. The abundance of juvenile coho increased dramatically throughout the study area soon after 1.2 million coho were released from Robertson Creek Hatchery (located near Port Alberni, at the head of Alberni Inlet) during April 10–20. Coho catches rapidly decreased and subsequently remained at very low levels during May-July. These data indicate that the residence time of both sockeye and coho in Alberni Inlet and Barkley Sound was very short in 1987. The abundance of juvenile chinook peaked in Alberni Inlet in the last week of May, when 8.1 million chinook were released from Robertson Creek Hatchery. Data from coded-wire tagged chinook indicate that most of the chinook caught in Alberni Inlet and Barkley Sound were from Robertson Creek Hatchery. The abundance of juvenile chinook remained relatively high throughout May and June, indicating that chinook remained resident in the protected waters of Barkley Sound much longer than either sockeye or coho.

Predation was suspected as the most important source of mortality during early sea life, so assessment of mortality of juvenile salmon focused on determining the abundance, distribution, and stomach contents of potential predators. Abundances of birds and mammals were assessed visually, and samples of fish predators were collected with gillnets and purse seines throughout Alberni Inlet and Barkley Sound each week during April-July. The number of sea birds was high during early April but decreased rapidly to very low levels by the beginning of May. The number of marine mammals sighted was consistently very low, so it appears unlikely that juvenile salmon suffered significant mortality in Alberni Inlet or Barkley Sound as a result of predation by either birds or marine mammals. A total of 924 potential fish predators, representing more than 15 species, was evaluated and no evidence for predation was found. Seventeen of these fish, including eight hake, six dogfish, and three pollock, had juvenile salmon in their stomachs. The research conducted in 1987 identified the major predators of juvenile salmon in Alberni Inlet and Barkley Sound. However, the total mortality from predation is uncertain, because the total abundance of each species of predator is not known. Research planned for 1988 will focus on fish predators, including an attempt to estimate the abundance and impact of each predator species.

MOTHERSHIP OBSERVER PROGRAM

Three Canadian observers participated in the U.S.A. observer program (Dahlberg and Murphy 1987) on board Japanese salmon motherships operating within the U.S.A. 200-mile Exclusive Economic Zone (EEZ) around the western Aleutian Islands west of 175°E longitude, in 1987.

One Canadian observer, along with a U.S.A. observer, was aboard each of three motherships (Kizun maru, Maiyo maru, and Nojima maru) whose catcher boats operated either continuously or discontinuously within the U.S. EEZ during all or part of the period from June 11 to July 12. The observers collected data on total catch, fishing effort, and average weight by salmon species, and examined coho and chinook salmon, and steelhead trout for missing adipose fins, which signal the possible presence of a coded-wire tag within the snout of the fish. They also collected scales and biological data from 3,614 chinook and 1,894 coho salmon for use in studies on continent of
origin of these species. Only 14 steelhead were landed on the motherships. Scales and other biological samples and data were collected from these fish. Three chinook and four coho were discovered with missing adipose fins; none were subsequently found to contain coded-wire tags.

PORT SAMPLING PROGRAM

At Canada's request, the Fisheries Agency of Japan sampled landings of salmonids from the Japanese landbased driftnet salmon fishery at Hanasaki Port, Hokkaido, for fish with a missing adipose fin, which indicates the possible presence of a coded-wire tag. Japan reported that 850 coho salmon and 629 steelhead trout were examined from a total of 185,959 coho salmon and 2,910 steelhead trout landed at this port in 1987. Five coho salmon and 66 steelhead trout were found to be missing the adipose fin. Japan further reported that when tested with a coded-wire tag detector, only two steelhead responded positively. These two steelhead were shipped to Canada, where neither was found to contain a coded-wire tag.

REFERENCES

P.O. Box 210155, Auke Bay, AK 99821.


Non-anadromous

INTRODUCTION

The Groundfish Section continued emphasis on multispecies and inter-disciplinary studies in 1987. Stock assessments with yield recommendations were authored by all major investigations and edited into a single document (Tyler and Saunders 1987). Reports of activities by Program are listed below.

FLATFISH

Field work on flatfish involved the investigation of reproductive biology of English sole in the Charlotte Area. This study, initiated in 1986 to study the annual cycle of ovary development, was first reported this year (Tyler et al. 1987). Ovary samples for histological investigation were taken during research cruises in January (Foucher et al. 1987) and June, and for both histological and fecundity studies in November. Sampling was also conducted during observer trips in March and August. Histological sections have been produced and determination of oocyte size frequency has begun.

Laboratory studies included completion of a manuscript dealing with results of a rock sole age-validation experiment. The burnt-otolith cross-section method of age determination was validated (Fargo and Chilton 1987). The rate of instantaneous natural mortality (M) was estimated to be 0.21. The oldest rock sole obtained from commercial samples was a 17 y old female, while the majority of recent commercial landings were composed of fish from ages 4 to 6 y.

A second manuscript dealing with environmental and stock size effects on rock sole year-class production in Hecate Strait (Charlotte Area) was completed. Results suggest a dome-shaped relationship between ocean surface temperature at the time of spawning and rock sole year-class production. A Beverton-Holt type stock-recruit relationship was also suggested for the species. These results were presented at the INPFC-IRIS symposium in 1987.

A multiplicative model incorporating effects of depth and vessel horsepower was used to standardize effort time series for rock and English sole in Hecate Strait. Standardized catch per unit effort indices derived for these species indicate that English sole abundance is stable while rock sole abundance is increasing.

A series of yield simulations was conducted for arrowtooth flounder in Hecate Strait. Results of a 50-year forward simulation indicate that MSY for the species is between 5000–6000 t/year. Maximum yields were achieved with recruitment at age 4 and a fishing
mortality rate of 0.6.

**Pacific Cod**

A study on the reproductive biology of Pacific cod continued in 1987 with three research cruises and two observer trips, during which ovary samples were collected for histological examination. These trips were the same as those reported for English sole. Samples for fecundity estimation were also collected during the January trip. Oocyte size frequency and fecundity estimation has been initiated but results are not yet available.

The publication of standardized landing statistics (Foucher 1987a) and historical length frequency distributions compiled from port samples (Foucher 1987b) will facilitate subsequent stock assessment work. A special stock assessment of Pacific cod in the Strait of Georgia was published which, for the first time, included yield-per-recruit analyses (Westheim and Foucher 1987a).

Data from research and port samples were used in an investigation of geographic and inter-annual variations in length at 50% maturity in Hecate Strait (Foucher and Welch 1987).

Results of an investigation of various factors affecting year-class strength of Pacific cod were published (Tyler and Westheim 1986). Factors which tend to increase year-class strength include a high abundance of herring (presumably as feed) and water temperatures during the spawning period (February) in the range from 6.5 to 7.5°C. Factors which tend to decrease year-class strength include lack of feed, adverse temperatures, and a strong northward current during the spawning period.

**Hecate Strait Project (Charlotte Area)**

(i) Species assemblage analysis

In May-June the third of a series of species assemblage survey cruises was conducted in Hecate Strait. The first two surveys facilitated a comparison of summer and winter distributions of on-bottom fish assemblages. The third survey allows an assessment of the inter-annual variation in these assemblages. Preliminary results from cluster analysis of the data from the third survey indicate very little inter-annual variation among assemblages. Northern Hecate Strait is dominated by rock sole, skate, Pacific halibut, and spiny dogfish in shallow depths (10–40 fathoms) during summer. Pacific cod, English sole, rex sole, and Pacific sanddab predominate in the deeper depths (41–79 fathoms) during summer. Southern Hecate Strait is characterized primarily by rockfish species, arrowtooth flounder, and Dover sole in summer. In general, depth distributions and assemblage areas remained stable between years, for the most abundant species in the region.

(ii) Food-resource division

Field studies consisted of one cruise during May-June to provide information on food-resource division within the species assemblages identified above. On this, the fourth sampling cruise, a total of 605 stomachs from 19 species of fish were collected. Laboratory analysis of stomach contents from cruises conducted during June and September 1985, January 1986 and May-June 1987 continued.

**Sablefish**

Field studies included: (1) monitoring of the commercial fishery; (2) tagging of juveniles; (3) survey of pelagic larvae; (4) a species interaction trawl survey; and (5) examination of biotic and abiotic factors controlling year-class success. Biological monitoring of the fishery was continued, using observers aboard three commercial vessels. Approximately 2000 juvenile sablefish were tagged and released off the west coast of Vancouver Island (Vancouver Area) as part of Canada's commitment to the international juvenile sablefish tagging program. For the fourth year, a survey determining the relative abundance and distribution of pelagic sablefish larvae off the west coast of Vancouver Island was conducted in April (Shaw et al. 1987b). Ichthyoplankton sampling was concentrated in the La Pérouse Bank (southwest Vancouver Island). A species interaction trawl survey, similar to Shaw et al. (1987c) was conducted in August to assess the impact of sablefish and Pacific hake on the herring stocks in the La Pérouse region. Cruises were conducted in the La Pérouse Region during February and March to monitor the distribution of sablefish larvae, and the associated biotic and abiotic factors that may be influencing year-class strength.

Laboratory studies included: (1) standardization of trap effort statistics; (2) rearing of sablefish larvae; (3) examination of factors determining the production of strong year-classes; and (4) reporting on oxytetracycline dosage selection for age validation studies, based on recoveries from the sablefish tagging program (McFarlane and Beamish 1987a). A multivariate standardization of effort was applied to sablefish trap effort statistics. It was determined that, while variability is high, CPUE appears to be an applicable index of abundance. The study of larval sablefish rearing was continued. Both gametes collected at sea and those from hormone-induced captive brood stock were used successfully. Experiments
were conducted to determine the appropriate time of presentation, size, density, and type of food organisms required to successfully bring sablefish through the larval stages. Biological and oceanographic data collected as part of the La Pérouse project were used to examine the biotic and abiotic factors influencing year-class success.

**Pacific Hake**

Field studies included: (1) a species interaction trawl survey; and (2) continued monitoring and biological sampling of Pacific hake in the Strait of Georgia (as per Shaw et al. 1987a) and off the west coast of Vancouver Island. A species interaction trawl survey similar to Shaw et al. (1987c) was conducted in August to assess the impact of Pacific hake and other predators on herring survival and recruitment.

Laboratory studies involved: (1) study of the reproductive response of Pacific hake to exploitation; and (2) analysis of the changes in size-at-age over time in the Strait of Georgia and offshore stocks.

**Spiny Dogfish**

Field studies included: (1) monitoring and biological sampling of the commercial fishery; and (2) adult tagging. Approximately 4,000 fish were tagged in the Strait of Georgia and approximately 4,000 and 2,000 fish were tagged off the west and northeast coasts of Vancouver Island, respectively. The purpose of these experiments is to assess long-term movements, in particular the rate of exchange between the Strait of Georgia and offshore stocks.

Laboratory studies included: (1) an examination of the impact of dogfish predation on other commercially important species in Hecate Strait during 1977–78; and (2) reporting of the validation of the age determination method currently in use (McFarlane and Beamish 1987b).

**Walleye Pollock**

Field studies involved biological monitoring of the commercial fishery (length-frequency by sex, fin rays, gonad condition, etc).

**Offshore Rockfish**

No new field studies were initiated in 1987. Laboratory studies of the reproductive and population biology of Pacific ocean perch were continued (Leaman 1987) including the processing of a second year of fecundity and histological samples from five Charlotte-Vancouver Region stocks. Isolation of these stocks at the adult stage was confirmed through analysis of their copepod gill parasite (Leaman and Kabata 1987). However, preliminary results of electrophoretic analysis of protein isozymes indicates that no genetic segregation of these stocks has occurred.

An analysis of the application of assemblage management of rockfishes in the British Columbia commercial trawl fishery was produced (Leaman and Nagtegaal 1987a). Results show that management of slope rockfish assemblages achieved optimum individual species yields, however shelf rockfish species appeared less amenable to this type of management. A study concerning the first age validation of a *Sebastes* spp. with oxytetracycline injections, in conjunction with a tag-recapture study, was also published (Leaman and Nagtegaal 1987b). Ages to 34 y estimated with the break/burn technique of otolith ageing were validated. An additional study of the relationship of surface and break/burn ageing results for Pacific ocean perch was also completed (Stanley 1987a), indicating general agreement of the two techniques to approximately ages 15–16 y, but progressively greater underestimation of true ages with surface ageing of older fish.

The development of a length frequency simulator was completed (Stanley 1987b). The simulator can be used for estimating historical mortality rates from the length composition of commercial catches.

**Inshore Rockfish**

Copper and quillback rockfish are the major commercial species in the Strait of Georgia (Vancouver Area) (Richards and Cass 1987a). SCUBA surveys were conducted in 1984–85 to study habitats of these species. The analysis is now complete and indicates that both species are abundant only in high relief areas, with copper rockfish generally at shallower depths (Haldorson and Richards 1987, Richards 1987a). Rockfish densities estimated from these surveys were used with rockfish CPUE data from the same sites to illustrate a method for comparing abundance indices (Richards 1987b). The method accounts for the statistical error in both indices.

Field angling studies to monitor rockfish abundance and size composition were continued in the northern Strait of Georgia and Johnstone Strait. As was found in 1986 (Richards and Cass 1987b), rockfish abundance, as measured by angling CPUE, was higher in areas that had not been exploited historically by the commercial rockfish line fishery (Richards and Hand 1987). Larger quillback rockfish were also caught in areas where CPUE was higher.

**Lingcod**

In 1985, a hook-and-line survey of lingcod was initiated in the Gulf Islands area of the Strait of Georgia
Statistics and Sampling

Principal activity is maintaining the long-term data series involving catch/effort (Leaman and Stanley 1987) by interviewing vessel captains at the time of landing and collecting biological data (length frequencies, sex, age structures, gonad condition, etc.) by sampling commercial landings. Additional activities during 1987 included field testing a microcomputer-based navigational system for electronic capture of commercial logbook data on catch and effort at sea. The increasing activity of domestic freezer trawlers has also necessitated the development of conversion factors to estimate round weight from measurements of the frozen product (Stanley and Otterdyks 1987).

Ageing Laboratory

Age Determination

In 1987, the Fish Age Determination Unit continued to provide ages to the Groundfish, Salmon and Herring Sections for research and management purposes. Approximately 8,500 groundfish and 39,000 herring structures were aged, as well as 20,600 salmon structures. The Unit maintains a double reader system, i.e. each fish and/or structure is aged at least twice. Precision tests for each species are conducted throughout the year.

Special Projects

Groundfish: The preliminary validation study for rock sole otoliths completed in 1986 was published in 1987 (Fargo and Chilton 1987). Pacific cod fin-ray samples were gathered and examined as part of a project to compare fin-ray and length frequency methods of age determination. The fin-ray cross sections of 500 oxytetracycline (OTC) tagged lingcod were aged and examined for presence and location of an OTC mark. This work will contribute toward validating the ageing method.

Salmon: The Unit participated in a number of salmon research projects. In conjunction with international salmon studies, 1,900 sockeye scales were digitized for stock identification analysis. The Unit continues to collect ageing structures, including those from known-age fish, in an effort to develop, validate, standardize and publish ageing criteria for salmon species such as chinook, sockeye and chum. Age structure comparisons for spawners continue to be evaluated. In the interests of standardizing the methods of collecting salmon ageing structures, a waterproof field sampling guide was published as an internal document, which is available to interested researchers (MacLellan 1987).

Herring: The results of the herring age structure comparison analysis completed in 1986 were published (Chilton and Stocker 1987).

REFERENCES


I. SALMON RESEARCH

1. Research on Board Motherships

The Japanese mothership salmon fishery operated in 1987 with three motherships and 129 catcher boats (43 catcher boats per mothership). The fleet sailed from Hakodate on June 1 for the fishing grounds and returned to Hakodate between July 17 and 18.

Landings of salmon from catcher boats to motherships began June 8 and ended between July 10 and 12. During this period, a total of 90 operations were conducted by the fleet (136 operations were conducted in the previous year, hereafter figures in the previous year are given in parentheses). Daily catch records were collected on board three motherships. Fork length, body weight, gonad weight, and sex were recorded, and scales were collected for 90 (60) sockeye, 30 (30) chum, 30 (30) pink, 60 (30) coho, and 60 (30) chinook salmon on those days when salmon were landed. The numbers of each species measured on board the mothership in 1988 was:

<table>
<thead>
<tr>
<th>Species</th>
<th>Numbers</th>
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<tr>
<td>Sockeye</td>
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<tr>
<td>Chum</td>
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<tr>
<td>Pink</td>
<td>2,693</td>
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<tr>
<td>Coho</td>
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<tr>
<td>Chinook</td>
<td>2,451</td>
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<td>16,639</td>
</tr>
</tbody>
</table>

2. Research on Board Research Vessels

Ten salmon research vessels conducted research operations from June to August in 1987. The survey area was mainly in the North Pacific Ocean and in the Bering Sea west of 170°W. Some surveys were also conducted in the Gulf of Alaska. The gears used were gillnets and longlines. The activities by each vessel are summarized as follows:

Hokushin maru, Iwaki maru, and Kaion maru conducted research on the distribution and abundance of salmon and collected information on their biological characteristics. These studies used “A” nets (commercial-type gillnet) and “C” nets (non-selective research gillnets, which were composed of ten different mesh sizes). Shin-Riasu maru and Hokuso maru conducted tagging operations with longline gear to determine the continent of origin of salmon migrating in the southern North Pacific Ocean, including waters south of 46°N. After that, Shin-Riasu maru participated in the surveys in waters south of the Aleutian Islands region with “A” and “C” nets. Hokko maru conducted tagging operations with longlines in the first cruise and participated in the surveys with gillnets in the second cruise.

The Wakatake maru used “A”, “C” nets and longlines in experiments to estimate the fishing efficiency of gillnets and in twenty-four hour experiments to study the diurnal activities of salmon migrating in the central Bering Sea. The Oshoro maru conducted the surveys in southern waters on the line of 180°, the Bering Sea, and Gulf of Alaska. The Hokusei maru collected biological information on pelagic fish, including salmon and squid in the west side of the Subarctic zone of North Pacific Ocean. The Oshoro maru and Hokusei maru used special research gillnets as well as “A” and “C” nets, and the Oshoro maru also used longline gear for the surveys on the line of 180°.

All ten research vessels made oceanographic observations and body measurements of salmon and conducted research on other organisms taken incidentally (fishes other than salmon, squids, sea-birds and marine mammals). Body measurements (fork length, body weight, and gonad weight, recorded by sex, and collection of scales) were made for almost all salmonids caught with “C” nets. Body measurements were made for up to 100 (60) sockeye, coho and chinook salmon and steelhead and up to 60 (30) chum, and up to 30 (30) pink salmon of the salmonids caught with “A” nets on each day of operation. Because there were too many reproductive scales for coho and chinook salmon and steelhead, two scales were collected from each salmon. Of the fish caught with longlines, those that were viable were tagged and the remaining fish were measured in the same way as the catch by “A” nets.

A total of 180 (183) research operations were made with gillnets from June 4 to August 7 and 240 (69) operations with longlines from June 5 to July 26. In conjunction with the longline operations, 228 (65) taggings were also conducted.

3. Foreign Scientific Observers on Board Motherships and Research Vessels

In 1987, a total of 6 scientific observers (two for each mothership) were on board three motherships.
On board research vessels, N. B. Hargreaves, Canadian scientist, was on board the Hokko maru (the first cruise) and J. T. Konecki, U.S. scientist, was on board the Oshoro maru, from Hakodate to Kodiak to conduct joint research including tagging and biological sampling for salmonids. In addition, four U.S. scientists were on board the Oshoro maru. Three U.S.S.R. scientists (one of them was an interpreter) were on board the Hokko maru (the second cruise) to conduct Japan-Soviet joint surveys.

4. Distribution of Salmonids in the Northwestern Pacific Ocean and Bering Sea in 1987

The numbers of salmonids caught with research vessels' "C" nets were summed by ten-day-periods and 1°×5° areas and compared with the corresponding long-term data (1972–86). Although the relative abundance of sockeye salmon in 1987 was high in waters west of 175°E in the North Pacific Ocean, it was apparently low in waters east of 175°E in the North Pacific Ocean. It was apparent that relative abundance of chum salmon was high in every area and, in particular, in the Bering Sea. In contrast, the relative abundance of pink salmon was apparently low in every area. Relative abundance of coho salmon was apparently low in waters east and west of 175°E in the North Pacific Ocean. The relative abundance of chinook salmon was about average in the North Pacific Ocean and high in the Bering Sea.

5. Tagging and Recoveries

Of the 240 longline sets conducted in 1987, 181 were conducted in waters south of 46°N, and 160°E to 175°W (MOU Area). This research was conducted in accordance with the Memorandum of Understanding on Research signed by the Delegations of Japan, U.S.A. and Canada in 1986. The numbers of salmonids released in all areas were 7,624 (1,790). Of those, the numbers of each species released in the MOU area in 1987 were: sockeye—39 (12); chum—1,905 (344); pink—2,017 (124); coho—733 (385); chinook—28 (19) and steelhead trout—53 (23) (4,775 (907) in total). This total was an extensive increase over the previous year.

A total of 55 new tag recoveries of salmonids were reported from September, 1986 to August, 1987. The significance of these recoveries is summarized by species as follows:

**Sockeye salmon**

One sockeye salmon released at 45°30’N and 168°35’N was recovered in the Taku Inlet of southeastern Alaska. This recovery extended the previously known southern limit (47°30’N, 178°30’E) of distribution of immature sockeye salmon originating from the boundary area between southeastern Alaska and British Columbia. One sockeye salmon released at 58°26’N, 175°35’W was recovered in Bristol Bay. This recovery extended somewhat the previous known northern limit (58°05’N, 174°10’W) of distribution of maturing sockeye salmon of Bristol Bay origin.

**Coho salmon**

Two coho salmon released at 42°30’N, 176°30’E and 42°30’N, 177°30’W were recovered in the east Kamchatka coast. Those recoveries extended the previously known southern limit (44°28’N, 173°31’W) of distribution of coho salmon of east Kamchatka coast origin.

6. Other Studies on Distribution and Origin

A. Scale Pattern Analyses of Chinook Salmon

There are three problems in the scale pattern analyses for classification of stock: (1) the establishment of standard group, (2) the selection of characteristics, and (3) the procedures of classification. These problems are interrelated with one another.

For example, the geographical grouping of each river's sample for establishing standard group affects the characteristics used for stock identification and the accuracy of classification of standard group. The cluster analysis was conducted in order to find what kind of scale characteristics appropriately represents the geographical distribution. The result revealed the necessity of giving more importance to the ocean zone characteristics than the freshwater characteristics in order to establish standard group which corresponds well to the geographical distribution.

It also showed that the independent dealing of two Asian samples (samples from Bolshaya River and Kamchatka River) and samples from Central Alaska easily affected the changing of cluster formation in accordance with the characteristics and year-class of samples. The necessity of further study with more samples was recognized.

B. Optical Scale Pattern Reading Device

As the result of consideration for accuracy of the number of circuli and distance of measurement, the optical scale pattern reading device was recognized to be no problem for practical use. The advantages and disadvantages of two methods of scale measuring were compared: one method measured a straight line by putting the whole image of scale onto a field of vision and a second method which measured while linking the straight lines after the image of scale was divided and enlarged.
C. Classification of Stock of Chinook Salmon by Parasites

All organs and tissues of fish body from 43 samples of chinook salmon collected in the North Pacific Ocean and Bering Sea in 1982 and 1986 were examined, and the existence of ten species of parasites was recognized. Of those, the parasites of freshwater origin were only two species, *Myxobolus arcticus* and *Diphyllobothrium* sp. Rate of occurrence of *M. arcticus* varies remarkably by sampling area, and was high (53.8%) in the northwestern Pacific Ocean. In contrast, it was not observed at all in the Bering Sea. This difference may be the result of different rivers of which chinook salmon originated. Further research is needed for this study.

7. Other Studies on Salmonids

A. Biological Information on Immature Sockeye Salmon in the Southern Aleutian Islands Region

Sixteen gillnet surveys were conducted in this region from July 7 to 23, 1987 and abundance and biological information of immature sockeye salmon caught by “C” nets was analyzed. Ocean age composition and abundance of immature sockeye salmon was 21% for age .1 year (0.14/tan) and 73% for age .2 year (0.49/tan). A linear regression of Bristol Bay run of immature sockeye salmon against the numbers per tan of sockeye salmon in the southern Aleutian area was updated using data obtained through 1986.

B. Horizontal Distribution of Salmon Observed by Longlines and Cause of Drop-out of Bait (anchovy)

In auto-correlogram analysis of the distribution of the longline catch by hook, a correlation was observed between hooks only when the hooks were close together, and the correlation between hooks disappeared when the hooks were far apart. In addition, according to the result of tests of significance for correlation of catch between adjacent hooks, the high probability of the catch occurring in adjacent hooks is suggested. It has been definitely shown that two elements, density of salmon and the velocity of wind contribute to the 50 to 80% drop-out rate of bait (anchovy).

C. Difference of Distribution Area Between Salmon and Flying Squid

The differences in the areas of distribution between salmon and flying squid was examined, based on data obtained from Japanese salmon research vessels in 1983-86. It was a continuation of the 1978 to 1982 data analyzed previously. Optimum water temperature areas i.e. where 50% or more of sets took the particular species, for salmonids and flying squid did not overlap each other.

In waters of 14°C and more which is the optimum water temperature area for flying squid on which the commercial fishery targets, CPUE value of salmonids was negligible, and no salmonids were caught in waters of 16°C and more. When the results of the survey were considered by station, there were only 9 (11%) operations in which salmonids and flying squid were caught substantially at the same time in a total of 79 operations. Apparent differences were observed between the distribution areas of salmonids and flying squid. Considering the relationship between distributions of salmonids and flying squid and the current fishing area permitted for squid driftnet fishery, the southern limit of distribution of salmonids did not extend to the fishing area permitted for squid driftnet fishery with few exceptions, and on the other hand, the northern limit of distribution of flying squid extended generally toward the north beyond the northern limit of the fishing area permitted for squid driftnet fishery.

D. Surveys By Flying Squid Research Vessels

Three research vessels conducted three research cruises on flying squid from June to September in 1986. Survey area for the first cruise (the *Shoyo maru*, from June 25 to August 29) was in waters of 36° to 47°N on the line of 165° to 150°W, 38° to 47°N on the line of 165°E to 180° for the second cruise (the *Kuromori maru No. 38* from July 2 to August 8) and off Hokkaido and Honshu west of 145°E and 40° to 47°N on the line of 175°E for the third cruise (the *Kanki maru No. 58* from August 13 to September 22). Gears used were gillnets of multi-mesh size ranged from 33 mm to 197 mm. In comparing the CPUE values of flying squid and salmonids on the longitudinal lines of 150°W, 165°W, 180°, 175°E, and 165°E, the main appearance area of the former apparently was located in the south more than that for the latter, but at only two survey stations were both species caught at the same time (4.8% of all survey stations) and both stations were located on the north side of the area in which the squid driftnet fishery was permitted. Flying squid consists of four groups which have different mantle lengths. Although the extra-large sized group, which is the main target for the squid driftnet fishery, migrates to the northernmost area during the summer more frequently than the other three groups, it is estimated that the main distribution area of the extra-large sized group is in
the Transition Domain, and this group has seldom migrated into the Subarctic Water north of the Transition Domain. On the other hand, the distribution of salmon is Subarctic Water and the main distribution areas of both flying squid and salmonids during the summer were obviously different.

8. Oceanography

Oceanographic conditions in the northwest Pacific Ocean in the summer of 1987 were observed at the time of the operations by the research vessel and motherships. The southward extension of Western Subarctic Water was stronger than usual in June and July. The westward extension of the Alaskan Stream was almost the same as the average level. Surface water temperature was almost the same as the average level in June, but it was lower in waters of 40° to 45°N in July.

II. RESEARCH ON MARINE MAMMALS CAUGHT INCIDENTALLY BY SALMON GILLNET FISHERIES

1. Collection of Information on Incidental Take of Marine Mammals

The incidental take of marine mammals in 1987 by the mothership, landbased salmon fisheries and salmon research vessel was as follows:

Mothership salmon gillnet fishery: 801 Dall’s porpoises, six northern fur seal and one harbor porpoise.

Landbased salmon gillnet fishery: 458 Dall’s porpoises.

Salmon research vessels: 16 Dall’s porpoises (all dalli-type. Of those, four porpoises were released alive), two Pacific white-sided dolphins and three northern fur seals.

2. Foreign Scientists and Observers on Board the Motherships, Catcher Boats and Research Vessels

A total of three scientists and eighteen observers (15 Americans and 3 Japanese) were on board the motherships, catcher boats attached to the motherships in 1987 (three U.S. marine mammal scientists were on board three Japanese motherships, five U.S. observers and one Japanese observer were on board the catcher boats attached to the mothership to monitor the incidental take of marine mammals). In addition, B. J. Turnock, U.S. scientist, was on board the third cruise of the R/V Hokusei maru.

3. Collection of Biological Samples of Dall’s Porpoises

A total of 348 Dall’s porpoises, 306 in the U.S. FCZ and 17 on the southern High Seas and 25 on the northern High Seas, were incidentally caught by catcher boats and brought to the motherships as biological samples. U.S. scientists on board each mothership conducted biological research and sampling in cooperation with Japan.

In the landbased salmon fishery, 54 specimens of Dall’s porpoises (53 dalli-type, one truei-type) were obtained and this number largely exceeded the 15 specimens obtained in 1986. Salmon research vessels obtained 8 Dall’s porpoises (all dalli-type) and 2 Pacific white-sided dolphins and specimens were analyzed at the National Science Museum with those from the landbased salmon fishery.

4. Estimation of Abundance of Dall’s Porpoise

Nine salmon research vessels and the Shoyo maru conducted sighting surveys for marine mammals in the northwestern North Pacific Ocean, Bering Sea, and northeastern North Pacific Ocean including the Gulf of Alaska, from June to August in 1987. Cruising distance for sighting surveys was 35,775 miles and total number of sighting dates were 416 days. In these surveys, 2,243 individual Dall’s porpoises were sighted in 644 groups.

Estimates of abundance of Dall’s porpoises were conducted by using data pooled from June to August in 1980 to 1987 obtained at Beaufort scale 0 to 3. As a result, the abundance of truei-type dominant Dall’s porpoise offshore Japan was estimated to be 133–135 x 10^3, that of dalli-type in the northwestern, northeastern North Pacific Ocean, and Bering Sea was estimated to be 826–874 x 10^3, 992–1,175 x 10^3, and 367–437 x 10^3, respectively.

5. Research by the Vessel Dedicated for Dall’s Porpoise Research (Hoyo maru No. 12)

A trans-Pacific cruise dedicated for Dall’s porpoise research was conducted during the period from August to September in 1987. The cruising distance of the sighting surveys was 4,533 miles and 64 Dall’s porpoises, 7 Pacific white-sided dolphins, and 10 common dolphins were caught by the electric harpoons.

In the sighting surveys, 336 groups (1,533 individuals) of Dall’s porpoises and 870 individuals of Pacific white-sided dolphins, 143 individuals of Northern right whale dolphins, 85 individuals of common dolphin, and 77 individuals of Northern fur seals were sighted. Cow-calf pairs of Dall’s porpoises were observed in the south side of Kamchatka peninsula of 159° to 166°E the south side of Aleutian Islands of 177°E to 168°W, and Gulf of Alaska of 163° to 140°W. Of the Dall’s porpoises caught all were dalli-type, and 41 were males, of which 28 (68%) were
mature, and 23 were females, of which 15 individuals (65%) were mature. Body length and left testes weight of mature male porpoise in the western North Pacific Ocean were 196 cm and 143 g, respectively, and exceeded the comparable figures (182 cm and 106 g) of Dall’s porpoises from the eastern North Pacific Ocean.

6. **Separation of Four Stocks of Dall’s Porpoise in the North Pacific Ocean and Bering Sea**

Sighting surveys and specimens caught by the Hoyo maru No. 12 in 1982, 1983 and 1985 to 1987 were analyzed and stocks of dalli-type in the North Pacific Ocean and Bering Sea were examined. Although the area in which cow-calf pairs were present moved to the east or west during the year, four separate areas were observed. They were the central Bering Sea, the southern part of Kamchatka peninsula, the southern part of Aleutian Islands, and the central Gulf of Alaska. The maximum body length of immature males was the largest in the western North Pacific Ocean (213 cm) and the smallest in the central and eastern North Pacific Ocean (189 cm). The maximum body length of immature females was the largest in the central North Pacific Ocean (186 cm), and the smallest in the eastern North Pacific Ocean (181 cm). In addition, the maximum body length of female porpoise was large in the western North Pacific Ocean (195 cm) and small in the central and eastern North Pacific Ocean (195 cm and 191 cm, respectively).

It was estimated that there are four stocks of dalli-type in the North Pacific Ocean including the Bering Sea according to the distribution conditions of cow-calf pairs, density distribution by sighting, locations caught, and geographical distribution of growth rate. It is necessary that this assumption should be confirmed by a continuation of research in the future.

7. **Genetic Variation of Enzyme of Dall’s Porpoise Originating in the Eastern and Central North Pacific Ocean**

Fifteen enzyme loci which have been reported were examined by amylolytic gel electrophoresis using livers of 148 Dall’s porpoises collected by the Japanese research vessels in the North Pacific Ocean from 1984 to 1987. Genetic variations observed were the same as the results obtained from the previous studies. Genotype frequencies for all twelve variable loci observed from the central North Pacific Ocean specimens consists of 88 samples and eastern North Pacific consist of 60 samples were well corresponded with the frequencies expected from the Hardy-Weinberg’s law. Residual errors of gene frequency for 8 variable loci were tested by G-test of contingency table. Although residual errors were recognized between specimens in 6 Pgd and Sod-1 loci, because of few samples and possibility of wrong estimation values of loci, heterogeneities were not observed between two specimens and between these specimens and specimens obtained from the past studies. Therefore, it was concluded that 15 loci which were tested by this study were not useful for identification of stock of Dall’s porpoises distributed in the North Pacific Ocean and Bering Sea.

8. **Study on Recognition of Gillnets by Harbor Porpoise**

Behaviors of three harbor porpoises which belong to the same family as Dall’s porpoise and clicks at the time of observation were recorded in the water tank of Kamogawa Sea World in January of 1987.

Average sound source level, frequency, and pulse width of clicks of harbor porpoise was 160 dB, 130 kHz, and 43 μs, respectively.

Behavior to gillnet observation was conducted at an upward underwater illuminance of 1.4 lux and sideway underwater illuminance of 0.8 lux.

After the net was placed into the water, the porpoises made nine U-turn actions in front of the net and they were entangled in the net 4 minutes 22 seconds later. Although harbor porpoise can recognize fully the existence of float and leadline, it was considered that if they lose their wariness, possibility of entanglement arises.

The detectable ranges by echo-location of float, leadline, and net were estimated to be 10, 9 and 2 m, respectively. It was determined that harbor porpoise cannot detect the net unless the porpoise approaches fairly close to the net, and the echo-location ability of harbor porpoise is not as good as that of Dall’s porpoise.

9. **Acoustic Surveys on Commerson’s Dolphin**

Underwater sounds of a total of 13 Commerson’s dolphins (at the Matsushima Aquarium in April, Sunshine International Aquarium in October, and Toba Aquarium in December, 1987) were recorded and analyzed.

Commerson’s dolphins emitted low-frequency clicks of 10 kHz and under at the Matsushima Aquarium and Toba Aquarium. Underwater sounds were examined under different lighting conditions at the Sunshine International Aquarium. The average value of peak frequency and pulse width was 125 to 143 kHz and 40 to 53 μs, respectively, and changes in lighting conditions did not affect the manner of emitting clicks. Band widths ranged from 21 kHz at lighting-up time to 24–32 kHz at lighting-out time.
In the experiment of on and off light at the Toba Aquarium, because there were lights around there, blinking effectiveness was low, and the peak frequency of high-frequency clicks ranged from 131 kHz to 133 kHz, band width ranged from 21 kHz to 23 kHz, and pulse width ranged from 54 μs to 57 μs, which was not so different. The sound-source level of low-frequency clicks was 100 to 120 dB, peak frequency was 2.2 to 2.8 kHz, pulse width was 1.6 to 6.0 μs, and band width was 180 to 300 Hz.

10. Effectiveness Test of Sound Generator

Three sound generators were attached to each gill-net of two catcher boats associated with the motherships, from June to July in 1987, to examine the effectiveness of preventing the incidental take of Dall's porpoises. The sound generators were attached to the net at the three positions (horizontal area 2 to 5) that were 55, 110, and 165 tans from the end of a set of 330 tans of gill-net which three air-tube threads knitted horizontally at the center part.

Six Dall's porpoises were incidentally taken by a total of 30 operations made by two experimental catcher boats, and the rate of incidental take (numbers of porpoise incidentally taken per numbers of operation) was 0.200, and decreased by only 10% than that (0.220) of the other catcher boats using only the air-tube threads. The minimum effective distance of the sound wave ranged from 750 to 1,050 m. The rate of incidental take was calculated by dividing into the high effective areas (horizontal areas 1 to 6) and low effective areas (horizontal areas 7 to 9) of the sound wave. As a result, the rate of incidental take of the former was 0.150, half of that of the latter (0.300). This indicates that the swimming courses of porpoise were forced to change by the sound generations, and there is a possibility that many porpoises are entangled in horizontal areas 7 to 9. The rate of incidental take for the experimental gillnet in horizontal areas 1 to 6 decreased by about 27%, compared with the rate of incidental take for the air-tube thread gillnet and multifilament thread gillnet and the effectiveness of sound generation was recognized. In the 1987 experiment, the minimum distance observed between the sound generator and entangled Dall's porpoise was 670 m which was somewhat less than that of the previous data.

11. Gear Modification to Avoid the Incidental Take of Dall's Porpoise

One hundred catcher boats attached to the motherships conducted 3,013 research operations (77% of the total) with a modified gillnet to avoid the incidental take of Dall's porpoise using air-tube threads, and 27 catcher boats conducted 815 operations (21% of the total) using the multifilament nets, and 2 catcher boats conducted 60 operations (2% of the total) using the air-tube threads and sound generators. As there were no ordinary gillnets, the rates of incidental take with the multifilament nets and air-tube thread nets were compared. Throughout the areas and periods, the rates of incidental take (numbers of incidental take of Dall's porpoise per operation) with the multifilament nets and air-tube thread nets were 0.194 and 0.213, respectively, and the rate of incidental take with the multifilament nets was 9% lower than that with the air-tube thread nets. However, this difference was not statistically significant at the 1% level. When the catcher boats conducted operations adjacent to one another, the rates of incidental take were similar, 0.180 and 0.250, and the rate of multifilament nets was 28% lower than that of the air-tube thread nets, and this difference was statistically significant.

III. Groundfish, Flying Squid and Marine Debris Research

1. Research on Board Commercial Vessels

1) The Bering Sea and Aleutian Region

Pollock were sampled for size composition and age characteristics (scales) on board North Pacific trawlers and landbased dragnet vessels, which fished for groundfish in the Bering Sea and Aleutian Region in 1987. In addition, frozen samples of pollock were collected on board Japanese fishing vessels which participated in the fish buying operations within the 200 mile zone of both the U.S. and U.S.S.R.

2) The Northeastern Pacific Ocean

Only a few Japanese vessels fished for groundfish in the northeastern Pacific in 1987. These vessels were engaged in trawling operations on the seamount outside of the 200 mile zone and did not take any biological survey data.

2. Groundfish Research on Board Research Vessels

1) The Bering Sea and Aleutian Region

Japan chartered commercial vessels and conducted the following two research activities on groundfish resources (Fisheries Agency of Japan, 1987).

(a) Longline survey on groundfish stocks

A longline survey was conducted in the Aleutian region and eastern Bering Sea in 1987 on a scale
similar to that of the 1986 Japan-U.S. joint survey. In this survey, which was the ninth year in the Aleutian region and the sixth year in the eastern Bering Sea, the longliner *Aryn maru* No. 22 (499.20 gt; 630 hp), chartered by JAMARC (Japan Marine Fishery Resource Research Center), conducted 60 longline operations (one per day) for 66 days from May 17 to July 21. Operations were not conducted at longline station No. 54 in the eastern Aleutian region because of bad weather.

The main objective of the survey was to follow annual changes in abundance and body length composition by depths (101 to 1,000 m) of the major species such as sablefish and Pacific cod caught by the bottom longline gears. Tagging experiments were also conducted to study the movements and migration of sablefish and Greenland turbot.

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 gangsions. Squid was the only bait used, the same as in previous years. At each station, longlines of 160 hachi were set at right angles to the isobath in depths of 101 to 1,000 m. Soak-time averaged five to six hours. These methods were not changed since 1979 when the systematic research began.

The total catch of fish during the research operations in the eastern Bering Sea and the Aleutian region was 145,942 individuals. The dominant species taken was Pacific cod (70,917 individuals or 48.6% of the total catch), followed by sablefish (20,077 or 13.6%), giant grenadier (17,379 or 11.9%), arrowtooth flounder (8,307 or 5.7%), halibut (5,578 or 3.8%), skates (5,071 or 3.5%), Greenland turbot (4,906 or 3.4%) and pollock (4,821 or 3.3%). These eight species constituted 94% of the total catch.

In the eastern Bering Sea, average CPUE (catch per hachi) of sablefish on the continental slope (201 to 800 m depth) of all areas decreased markedly from the previous year. The rate of decrease from the previous year ranged from 55% to 72%. Among four areas, the average CPUE in Region III in northwest waters was comparatively high (4.07) and that in Region IV in the same northwestern waters was lowest (2.23). In the surveys this year, there were seven stations of Regions I and II in southeastern waters in which sablefish were damaged by killer whales and the CPUE of sablefish in these Regions is considered to be underestimated extensively. However, because there were seven stations in which sablefish were damaged by killer whales in Regions I and II in the surveys of previous year and because the CPUE of sablefish also decreased sharply at stations in which fish were not damaged by killer whales, the abundance of sablefish stocks in the eastern Bering Sea is considered to have decreased extensively in 1987.

The average CPUE (catch per hachi) of sablefish in the 201 to 800 m depth zone of the continental slope in the Aleutian region was high (5.37) in the eastern area, similar to that of previous years, and low (2.38) in the western area from the longitudinal line of 180°. In comparison with the average CPUE of sablefish in the previous year, there was little change in both the eastern and western areas.

The average CPUE of sablefish on the continental shelf was at an extremely low level in both eastern Bering Sea and Aleutian region and the strong year-class that occurred in 1984–86 was not observed.

The average CPUE (catch per hachi) of Pacific cod in the 101 to 300 m depth zone in the eastern Bering Sea was highest (14.95) in Region II in southeastern waters, and lowest (9.65) in Region I in the north side of the Aleutian Islands east of 170°W. In comparison with the average CPUE and that in the previous year, it increased in two areas in southeastern waters and decreased in two areas in northwestern waters. CPUE by depth was high in the 101 to 300 m depth zone on the continental shelf and the upper part of the continental slope, similar to that in the previous years, and few Pacific cod were distributed in depth zones greater than 401 m. In Regions II and III, the CPUE recorded was fairly high in the 301 to 400 m depth zone, similar to that in the previous years.

The average CPUE (catch per hachi) of Pacific cod in the 101 to 300 m depth zone in the Aleutian region was high (15.14) in the eastern area, similar to that in the previous years, and fairly low (8.69) in the western area. In comparison with the average CPUE of Pacific cod and that in the previous year, it increased in the eastern area and decreased in the western area. The trend of CPUE by depth was the same as that in the eastern Bering Sea.

(b) Research on pollock stocks in the Bering High Sea

The trawl surveys were conducted in the Bering High Sea for 48 days from August 6 to September 22 by the two stern trawlers of the landbased dragnet type, *Hamayashi maru* No. 63 (279.00 gt, 1,100 hp) and *Hokuyu maru* No. 68 (349.80 gt, 1,230 hp) which was chartered by JAMARC.

The main objective of these surveys was to estimate the biomass of pollock and to collect biological data in the high seas. Therefore, fish finders and midwater trawl gear were used to conduct the surveys. In addition to these surveys, water temperatures by
XBT were observed and larvae and juveniles of pollock, and zooplankton were collected. The surveys were conducted by dividing the high seas into subareas of 30 minutes of latitude and one degree of longitude. Two research vessels conducted surveys in two subareas of the eastern and western parts of the Bering Sea and operated in one subarea per day along the stations fixed diagonally from a northeastern to southwestern direction in each subarea.

In the hydroacoustic surveys, the Hydroacoustic System FQ-60 which is manufactured by the Furuno Electric Co. Ltd. was used, and two research vessels cruised at a speed of 4 knots and took the records of 180 minutes (12 miles) in each subarea. The tapes recorded were analyzed by the integrator of FQ-70, and backscattering (SU) and surface scattering (SS) strengths were calculated by depth 20 m in range of integral layers 25–200 m. The target strength (TS) of pollock was introduced into these values, and the biomass of pollock was estimated, preliminarily, to be 9.1 million t. In the hydroacoustic surveys, there was a possibility that errors were introduced by various factors, therefore, the appropriateness of the results must be carefully considered.

In the surveys by mid-water trawl gear, three operations at a towing speed of 3 knots and towing time of 60 minutes were conducted in each subarea. The first and third tows were aimed at depth zone in which the fish density was high, but the second tow was aimed at depth zone in which the fish density was low.

Two research vessels conducted a total of 141 tows and the total catch was 53,794.0 kg. Of these, the dominant species taken was pollock (52,811.2 kg or 98.2% of the total catch). For species other than pollock, the catch of smooth lump scupper was relatively high, and few ragfish, lampreys, lanternfishes, and vipersfishes were incidentally taken.

The average CPUE (catch per hour) of pollock was low in northwestern area and high in southeastern area in the high seas. By depth, CPUE of pollock was highest in depths of 150 to 200 m. This trend was almost the same as that of density distribution estimated by the hydroacoustic surveys, but the discrepancies in the horizontal distribution of CPUE is considered to be due to the differences of fishing efficiency between the two research vessels.

The average length and average body weight of pollock caught was 47.0 cm and 805 g, respectively, and the length composition ranged from 36 cm to 58 cm, the mode was in 46–48 cm. This length composition was almost the same as that of pollock collected in the high seas during the winter season (January to March) of the same year.

Based on the horizontal distribution of water temperature in depth of 150 m, the trend of water temperature was low (around 2.0°C) in northwestern area and high (around 3.5°C) in southeastern area in high seas. In the observations of the vertical distribution of water temperature which extended from east to west along the isothermal line of 57°N, a noticeable seasonal thermocline developed in the vicinity of 50 m depth, and a cold water layer (3.5°C and under) was observed in the underlayer of thermocline. In depths of 200 m and under, there was warm water of 3.5°C and over, and vertical distribution of pollock was almost equivalent to the cold water layer in depths between 50 m and 200 m.

2) The Northeastern Pacific Ocean

The fishing vessel chartered by Japan conducted the following two surveys on groundfish stocks as part of the Japan-U.S. cooperative survey in 1987.

(a) Longline survey on groundfish stocks

This longline survey was the ninth year in the Gulf of Alaska and was conducted using the longline-gillnetter, Aya maru No. 22 for a total of 51 days from July 24 to September 12, following the survey in the Bering Sea and the Aleutian region. The general objectives and methods were mentioned before.

Forty-seven longline operations were conducted using longline gears at 47 predetermined stations (one per day) in the Shumagin—Southeastern Region. The results obtained are summarized as follows: a total of 149,321 individuals were caught from 47 operations. Of those, the dominant species was sablefish (92,540 or 62.0%), followed by giant grenadier (22,334 or 15.0%), Pacific cod (11,563 or 7.7%), arrowtooth flounder (6,597 or 4.4%) and shortspine thornyhead (4,680 or 3.1%). These species constituted 92.2% of the total catch.

The average CPUE (number per hachi) of sablefish on the continental slope (201 to 800 m) by INPFC area was as high as 14.00 and 14.30 in the Yakutat and Southeastern Areas, respectively, and as low as 10.51 in the Shumagin Area. Compared with the previous year, the CPUE values of sablefish decreased in all areas, and the rate of decrease from the previous year ranged from 5% to 18%.

By depth, CPUE of sablefish was high in waters deeper than 400 or 500 m in the Kodiak, Yakutat and Southeastern Areas of the eastern region, the same as in 1986, but it was higher in the Shumagin Area of the western region at depths of 201 to 600 m where the waters were shallower than in the eastern region. Although highest CPUE was recorded in depths of 201 to 300 m in the Chirikof area of the
western region, a relative high CPUE was observed in depths of 501 to 700 m.

The average CPUE (number per hachi) of Pacific cod in depth zone of 101 to 300 m by INPFC area was high in the western region (Shumagin and Chirikof Areas), the same as that in the previous year, and was 8.30 and 8.39, respectively, and was lowest (1.30) in the Southeastern Area of the eastern region. As compared with the previous year, CPUE of Pacific cod increased by 27% and 72%, respectively, in the Shumagin and Chirikof Areas of the western region, and also increased by 124% in the Yakutat Area of the eastern region, but decreased by 27% and 59%, respectively in the Kodiak Area (which is located in the center of Gulf of Alaska) and the Southeastern Area of the eastern region from the previous year.

By depth, CPUE of Pacific cod was highest in depth zone of 101 to 200 m, the same as that in the previous years, followed by that in depth zone of 201 to 300 m but it was extremely low in depths of 301 to 400 m. No Pacific cod was found in depths of 401 m and greater.

(b) Trawl survey on groundfish stocks in the Gulf of Alaska

The trawl surveys were conducted as the second Japan-U.S. large scale cooperative survey in the Gulf of Alaska. The chartered stern trawler Taisei maru No. 35 (349.70 gt; 3,400 hp; Hokuten-type) conducted surveys mainly in the 30 to 750 m depth range on the continental shelf and slope for 101 days from May 21 to August 29. Trawling was conducted at 454 stations with a bottom trawl.

The main objective of these surveys was to estimate the biomass of groundfish which inhabit in the survey areas and to collect biological information on body length and age composition and feeding habits. The survey area was stratified into 43 subareas by INPFC Area, submarine topography, and depth. The number of trawl sets was determined in accordance with covariance of CPUE of major species obtained in the surveys of 1984. At each station, 30-minute standard tows were conducted, and water temperature at each layer was taken by XBT at once in two to three tows.

The survey was divided into two legs: 229 trawling operations were conducted during the first leg and 225 operations in the second leg. Of these operations, 45 operations were designed for comparison of fishing capability with the U.S. research vessel and 9 were unsuccessful because of net damage by the bottom etc., so 400 trawl operations were conducted to obtain basic data for estimation of biomass.

On the first leg, the surveys were conducted in the Shumagin and Chirikof Areas and Kodiak Area west of 149°W. According to the preliminary analyses (Mito, 1987), in the Shumagin Area, Pacific cod and halibut were dominant in the 1 to 100 m depth zone, arrowtooth flounder in the 101 to 200 m depth zone, Pacific Ocean perch and sablefish in the 201 to 300 m depth zone, giant grenadier, sablefish and shortspine thornyhead in the 301 to 500 m depth zone, and giant grenadier in the 501 to 1,000 m depth zone. In the Chirikof Area, northern rockfish was dominant in the 1 to 100 m depth zone, arrowtooth flounder in the 101 to 200 m depth zone, sablefish in the 201 to 300 m depth zone, shortraker rockfish and sablefish in the 301 to 500 m depth zone, and sablefish and giant grenadier in the 501 to 1,000 m depth zone. In the Kodiak Area, halibut and Pacific cod were dominant in the 1 to 100 m depth zone, arrowtooth flounder and pollock in the 101 to 200 m depth zone, sablefish in the 201 to 300 m depth zone, sablefish and shortraker rockfish in the 301 to 500 m depth zone, and sablefish and giant grenadier in the 501 to 700 m depth zone. In comparison with the survey in 1984, the trends of the catch of major species by 30 minute tows in 1987 varied by area, some increasing and some decreasing. That is to say, arrowtooth flounder in the Shumagin Area, pollock in the Chirikof Area, and sablefish in the Chirikof and Kodiak Areas increased, and Pacific cod in the Chirikof, and pollock and sablefish in the Shumagin Area decreased.

3. Tagging Experiments on Groundfish Stocks

1) Tagging

In connection with the longline survey in 1987, tagging for sablefish and Greenland turbot was conducted throughout the survey areas. Release of sablefish was conducted by selecting viable fish caught in depths of shallower than 600 m. Anchor-type tags which were provided by the U.S. were used, and attached at the base of the first dorsal fin of sablefish. A total of 8,487 sablefish (7.5% of the total catch) were tagged. By Area, 1,491 sablefish were tagged and released in the eastern Bering Sea, 1,792 in the Aleutian region, and 5,204 in the Gulf of Alaska. The total numbers of sablefish which have been tagged and released in Japan-U.S. longline cooperative survey since 1978 reached 135,264 individuals in 1987.

In the longline survey in 1987, tagging for Greenland turbot as well as sablefish was conducted, as a continuation of the previous year, and a total of 238 Greenland turbot were tagged and released in the eastern Bering Sea and Aleutian region. Petersen-
type disk tags which were provided by the U.S. were used. Greenland turbot behaved differently than sablefish. There were few viable individuals, and many Greenland turbot were floating after tagging, and we cannot expect high survival rate after tagging of Greenland turbot.

In the Japan-U.S. trawl cooperative survey conducted in the Aleutian region, tagging was not conducted in 1987.

2) Recoveries of Tagged Fish

Recoveries of 619 sablefish have been reported from September, 1986 to the end of August, 1987 to Japan.

4. Research on Squids in the Open Sea

1) Surveys on Fishing Activities

The Fisheries Agency of Japan collated the reports on catch submitted by 492 squid driftnet fishing vessels in 1986. The reports describe the catch of squids and other fish by species. In 1987, 9 fishing vessels conducted biological surveys on flying squid in the areas of 35° to 39°N and 170°E to 145°W. The catch report was collated as in the previous year. Three scientists also engaged in surveys on board the fishing vessels.

2) Surveys by Research Vessels

To study distribution and ecology of flying squid, the research vessels, Shoyo maru (1,362 gt), Kuromori maru No. 38 (160 gt), and Kanki maru No. 58 (96 gt), of the Fisheries Agency of Japan, conducted survey cruises for a total of 144 days. The vessels used the surface driftnet and angling for collection of nekton, including squids, and engaged in oceanographic observations as well. Most of squids were flying squid, however, they were not caught in waters of less than 11°C of surface water temperature. Its' distribution seemed to be influenced by mid-layer water mass. In addition, flying squid move toward the north, as they grow. The major distribution areas of flying squid and salmon in summer were obviously different, and their densities were extremely low. Sixteen northern fur seals were caught, and of these, 11 were immediately released, because they were alive. Only two Dall's porpoises were caught. Separately, analyzing the data obtained by the salmon research vessels during the periods of 1983 to 1986, it was clear that distribution of salmon and flying squid do not overlap, and it confirmed the previous conclusion that the southern limit of distribution of salmonid generally does not reach to the current approved fishing area, and flying squid are distributed in the area beyond the northern limit of the approved fishing area.

For the surveys on distribution of flying squid in 1987, the research vessels, Shoyo maru (1,362 gt) engaged in surveys from June 25 to August 28, Kanki maru No. 58 (96 gt) from July 13 to September 30, and Hokuko maru (441 gt) from October 21 to December 9. The survey period was 193 days in total, and increased 49 days from the previous year.

5. Marine Debris

In 1986, the Fisheries Agency of Japan conducted surveys on the distribution of marine debris using 20 research vessels in total in the North Pacific Ocean including Japanese waters. According to the preliminary analyses, there was much marine debris in the Japanese coastal areas, the East China Sea, North American coastal areas, and the northwestern Hawaiian Islands. Taking sea currents and wind direction into consideration, it appeared that marine debris in the North Pacific Ocean moves toward the east along 40° to 50°N, advances southward off the U.S.A., and flows toward the west, and is accumulated in the northwestern Hawaiian Islands with marine debris of the U.S. coastal areas origin. Of the results obtained from sighting observations on the line of 137°E and 34°N to the equator which had been conducted by the Meteorological Agency of Japan in cooperation with GIPME of IOC since 1977, the data obtained from summer to winter were analyzed. Discovery frequency rate of marine debris in this area was less than 10 individuals per 100 km, and 50% of those were styrofoam.

In 1987, the Fisheries Agency of Japan conducted sighting surveys on marine debris using a total of 32 research vessels, patrol boats, etc. The survey area was mainly the North Pacific Ocean and extended to the Gulf of Mexico as well. In order to clarify the transportation and accumulating mechanism of marine debris, a basic study on oceanic circulation of the North Pacific Ocean was initiated. The Meteorological Agency of Japan continued the survey on the line of 137°E as well.

REFERENCES


C. REPORT ON RESEARCH BY THE UNITED STATES FOR THE
INTERNATIONAL NORTH PACIFIC FISHERIES COMMISSION IN 1987

National Marine Fisheries Service
National Oceanic and Atmospheric Administration
7600 Sand Point Way N.E.
Seattle, WA 98115-0070
March 1988

INTRODUCTION

Research conducted by the United States on fisheries resources within the INPFC Convention area are varied, and only those projects that are of direct interest to INPFC are summarized here.

HIGH SEAS SALMONID RESEARCH

High Seas Tag Recovery

There was no cooperative U.S.-U.S.S.R. tagging program in 1987, and therefore all tag recoveries were from earlier releases (Fisheries Research Institute 1987). Eleven tags from U.S.-U.S.S.R. tagging operations in 1985 (2 tags) and 1986 (9 tags) were returned between 1 October 1986 and 30 September 1987. The tagging experiments are summarized by Harris (1985) and Kautsky and Harris (1986). The recoveries included nine chum salmon tagged in the central North Pacific and Bering Sea and recovered in Japan, a chinook salmon tagged in INPFC area E7552 in 1985 and recovered in the Kushokwim River, Alaska in 1987, and a sockeye salmon released in area W7554 in 1986 and recovered in Bristol Bay, Alaska in 1987.

Scale Pattern Analysis Methodology

For standardizing the methodology of scale pattern analysis, data collected by Myers et al. (1987) were used to examine the performance of variable subsets in scale pattern analysis (Davis 1987). Direct-measure characters based on life history information produced higher classification accuracies of known-origin fish than rate or ratio characters or characters not based on life history. A reduction in the number of scale characters from 48 used by Myers et al. (1987) to 11 direct-measure characters decreased overall accuracies of classification by only 1–2%. Two variable selection criteria common in linear discriminant analysis computer programs (Wilks’ Lambda and Mahalanobis distance) selected different variables from the larger data set and the same variables from the smaller data set. Based on these results, the use of fewer characters was recommended. If reduction in number of variables is necessary, a stepwise procedure using Wilks’ Lambda selection criterion provides an efficient and repeatable selection methodology.

Image collection, measurement components and hardware settings of an image analysis system were tested for effects on data collected for scale pattern analysis (Walker 1987). Generally, light levels had little effect on measurement data until they noticeably changed the image. Several of the software settings and constants (smoothening parameters, lens calibration factors, and hysteresis) can have major effects on data. Measurement errors up to 4% were found in imaging components of the system, but results of discriminant analysis of two data sets collected by the new system and a digitizing tablet used in earlier studies were very similar. Subsequent studies showed that most measurement errors associated with imaging components can be eliminated by replacing the vidicon camera with a charge couple device (CCD) camera.

Steelhead Trout Studies

Abundance of steelhead returning to Pacific coast of North America was estimated from sport harvest data, counts at dams, and other run size information collected from 1970 through 1986 (Light 1987). The estimates, though rough, reflect the best information available and provide a general view of abundance. Annual abundance of all Pacific coast stocks was estimated to be 1.6 million adult fish. The Columbia River basin is the center of abundance and produces 29% of the total coast-wide population. Other regions’ production were: coastal Oregon (21%), California (17%), coastal Washington and Puget Sound (14%), British Columbia (14%), and Alaska (5%). The proportion of hatchery fish was 51% overall, and ranged from 3% in Alaskan populations to 80% from Columbia River basin.

Distribution Overlap of Salmonids and Flying Squid

Salmonid catch data (1972–1985) and flying squid (Ommastrephes bartrami) incidental catch data (1982–1985) from gillnet sampling of salmon research vessels in the north Pacific Ocean south of 48°N latitude
(May-August) were used to describe empirical relationships between salmonid and squid abundance, and their co-occurrence in gillnet catches (Harris and Kautsky 1987). Co-occurrence of salmonids and squid occurred mostly in the temperature range 10–15°C, was infrequent within the squid fishery area, but markedly increased just north of its northern boundary. Chum, pink, and coho salmon were encountered within the area in June or July, and all salmonid species, except sockeye, were encountered in the 2°-latitude sector immediately north of the area. This study confirmed earlier conclusions that incidental salmonid catches within the squid fishery area are infrequent and low, but that frequency, magnitude, and species diversity of salmonid incidence increases markedly just north of the area or within it in cold years.

Sampling for Coded-Wire Tags

Six U.S. salmon observers on board three Japanese salmon motherships operating in the North Pacific Ocean and Bering Sea within the U.S. Exclusive Economic Zone (EEZ) examined 10,615 salmonids for missing adipose fins in 1987 compared to 23,308 examined in 1986. Three chinook and four coho salmon without an adipose fin were sampled; none contained tags. From 1981 through 1987, U.S. observers examined 60,918 chinook salmon on board motherships for missing adipose fins. Only 20 fish were found missing the fin; none contained coded-wire tags (CWT). For the fourth consecutive year since inception of the observer program in 1978, fishing masters on all catcher boats were requested to return all steelhead trout to motherships for sampling by observers. A total of 14 steelhead trout were returned and examined; no fish were missing adipose fins.

Twenty-three steelhead trout missing adipose fins were sampled on Japanese salmon research vessels in 1986; coded-wire tags were recovered from 5 fish. In 1987, an additional 7 coded-wire tags were recovered from 90 steelhead trout missing the adipose fin which were present in longline and gillnet catches on board Japanese salmon research vessels. One coho salmon recovered in 1986 and two recovered in 1987 were missing the adipose fin but did not have tags.

Release and recovery data for all coded-wire tags recovered from salmonids landed on Japanese salmon research vessels in 1986 and January through August 1987 are reported in Dahlberg et al. (1987).

During 1986, U.S. groundfish observers examined 39,007 salmon for missing adipose fins; 868 had the fin missing. From these samples, 839 tags were detected and decoded, including 795 from chinook salmon, 43 from coho salmon, and 1 from a chum salmon. Over 2.6 times more salmonids were examined by observers in 1986 than in 1985, and tag recoveries increased from 83 in 1985 to 839 in 1986. The greatest increase in tag recoveries came from the Pacific Coast area where 34 CWT fish were recovered in 1985 and a total of 821 CWT fish were recovered in 1986. Tag recoveries decreased from 42 to 16 in the Gulf of Alaska. The Bering Sea-Aleutian area produced 2 recoveries in 1986; a chum salmon released in Alaska and a chinook salmon of British Columbia origin. Through August 1987, an additional 202 samples of fish from catches of groundfish vessels were returned by observers and examined. A total of 187 coded-wire tags were recovered; 178 tags from chinook salmon and 9 tags from coho salmon. Release and recovery data for all CWT recovered in the groundfish fisheries in 1985 as well as those recovered through August 1987 are reported in Dahlberg et al. (1987).

The recovery rate of coded-wire tags from steelhead trout missing the adipose fin changed markedly in 1986–87. During the period 1981–85, nearly 60 percent of the steelhead missing the adipose fin contained a tag. In comparison, the recovery rate fell to 8 percent in 1987. Tag recovery rates for chinook and coho salmon missing the adipose fin have been relatively high since 1981. The 1981–87 average tag recovery rates were 93% and 78% for chinook and coho salmon.

U.S. Observer Coverage of the Japanese Mothership Salmon Fishery

Salmon fishing operations of the three mothership fleets in 1987 within the U.S. EEZ followed the pattern reported by U.S. observers during 1978–86. Each fleet of 43 catcher boats set gillnets in late afternoon and began retrieval early next morning. Salmon were transferred to each mothership daily. The catcher boats were moored at fore-and-aft weigh stations, and fish were transferred in mesh bags containing a reported single species of salmon.

In 1986, a randomized sampling design was developed for selecting daily a set of catcher boats in each mothership fleet that the observers monitored (Dahlberg and Murphy 1986). A table of randomized catcher boat numbers was used to determine which 19 of the 43 catcher boats were observed on a given day during the 1986 season. In 1987, the sample size was increased to 35 catcher boats and the number of observers doubled. In the evening, once the fleet had set the nets, the sample of catcher boats was drawn by the U.S. observer and fleet commander or his representative.

From June 30 to July 10, the three fleets either
fished in the eastern central Bering Sea or were in
transit. The *Kizan maru* operated outside the U.S.
EEZ July 1–6, and the *Meiyo maru* was either in
transit or seaward of the EEZ July 1–8; the *Nojima
maru* was either moving or seaward of the EEZ July
4–10. The U.S. observers boarded the motherships
when the vessels reentered the EEZ, except for the
*Nojima maru*, and observed salmon catches until July
11–12. The *Nojima maru* observer boarded a Japa-
nese patrol vessel on July 3 and returned to Adak,
Alaska, on July 5. The observers on the *Kizan maru*
and *Meiyo maru* boarded Japanese patrol vessels on
July 11–12 and returned to Adak on July 13.

The U.S. salmon observers collected scales from
3,614 chinook salmon and 1,894 coho salmon for use
in continent-of-origin studies of chinook and coho
salmon in the mothership fishing area inside the EEZ,
and scales from 14 steelhead trout. Steelhead trout
organs were frozen for additional biological studies.

The total daily catch by species for all motherships
was compared with catch estimates made from three
other sources: (1) data from observer number one on
each mothership; (2) data from observer number two
on each mothership and (3) combined data from all
observers on the three mothership fleets (Dahlberg
and Murphy 1987). The mean catch for each source
was expanded and these estimates compared with the
total daily observed and reported catch. Daily catches
of each species estimated from either sources 1 or 2
fluctuated above and below the combined observed
and reported catch. When the data from samples of
35 observed boats in each fleet were pooled and the
mean expanded, the estimated daily catch of each
species closely matched the value obtained from pool-
ing all observed and reported catch data for a given
species. Differences between daily catches estimated
from the combined observer data and pooled ob-
served and reported daily catches were generally less
than 10\%. However, there was a tendency to over-
estimate total daily catches from the combined ob-
server data.

To guarantee validity of catch statistics, various
sampling rates were examined to find what sample
size is required for a given level of estimation preci-
sion. The goal is to estimate numbers of each salmon
species caught by one mothership fleet day (43 catcher
boats) with a tolerable error of less than 10\% at a
99\% confidence level. Normal point estimation pro-
cedures and data from the 1987 fishing season were
used to calculate tables of sample sizes and their asso-
ciated levels of tolerable error for each species and
the total catch of all species for one day of fishing
effort (Jessen 1978). Catch in weight was converted
to numbers of fish using the 1981–85 average weight
of each species.

The number of catcher boats which must be sam-
piled in order to maintain the desired tolerable error
ranged from 34 for chum to 43 for coho salmon. In
the past, as many as 6 catcher boats may be assigned
to scouting activity and may not be available to sam-
ple on a given day. Therefore, a daily sample of 35
catcher boats should yield estimates of total daily
catch by species near a tolerable error of less than
10\% at a 99\% confidence level.

**High-Sea Squid Fisheries Research**

The 1987 research program expanded to become
multidisciplinary and inter-laboratory oriented, re-
flecting a broad based interest in marine resources
of the central North Pacific Ocean and growing im-
portance for ecosystem studies. As such, cooperative
research activities involving Canadian, Taiwanese
and Republic of Korea vessels focused on collecting data
on fisheries oceanography.

The 1987 oceanographic data revealed a mass of
unusually cold surface water persisting to a varying
degree in the central North Pacific Ocean (Ignell
1987). This anomaly was probably associated with an
El Nino/Southern Oscillation event observed in the
tropical Pacific Ocean in 1987. Sea surface tem-
peratures (SST) along the northern boundary of the
Japanese squid driftnet regulatory area averaged up
to 3\(^\circ\)C below normal with some SST’s of less than
10\(^\circ\)C. They probably impacted salmon species distri-
butions within the squid fishery area.

The 1987 research indicated that neon flying squid
were primarily taken by smaller mesh gillnets (less
than 100 mm mesh) in waters 15\(^\circ\)C or warmer.
These results are consistent with previous observa-
tions on declining catch rates of the large size class
of flying squid found in cooler waters and with re-
ports that commercial vessels are beginning to use
smaller size meshes. Large numbers of saury were
also caught in the northeastern portion of the fishing
area (over 10 saury per meter of net at one station).

In 1987, U.S. scientists collected data on distribu-
tion, abundance, type and color of floating marine
debris from 5 research vessels. Of particular interest
was a study to determine increase in plastic particles
cought in 50 micron Neuston nets versus those caught
in 500 micron nets. Preliminary results indicate a
3-4 fold increase in particles with the smaller mesh.

**Marine Mammal Research**

**Incidental Take**

Five U.S. and one Japanese biologists monitored
incidental take of marine mammals aboard catcher-boats of each of the three Japanese salmon mothership fleets in 1987. A total of 303 gillnet sets (11%) were monitored in the U.S. EEZ and 329 in all mothership fishing areas. The mean take rate (number of Dall's porpoise per gillnet set) in the U.S. EEZ was 0.26. In 1986, two types of nets were used by the catcher boats in each fleet: 21% used nets with 3 strands of hollow tubes present along the midline of the net, and 79% used nets with three strands of multifilament material along the midline. One U.S. observer in each fleet monitored the multifilament nets while the remainder monitored the hollow tube nets. The observed mean take rate using the hollow tube nets was 0.24 (n=242) and for the multifilament nets was 0.33. There was no significant difference in take rate between the two types of nets.

Total incidental take of Dall's porpoise was estimated using data collected by the observers onboard catcher-boats. The estimated take inside the U.S. EEZ was 741 (95% confidence limits: 558–925). In 1987, a new system required separate incidental take quotas and estimates for the Bering Sea and western North Pacific stocks of Dall's porpoise. Estimated incidental take for the Bering Sea population was 240 and for the western North Pacific was 796. These estimates do not include incidental take by the salmon landbased fishery or the high seas squid fisheries.

Biological Studies

Biological samples and data were collected from all marine mammals returned to the motherships by Japanese salmon catcher boats. A total of 1 harbor porpoise and 306 Dall's porpoise, including 1 tric- color type, were collected inside the U.S. EEZ. Seventeen Dall's porpoise were collected south and 25 north of the U.S. EEZ.

Sighting data were collected aboard Japanese catcher-boats, research and patrol vessels, and U.S., Korean and Taiwanese research vessels in 1987. A study of the accuracy of angle and distance estimates during marine mammal sighting surveys was conducted. Observers consistently underestimated distance. Binoculars with reticles reduced distance estimation errors substantially and are now used in sighting surveys for Dall's porpoise.

The trend in a population abundance index was analyzed. In the western North Pacific Ocean, the trend was increasing, and in the Bering Sea and the U.S. EEZ, no trend was detected. However, due to high variance of the yearly estimates of the abundance index, the ability to detect large magnitudes of change in abundance is low.

Independent observers were placed on research vessels to determine whether porpoise are missed near the transect line during sighting surveys. Mark recapture methods were used to estimate a correction factor for missed animals. Mark-recapture methods were also used to estimate a correction for the responsive movement of the porpoise. Most of the variability in corrected abundance estimates is the result of large variances for the correction for responsive movement and missed animals.

Sighting surveys and incidental take studies were conducted during 12 research and commercial cruises in the high seas squid fishing area in 1986 and 1987. In a total of 206 gillnet operations (1956 km) there were 48 northern right whale dolphins, 30 northern fur seals, 16 Pacific white-sided dolphins, 17 Dall's porpoise, and 3 common dolphins taken. Incidental take of northern fur seals was higher than that of Dall's porpoise and sighting data also indicate there may be a high density of fur seals in the eastern North Pacific fishing area.

Crab Research

The 1987 EBS trawl survey was conducted aboard the F/V Pot San Marie and the R/V Alaska from May 27 to July 30. The survey consisted of 380 successful trawl tows and covered 135,900 square nautical miles, including 16 stations northwest of the 1986 survey area. Population estimates and their 95% confidence intervals for various species of crabs derived from the survey are summarized as follows.

Abundance of legal male red king crab (Paralithodes camtschatica) was 7.9 million crabs, ±39%, representing a nonsignificant increase of 34% from the 1986 level. Pre-recruit (110–134 mm carapace length, cl) males showed no significant change. The abundance of females above the median size at maturity (89 mm cl) increased significantly by 236%. The population is showing improved recruitment and appears to be increasing.

The abundance of legal blue male king crabs (P. platypus) in the Pribilof District was 732,000 crabs, ±67%, a non-significant increase from 1986. Females and pre-recruit males also showed no significant changes. In the Northern District, abundance of legal males increased significantly by 90% and was estimated to be 740,000 crabs, ±36%. Pre-recruits and females showed no significant changes. Both stocks are still at historically low levels.

Over the past year, C. bairdi showed large and significant increases in abundance for small (<85 mm carapace width, cw) males and small (<85 mm cw) females. Large females increased significantly by 163%. Abundance of large males (>135 mm cw)
increased significantly by 164% and now stands at 8.3 million crabs, ±34%.

The population of *C. opilio* ranges from the Bering Straits to Unimak Island. Expansion of the fishing grounds north of the survey area allowed the landings to increase greatly in 1986 while the population remained relatively stable. Landings leveled off in 1987. Male crabs >101 mm cw (the industry-preferred minimum size) increased significantly by 60% from 1986 and were estimated to be 132.6 million crabs, ±16%. An additional 15 million males of this size (±57%) were available northwest of St. Matthew Island. Males smaller than this limit increased significantly by 260%. Large females (≥50 mm cw) increased significantly by 520%. This population is increasing due mainly to improved recruitment.

Very few juvenile or female hair crab (*Erimacrus isenbeckii*) have been taken during the survey, so abundance estimates reflect primarily the distribution of large (≥90 mm cl) males. A major center of abundance exists in the Pribilof Islands area and a minor one just north of the Alaska Peninsula, with low densities in between. The abundance of hair crab showed no significant change in all areas for all size/sex groups. Abundance of large males was 1.2 million crabs, ±53%.

**Groundfish Research**

The Northwest and Alaska Fisheries Center (NWAFC) of the U.S. National Marine Fisheries Service (NMFS) conducted or cooperated in 17 groundfish related surveys in 1987 from off California to the Bering Sea. There were 7 bottom trawl surveys, 1 ichthyoplankton survey, 1 pot survey, 2 hydroacoustic/midwater trawl surveys, 1 longline survey, and 5 special study surveys. The primary purpose of these surveys was directly related to research and management of crab and groundfish resources in U.S. waters. Objectives included determining resource distribution, abundance by age, length and sex composition, maturation schedules, trophodynamics, movement and migration, trawl performance and relative fishing efficiency, and environmental factors which influence growth, mortality, distribution, and year-class strength.

The NWAFC has established a plan of resource assessment in which survey activity is more concentrated each year on a rotating basis in one of three major geographical regions (Bering Sea, Gulf of Alaska, and the west coast from off Washington to California). The emphasis in 1987 was in the Gulf of Alaska. A narrative of the activities on a regional basis follows.

**Bering Sea-Aleutian Region**

Three surveys were conducted in 1987:

1. **Summer Crab—Groundfish Survey**—The purpose of this survey was to assess abundance and condition of crab (see previous section) and groundfish resources. The 1987 survey was the ninth consecutive year in which a large standardized survey area has been sampled.

   The standard survey encompasses 465,000 km² and is conducted from early June to mid-August each year. Sampling stations were uniformly distributed on a 20×20 nmi. grid as in the past with more intensive sampling in the vicinity of Pribilof and St. Matthew Islands to improve data on blue king crab. Station sampling was coordinated between the chartered vessels R/V *Alaska* and F/V *Pat San Marie*, with the two vessels fishing alternate columns of stations. In addition to collection of catch (weights and numbers of each species) and biological data (approximately 144,000 length measurements, 5,200 age structures), about 4,400 stomachs were collected for feeding studies and 700 Pacific cod and 258 Pacific halibut were tagged for migration studies. In addition, relative fishing powers of the two vessels were determined.

2. **Crab By-Catch Experiment**—A joint Government-Industry study examined the effectiveness of two net modifications in reducing by-catch of crabs in demersal trawls. The field work was performed on yellowfin sole trawling grounds of the EBS during August 12-September 10. This experiment was conducted under actual commercial fishing conditions and employed the services of 5 U.S. trawlers, the Soviet factoryship *Sulak*, representatives from several private companies and several scientists from the NWAFC. Also associated with the study was a remotely-operated-undersea vehicle (ROV). The ROV was used to visually assess fishing characteristics of the experimental trawls and determine the viability of crabs encountered by the nets but not captured. Over 300 trawl hauls were completed during the study. Analysis of the data indicated that one of the trawl modifications (an escape panel) significantly reduced the by-catch of both king and Tanner crabs.

3. **Juvenile Walleye Pollack Survey**—A survey of juvenile pollack by the Soviet R/V *Darwin* between August 21 and October 8, 1987. The objective of this cruise was to collect information on distribution and abundance of juvenile (pre-recruitment) pollack. As a part of ongoing cooperative bilateral research, two U.S. observers participated in the survey. The shelf, slope, and basin areas were sampled in a 180-station grid from approximately the 40 m isobath to the U.S.-
Soviet Convention Line.
Special 10 mm mesh inserts were used to target midwater occurrences of juvenile pollock. Additionally, hydroacoustic surveying, CSTD sampling, weather events monitoring, and stationary plankton sampling activities were conducted. Frozen juvenile pollock were collected and returned for age determination and potential stock discrimination based on morphometric and meristic analyses.

Gulf of Alaska

Nine surveys were conducted in 1987:
1. **Triennial Groundfish Survey of the Eastern Gulf of Alaska**—From 12 July to 11 September 1987, the NWAFC Auke Bay Laboratory, conducted a trawl survey of groundfish resources in the eastern Gulf of Alaska. Two chartered fishing vessels, the *Leis Go* and *Nore-Dick* were used to survey waters near Cape St. Elias to the U.S.-Canada boundary at Dixon Entrance. The primary objective was to determine distribution, abundance, and other biological parameters of major groundfish species inhabiting the continental shelf and upper slope.

2. **U.S.-Japan Cooperative Groundfish Survey of the Central and Western Gulf of Alaska**—The 1987 triennial bottom trawl survey of the central and western Gulf of Alaska was conducted by the NWAFC and the Far Seas Fisheries Research Laboratory, Shimizu, Japan, during May-September 1987. Eight hundred and twenty-eight bottom trawl stations ranging in depth from 20–750 m were sampled between Cape St. Elias and the Islands of Four Mountains by the Japanese stern trawler *Taisei Maru No. 35* and the U.S. stern trawlers *Nore-Dick* and *Leis Go*. The primary objectives of the survey were to estimate abundance and distribution of groundfish and to compare relative fishing efficiencies of the U.S. and Japanese trawlers and trawl gear through an experiment involving side-by-side trawling in the Kodiak Island area.

3. **U.S.-U.S.S.R. Cooperative Trawl Survey**—During 1987 a cooperative groundfish survey was conducted in the western and central Gulf of Alaska by the NWAFC and the Soviet Pacific Research Institute of Fisheries and Oceanography (TINRO), Vladivostok, U.S.S.R. During the survey period (June 6-July 12) the Soviet vessel *Babaeski* completed a total of 196 demersal trawls in the survey area which extended between the Islands of Four Mountains and the Barren Islands in depths from 95 to 741 m. The primary objective of the survey was to provide an estimate of the abundance, distribution, size and sex composition of groundfish. Other primary objectives were to compare the relative fishing efficiencies of the U.S. and Soviet trawlers and trawl equipment using side-by-side trawling at selected sites southeast of Kodiak Island and obtain measurements of the horizontal and vertical net openings of trawls using acoustic net mensuration systems. Other objectives included length-weight and stomach scan observations.

4. **Longline Survey of Sablefish and Other Deepwater Species**—From mid-July to mid-September, 1987, NWAFC personnel conducted the first domestic longline survey of the upper continental slope in the Gulf of Alaska aboard the chartered U.S. longline vessel *Prowler*. The relative abundance of sablefish and other deepwater species was assessed at the same 47 stations sampled during the past 10 years by the Japan-U.S. cooperative longline survey. Survey operations extended from the Island of Four Mountains in the Aleutian Islands eastward to Dixon Entrance between depths of 100–1,000 m. The domestic longline gear matched that used during the previous cooperative surveys with respect to number of hooks per skate and number and total length of skates fished per day. However, the hook style, gangion lengths, weighting arrangement and bait were different. Preliminary comparison of the 1987 Japan-U.S. cooperative and domestic survey data showed that the U.S. catch rates were 82% as high as the Japanese catch rates over all depths and stations. Several stations were sampled in gullies to allow a comparison of relative abundance and size composition of sablefish in gullies with those sampled during past surveys along the continental slope.

5. **Young-of-the-Year Survey**—This survey was aimed at determining the distribution in late summer of the 1987 year-class of pollock within the western Gulf of Alaska. Most of the small pollock found in the general area are presumed to have been spawned in Shelikof Strait during early spring and to have been dispersed by currents streaming southwestward through the strait.

Predetermined survey lines and hydro-acoustical monitoring were used to locate targets which were then sampled by means of a 61-foot shrimp trawl equipped with a fine mesh liner in the codend. The survey began at the Shumagin Islands in mid-August. Concentrations of small pollock, 6–7 cm modal length, were found along the continental shelf from the Shumagin Islands westward to Unimak Pass where they appeared to be entering the Bering Sea. East of the Shumagin Islands, abundance of small pollock diminished, but another area of concentration was found in the vicinity of Chignik and Kujulik Bays. Most of the small pollock were schooled at depths between 26 and 68 m at water temperatures from 7–9°C. Few young-of-the-year pollock were encountered in the offshore area between the Shumagin
Islands and Kodiak Island, in Shelikof Strait, or along the southeast coast of Kodiak Island.

6. **Shelikof Strait Pollock Acoustic-Midwater Trawl Survey**—The sixth annual (except 1982) survey since 1981 was completed during March. Three separate passes were made over the survey area and the data obtained were used to derive estimates of relative age specific population and biomass. About half of the total biomass was composed of 2 and 3 year-old fish, the remainder being mostly 7 and 8 years old. Recruitment of 4–6 year-old pollock has been poor.

7. **Fisheries Oceanography Coordinated Investigations (FOCI)**—This was the third year of a multi-discipline, multi-agency study of Shelikof Strait pollock, and the environment in which they spawn and the young develop. The purpose of this study is to attempt to relate environmental conditions to survival of eggs and larvae and success of year-classes. The two primary organizations of NOAA involved in these studies are the NWAFC and Pacific Marine Environmental Laboratory. The U.S.S.R. also provided a vessel (Babaoeok) to assist in the investigations. The initial phase of this study, in early April, was a survey of the horizontal and vertical distribution and abundance of pollock eggs, and was a continuation of investigations that have been conducted annually since 1981. The second stage, in mid-May, was designed to locate and map distribution of larvae and study feeding, growth, and behavior of the larvae. The third and fourth stages of this study were conducted during a survey in June-July to determine distribution of late-larval pollock in the western Gulf of Alaska, and study their feeding and growth. The Soviet vessel sampled for pollock eggs and larvae over a wide area of the Gulf of Alaska in April.

8. **Longline Survey Methodology**—The NOAA vessel *John N. Cobb* was used to conduct longline soak-time experiments and explore gully areas for sablefish abundance. Soak-time experiments were conducted to develop a correction factor that will account for variability in catches due to soak-time during sablefish longline surveys. Gully areas were explored because these areas are not sampled in sablefish surveys conducted along the continental slope and some are commercially productive.

During the soak-time study, 3,463 sablefish were caught in 37 sets between May 11 and May 31. The study was conducted in Stikine Strait in southeastern Alaska, a site purposely chosen for low densities of sablefish. From June 3 to June 29, Spencer Gully and Ommaney Trench were sampled and compared to the slope areas adjacent to each. A total of 5,454 sablefish were caught in 32 sets.

9. **Rockfish/Hydroacoustic Investigation**—The NOAA vessel R/V *John N. Cobb* was used from July 22 to August 7 to explore the feasibility of using hydroacoustic methods to assess Pacific Ocean Perch (POP) abundance. The study was conducted off Southeast Alaska. Presence of POP was confirmed with bottom trawls, but identification of potentially assessable off-bottom signals was not accomplished with the midwater gear used. The vertical and horizontal distribution of the targets was monitored for 24 periods. All rockfish obtained from the bottom trawls were sampled for species composition. POP were subsampled for sex, size and age composition.

Washington, Oregon, California Region

Five surveys were conducted in 1987:

1. **Ichthyoplankton Survey**—Bongo and neuston sampling was conducted aboard the NOAA R/V *Miller Freeman* from 13–31 January, 1987, and at 98 stations off the Pacific coasts. Special deep plankton collections were made for sablefish eggs. This was the tenth survey in this series that began in 1980.

2. **Sablefish Abundance Indexing**—Sablefish abundance indexing surveys are conducted off Washington/Oregon and California in alternate years. In 1987, eight index sites off Washington and Oregon were sampled with conical traps fished 10 on a line. Data collected included the number and weight of sablefish and other species captured in each trap, fork lengths, otoliths for determination of age composition, sex composition, and state of maturity. About 1,650 sablefish were double tagged with anchor tags and released in a continuing study of tag loss rates and migration. Catch rates in 1987 were 62% lower than those obtained in 1985. Catch rates were lower for all size groups, but especially for non-marketable and small (marketable) sizes.

3. **Rockfish Recruitment**—Since 1983 midwater trawling and ichthyoplankton sampling have been conducted to collect information on seasonal and temporal distribution of juvenile rockfish off northern California between Monterey and Point Reyes. In 1987, day and night trawling was conducted at pre-established stations in depths of 4–100 m. CTD casts were made to provide temperature and salinity profiles. Preliminary analyses of 1987 data suggest that juvenile rockfish are rare in water that was upwelling shortly before sampling occurred. In addition to obtaining abundance indices, other objectives included determination of juvenile rockfish feeding habits, habitat preference, and identifying predators as part of an ecological study. Long term objectives are to develop capability for predicting year-class strength for commercially important species, gain insight into factors affecting strength of recruitment, and to obtain
a better understanding of the ecological niches occupied by juvenile rockfish.

4. Dover sole and Sablefish Abundance Estimates—A bottom trawl/ichthyoplankton survey was conducted during January-February 1987 to examine area-swept and back calculation from egg/larvae indices as methods for estimating spawning biomass in a small test area off southern California. Specific objectives were to: determine spatial variability of bottom trawl catches and reproductive condition of important groundfish species; determine vertical and horizontal distribution of Dover sole and sablefish eggs and larvae; define variability in egg abundance; and determine diel variation in spawning. Fifty-eight bottom trawls of 30–60 minutes duration were conducted at 183 m intervals over a depth range of 183–1,281 m. A net mensuration system was employed to measure trawl performance including horizontal and vertical net mouth dimensions. A MOCNESS plankton sampler was used to obtain samples from 9 discrete depth intervals at various sites. Other samples included sablefish and Dover sole stomachs for food habit studies, fish and invertebrate tissues to be used in parasite and disease studies, and live sablefish and Dover sole for culturing experiments.

5. Puget Sound Demersal Trawl Survey—The NWAFC in cooperation with the State of Washington's Department of Fisheries (WDF), conducted a survey of demersal fish resources of Puget Sound during September 28–November 4. The purpose of this work was to perform a reconnaissance survey of flatfish stocks in Puget Sound, introducing WDF personnel to NWAFC resource assessment techniques so that they could conduct future surveys of the area. Concurrent to the resource assessment activity, a separate trawl dynamics study was conducted in the Possession Sound-Saratoga Passage portion of Puget Sound. This gear work utilized a hydroacoustic net mensuration device to measure vertical and horizontal trawl mouth openings associated with a variety of parameters, such as: trawl door size, trawl cable scope, current, fishing depth, etc. Measurements were continuously recorded over a series of trawl hauls associated with various combinations of the above parameters. All trawl designs currently used by NWAFC were measured.

Observer Coverage of Groundfish Fisheries

The year 1986 was the tenth year that foreign and joint venture (JV) fisheries have operated under The Magnuson Fishery Conservation and Management Act of 1976 (MFCMA). In 1986 the NWAFC sent 322 U.S. fisheries observers to sample aboard vessels from Japan, Republic of Korea (South Korea), U.S.S.R., Poland, and Peoples Republic of China. The purpose of placing scientific observers was to collect data to estimate foreign and JV catches, determine incidental catch, provide biological data for assessing status of stocks, and monitor compliance to U.S. fishing regulations. An overall observer coverage (foreign vessel days sampled by observers) of 94% was achieved in 1986. This represented 18,158 observers-days out of 19,306 vessel-days. Observer coverage by major regions was 92.0% in the Bering Sea-Aleutian region, 98.6% in the Gulf of Alaska region, and 95.1% in the Washington-Oregon-California region.

Bering Sea-Aleutian Groundfish Fishery

Foreign catch of groundfish in 1986 was 476,000 t, down 54.0% from the 1985 catch of 1,035,000 t. Walleye pollock (Therastra chalcoogramma) dominated (74.1% of catch). Combined catches of three categories of flatfish—yellowfin sole (Limanda aspera), turbot and other flatfishes—accounted for 16.4% of the catch, and Pacific cod (Gadus macrocephalus) made up 8.4%. Japanese vessels landed the largest portion of the catch, 77.7%.

U.S. vessels delivered over 1,160,000 t of groundfish to foreign processing vessels in joint-venture (JV) fisheries in 1986; an 81% increase over the 1985 catch. The catch composition was pollock (72.0%), yellowfin sole (13.0%), Pacific cod (5.5%), other flatfishes (5.3%) and Atka mackerel (Pleuragrammus monopterygius) (2.8%).

The incidental catch of salmon was estimated in 1986 to be 1,643 salmon (5 t) by the foreign fishery and 19,340 salmon (66 t) by the JV fisheries. The comparative data for 1985 were 10,000 fish by foreign and 10,400 fish by JV fisheries. Chinook and chum salmon were the primary species taken in the foreign fishery making up 60% and 38% of the catch, respectively. Chum salmon accounted for 71% of the JV catch and chumook made up 25%.

The incidental catch of halibut (Hippoglossus stenolepis) in the foreign groundfish fishery was estimated to be 296,400 fish (1,192 t); a 39% decrease from 1985. Incidental catch in the JV fishery (593,600 fish, 1,711 t) increased almost 33% from 1985.

The incidental catch of Tanner crab in 1986 decreased from 1985 in the foreign fishery (from 891,400 to 3.543 million crabs). The foreign catch was composed of C. opilio (88%), C. bairdi (10%), C. angulatus (1%), and C. Tanneri (1%). The JV catch was composed of C. opilio (92%) and C. bairdi (8%).
The 1986 incidental catch of king crab decreased from those of 1985 in the foreign fishery and in JVs. The incidental catch of 14,600 crab in the foreign fishery was down 93% and the 260,400 crab taken in JV fisheries was down 74%. The species composition in the foreign catch was red king crab (63%), golden king crab (L. aeropus) (22%), blue king crab (P. platypus) (14%), and L. couesi (<1%). The JV catch was composed of red king crab (96%), blue king crab (3%), and golden king crab (1%).

Gulf of Alaska Groundfish Fishery.

The total catch by foreign vessels (only Japanese longliners) in the Gulf of Alaska in 1986 was 15,500 t, down 62% from 1985. Pacific cod (98%) was the predominant species. The catch by U.S. trawlers participating in JVs was almost 65,300 t, down 74% from 1985. Pollock accounted for almost 96% of the catch.

Salmon was not caught in the foreign groundfish fishery in 1986. Incidental catch of salmon increased 52% in JV fisheries (from 13,700 to 20,800 fish) in 1986. Chinook salmon accounted for over 99% of the catch.

The foreign groundfish fishery took 116,200 Pacific halibut (384 t) in 1986, down 7% in number from 1985, but up 59% by weight. The JV fisheries took 27,400 halibut in 1986 compared to 78,500 in 1985. This was a decrease of 65%.

Incidental catch of Tanner crab by foreign groundfish fishery in 1986 (1,425 crabs) increased 180% from 1985. Incidental catch in JV fisheries decreased from 64,600 crabs in 1985 to 11,800 crabs in 1986. C. bairdi and C. opilio accounted for 99% and 1%, respectively for the foreign catch; and 97% and 3%, respectively for JV catch.

Incidental catches of king crab decreased in both foreign and JV fisheries in 1986. The foreign fishery did not catch any king crab. The catch of 33 king crab in JV fisheries was 99% lower than the 1985 catch of 2,427 king crab. The JV catch was composed of red king crab (93%) and blue king crab (7%).

Washington-Oregon-California Pacific Whiting (Hake) Fishery

Poland conducted a foreign fishery for Pacific whiting (Merluccius productus) in 1986, landing about 69,900 t. JV fisheries landed 31,900 t of groundfish in 1986 of which 99.7% was whiting. The 1986 whiting catch by the foreign fishery was 40.1% larger than that of 1985 and the catch by JV fisheries was 158% larger. Total incidental catch of salmon (for-
PUBLICATIONS OF THE
INTERNATIONAL NORTH PACIFIC FISHERIES COMMISSION

All publications are in English (E) and Japanese (J) unless otherwise noted.

ANNUAL REPORT

An annual summary of the Commission’s meetings, administrative and fiscal reports, and research conducted during the year in connection with the Commission’s Programs. Annual Reports, 1954 (E) 1955 to 1987 (E & J).

BULLETINS

Contain reports of research conducted in connection with the Commission’s programs. Published at irregular intervals.


No. 4 — (1961): The exploitation, scientific investigation and management of herring on the Pacific Coast of North America in relation to the abteration provisions of the North Pacific Fisheries Convention.


No. 7 — (1962): The exploitation, scientific investigation and management of halibut stocks on the Pacific coast of North America in relation to the abteration provisions of the North Pacific Fisheries Convention.

No. 8 — (1962): Intraspecific differences in serum antigens of red salmon demonstrated by immunochemical methods (C. J. Ridgway et al.), Continental origin of red salmon as determined from morphological characters (F. M. Fukuhara et al.).

No. 9 — (1962): The exploitation, scientific investigation and management of salmon stocks on the Pacific coast of Canada in relation to the abteration provisions of the North Pacific Fisheries Convention.

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No. 15 — (1963): Salmon of the North Pacific Ocean—Part V: Offshore distribution of salmon (J. I. Manzer et al.).

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No. 31—(1975): Distribution and abundance of coho salmon in offshore waters of the North Pacific Ocean (H. Godfrey et al.).


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No. 38—(1978): Distribution and origin of chinook salmon in offshore waters of the North Pacific Ocean (R. E. Major et al.).


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No. 46 (E)—(1986): Early oceanic migrations and growth of juvenile Pacific salmon and steelhead trout (A. C. Hart and M. B. Dell).


STATISTICAL YEARBOOK

Contains summary statistics for fisheries in the northern North Pacific Ocean of joint interest to the Contracting Parties. Distribution is limited primarily to those directly concerned with INPFC activities. English only. Annually: 1952-1984.