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INTERNATIONAL PACIFIC HALIBUT COMMISSION

Annual Report
2002

Established by a Convention between
Canada and the United States of America

This report produced by IPHC staff
and Bob King
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W. F. Thompson quotes in this report were extracted from personal notes and reports at the IPHC, various Reports of the (BC) Commissioner of Fisheries from the 1910s, and Marine Fisheries Review journal articles by J. Richard Dunn (contact IPHC for complete citations).

PREFACE

The International Pacific Halibut Commission (IPHC) was established in 1923 by a convention between Canada and the United States for the preservation of the halibut (*Hippoglossus stenolepis*) fishery of the North Pacific Ocean and the Bering Sea. The convention was the first international agreement providing for the joint management of a marine resource. The Commission's authority was expanded by several subsequent conventions, the most recent being signed in 1953 and amended by the protocol of 1979.

Three IPHC Commissioners are appointed by the Governor General of Canada and three by the President of the United States. The commissioners appoint the director, who supervises the scientific and administrative staff. The scientific staff collects and analyzes the statistical and biological data needed to manage the halibut fishery. The IPHC headquarters and laboratory are located on the campus of the University of Washington in Seattle, Washington.

The Commission meets annually to review all regulatory proposals, including those made by the scientific staff and industry; specifically the Conference Board and the Processor Advisory Group. The measures recommended by the Commission are submitted to the two governments for approval. Upon approval the regulations are enforced by the appropriate agencies of both governments.

The IPHC publishes three serial publications: Annual Reports (U.S. ISSN 0074-7238), Scientific Reports—formerly known as Reports— (U.S. ISSN 0074-7246) and Technical Reports (U.S. ISSN 0579-3920). Until 1969, only the Report series was published; the numbers of that series have been continued with the Scientific Reports.

Unless otherwise indicated, all weights in this report are dressed weight (eviscerated, head-off). Round (live) weight may be calculated by dividing the dressed weight by 0.75.

Thanks to our friends

The Commissioners and staff wish to thank all the agencies and individuals who helped us in our scientific investigations this year. A special thank you to: Gary Walters and the Bering Sea RACE division group (NOAA/NMFS, Seattle); Craig Kastelle (NOAA/NMFS Alaska Fisheries Science Center); Al Stoner (NMFS, Newport); Tory O'Connell (ADF&G, Sitka); Susan Saupe (Cook Inlet Regional Citizens Advisory Council); Bill Bechtol (ADF&G, Homer); Alisa Abookire (NMFS, Kodiak); Sean Powers (UNC, Chapel Hill); Jeff Fargo and Rob Kronlund (PBS, Nanaimo); Phillip Lestenkof, and the fishermen of the CBSFA; Andy Seitz (University of Alaska, Fairbanks).

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ACTIVITIES OF THE COMMISSION: LAYING DOWN THE GROUNDWORK

"Regulation of the halibut fishery has for its purpose the maintenance and increase of the yield. This yield has already been shown to have declined greatly, both as the total from each district and as to the return to the fisherman. A knowledge of the cause of this decline is necessary to any intelligent action in prevention." William F. Thompson

Overall, 2002 was a very good year for the halibut fishery. The commercial catch was the best in 20 years, fell within harvest levels in each area, and prices paid to fishers for their catch were up from the previous year. The sport fish catch was also strong, bycatch and waste were down, and the annual assessment showed that halibut stocks are still healthy. Meanwhile, considerable progress was made toward meeting the Commission's long-term goals including a major tagging program set to take place in 2003.

Progress on the PIT tagging program

The PIT tag program, scheduled for 2002, was postponed for a year in order to work out some potential problems.

A major tagging program using Passive Integrated Transponder or "PIT" tags was originally planned for 2002 but was postponed for a year to allow the program to be peer reviewed and refine the protocols for tagging and recovery operations.

Pacific halibut. Photo by Roberta Brooks.

PIT tags differ from traditional tags in that they are a small wire tag that is implanted under the skin near the halibut's jaw. Encoded with identifying information, the tags can be activated electronically with a scanning device even while still inside the halibut. As many as 45,000 halibut will be marked with PIT tags in 2003 and, as the tags are recovered in years to come, will provide valuable information on the accuracy of population models and survey assessments, as well as halibut migration patterns.

But before such a major operation got underway, some questions remained. What's the best location to insert the tag on the fish? What scanner provides the best results? Techniques for tagging and releasing the fish, and scanning for tags at processing plants also needed to be tested. Research projects conducted in 2002 focused on these and other questions related to the PIT tagging program and the results are summarized in the chapter on biological research.

Extended fishing seasons and aquaculture

IPHC scientists concluded that a winter fishery would not compromise the health of the halibut resource, but could redistribute the harvest between areas by impacting winter-migrating fish.

The Commission devoted considerable time on two subjects of keen interest to the halibut industry: extending the fishing season and issues related to farmed halibut. The two are related since part of the reason for extending the season is to respond to perceived competition from the growing farmed halibut industry.

The IPHC continued its research into implementing an extended season beyond the usual season of March 15 to November 15 and has concluded that conservation of the resource is not an issue since the annual stock assessment would continue to guarantee a conservative biomass for the coastwide spawning stock. A winter fishery, though, could redistribute the harvest between areas by impacting winter-migrating fish. The extent of such an impact is hard to estimate but would be proportional to the magnitude of the winter fisheries.

There are financial and administrative considerations to an extended season as well. An extended season would cost the Commission $20,000-$30,000 (US) for port sampling as well as some costs for additional data entry. The U.S. Coast Guard would also be impacted and with its current flat budget is not likely to find additional funds for an extended season. Costs would increase by $100,000-$200,000 for monitoring. Some downtime between seasons would be still needed to ascertain the status of quota shares for the previous and upcoming year and since management plans must be approved and cannot be changed in mid-season, the IPHC staff needs six to eight weeks after the Annual Meeting to implement the fishery for that year.

A committee is being formed to monitor aquaculture development in the U.S. and Canada.

Concerns have also been raised that aquaculture practices could threaten wild halibut by introducing a genetically different fish such as Atlantic halibut on the Pacific coast. A committee is being formed to monitor development of aquaculture in each country that includes one scientist from each country and a staff member.

During the year, the Commission also examined issues associated with halibut retention by halibut quota holders while participating in hook and line fisheries targeting on other species. Accommodation of this retention would require changes to halibut fishing seasons, alteration of some procedures, and potential shifts in the timing of some administrative matters. The degree of impact depends on how much the commercial halibut season would be extended.

Annual meeting

Much of the routine business of the IPHC was conducted at the Annual Meeting held in Seattle on January 22-25, 2002. During the meeting, Cliff Atleo was introduced as the newest, Canadian member of the Commission, replacing Commissioner Kathleen Pearson. A member of the Nuu-chah-nulth Tribal Council, Atleo was born and raised in Ahousaht on Vancouver Island and has over 20 years fishing experience.

The Commission considers issues at the meeting through a week-long process of discussions, input from the IPHC staff, as well as recommendations from the public and two industry advisory boards; Processor Advisory Group (PAG) and Conference Board (CB). Presented here are some highlights.

Public session of the Annual Meeting. From left: Commissioners Atleo, Secord, Beamish, Balsiger, Scalzi, and Hoard. Photo by Robert Tobin.

Always a show-stopper, the annual budget of the Commission was discussed in detail. Appropriations from both countries totaled $2.924 million. Additional means of funding are also sought out and include cooperative research with other agencies, revenues from the setline surveys which go directly back into running the surveys themselves, contracts, and grants.

The CB and PAG recommended total coastwide catch limits of 75.49 and 74.77 million pounds, respectively, compared with the IPHC staff recommendation of 74.18 million pounds; differing only in Area 4B and 4CDE recommendations.

Each year, the staff presents recommendations for commercial catch limits based on the results of the stock assessment. The Commission then uses those recommendations along with input from the CB and PAG to arrive at their final decision.

The Commission considered the North Pacific Fishery Management Council (NPFMC or Council) program of guideline harvest limits (GHLs) for the charterboat halibut fishery, and how they pertain to halibut. The program has not yet been adopted by the Council, but when it is, the Commission will be asked to recommend an Area 2C and Area 3A combined setline/sport charter catch limit. There is not yet a GHL framework for Areas 3B and 4. In addition, an IFQ program is being considered for the sport charter fleet that would take several years to collect data, design, and implement. If that system is not implemented, the GHL will remain.

DIRECTOR'S REPORT

The halibut stocks are currently above the long-term average in most areas of the coast. The stock assessment for 2002 indicates that the stock is declining from this high level but on a gradual basis. When stocks and ex-vessel prices are high, attention often shifts to aspects of the fishery other than just the availability of fish for harvest. That is certainly the case for 2002. This year there was concern by industry about local depletions in some areas and for developing a means to combat the threat to the industry posed by potential competition from aquacultured halibut.

Halibut production is very broadly based, largely as a result of the extensive spawning migrations by adult halibut and the drift of eggs and larvae with ocean currents. This means that the production from local fishing grounds is dependent on the spawning of fish from many regions and the subsequent transport of juveniles into the area of concern. We are seeing increased competition for halibut among commercial, guided, and independent anglers in some of these smaller localities. Since the recruitment to these areas is not governed solely by the abundance of adults in them, restriction of total harvest is unlikely to have any significant effect on increasing recruitment. However, the issue of local depletions is real and needs to be addressed through local allocative arrangements among resource users. An example of this process is the Sitka Sound Local Area Management Program (LAMP). This LAMP was developed over a number of years and discussions among user groups. It provides user-specific access for specified times and areas and is the mechanism whereby the users can share the halibut resource while minimizing the problems of over-use for some areas. Such arrangements offer the most effective means to address local area depletions and are likely to become more common.

Director Bruce Leaman port sampling in Port Hardy with IPHC sampler Rhonda Miller. Photo by Tracee Geernaert.

The halibut industry continues to be concerned about the threat posed by aquaculture of halibut. The primary focus of this concern is the loss of

market share for wild fish, particularly during the period when the commercial halibut fishery is closed. Industry wishes to address this concern by having wild, fresh halibut on the market for as much of the year as possible. One mechanism to achieve this end is to extend the commercial halibut season beyond its present period of March 15th – November 15th. The IPHC staff has produced several reports on the issues associated with an extended season and during 2002 reported specifically on the impacts of winter fishing on migrating fish. Winter fisheries would intercept fish migrating to and from spawning grounds, resulting in long-term re-distribution of biomass. While conservation for the stock as a whole can be guaranteed, the traditional summer distribution of fish might be altered, depending on the magnitude and location of winter removals. The staff is continuing to work on the issues associated with a season extension, including the necessary changes to administrative and management procedures that might be required, as well as research projects directed to understanding movements of fish.

The Commission has proposed a major tagging program using PIT tags (reported elsewhere in this report) to estimate current exploitation rates and abundance. We hoped to initiate this stock-wide program in 2002 but after conducting the preliminary research necessary to examine issues of tag shedding and appropriate tag location on the fish, we have postponed the project. Holding experiments conducted in late 2001, involving several tag locations on the fish, indicated an unacceptable shedding rate for the tags. The project is both important and expensive, and we believe that we must have the best possible design before we proceed. During 2002, we investigated a new location for the tag and subsequent holding experiments indicated a much lower and acceptable rate of tag loss. The PIT tagging project is now ready for initiation in 2003. Both the Commission staff and industry are very anxious to proceed with this experiment.

The Commission has continued to broaden its research into the biology of halibut and its links to the north Pacific ecosystem. Over the next decade, we hope to have a more comprehensive understanding of how the halibut resource will respond to environmental changes and, more importantly, how our management of the resource should be adapted to ensure the sustainability of the resource. As we approach the 80th year of the Commission, we are poised to see the results of several important research programs that will assist us in refining this management approach.

Bruce M. Leaman
Executive Director

CATCH AND CALCULATIONS: THE COMMERCIAL FISHERY IN 2002

"Information as to the yield can be gathered from the ships' daily records or logs. These logs are the notes kept by the officers concerning the movements of the vessels, the amount of gear used, and the catch. These were not at first accepted as accurate, but extended acquaintance with the fishermen and their records has shown that they are as accurate as necessary. The captains and mates are, as a rule, intelligent men." William F. Thompson, 1915

Ultimately, the work of the IPHC in tagging fish, dockside sampling, and even reading rings in earbones, is all geared toward ensuring that halibut is available for the dinner table. Whether elegantly prepared at the finest white tablecloth restaurants or simply wrapped in a taco shell with some slaw on the side, halibut is a premier food fish, tasty and healthy. The business of the Commission each year is aimed at managing and conserving this resource so halibut will continue to be a stable source of quality protein.

Commercial fishers landed 73.4 million pounds of halibut, the largest harvest in over 20 years.

IPHC data entry technician Huyen Tran with sampler Binget Nilsson having some fun in Seward, Alaska. Photo by Lara Hutton.

Average ex-vessel price per pound was $2.20 (U.S.$) in Alaska and $2.33 (U.S.$) in British Columbia.

Stretching from the California coast to the tip of the Aleutian Islands, the halibut resource is vast. To properly manage the fishery, the IPHC has subdivided areas of the ocean and sets catch limits for each. Fishers then take to the sea where they set long lines of hooks to reap the bounty of the deep. In Alaska and British Columbia, quota shares that are allocated by the governments allow for the harvester to take time to provide a better quality product on the market, and allow harvesters to avoid the notorious storms of the north Pacific.

Catch limits were high in 2002. Commercial fishers landed 73.4 million pounds of halibut, the largest harvest in over 20 years. The average ex-vessel price was slightly higher than last year, averaging $2.20 in Alaska and $2.33 (US) in British Columbia, where the closeness to market typically fetches a higher price. Those that landed their catch late in the season saw the ex-vessel price jump to over $3.00 per pound. Overall, the commercial catch in 2002 was worth a total of about $165 million to harvesters, and much more at the retail level.

Regulatory areas for 2002

Regulatory areas for the 2002 commercial halibut fishery have remained the same since 1990 and are shown in Figure 1. The southeastern flats in the Bering Sea, excluding Bristol Bay, remained closed in 2002 to all halibut fishing. A brief description of the regulatory areas for the 2002 halibut fishery follows:

Area 2A - all waters off the coast of the states of California, Oregon, and Washington.

Area 2B - all waters off the coast of British Columbia.

Area 2C - all waters off the coast of Southeast Alaska, south and east of Cape Spencer.

Area 3A - all waters of the Gulf of Alaska between Cape Spencer and Cape Trinity, Kodiak Island.

Area 3B - all waters south of the Alaska Peninsula between Cape Trinity and Cape Lutke, Unimak Island.

Area 4A - all waters of the eastern Aleutian Islands and south of the Bering Sea closed area that are east of 172°00' W and south of 56°20' N.

Area 4B - all waters of the western Aleutian Islands in the North Pacific and the Bering Sea west 172°00' W and south of 56°20' N.

Area 4C - all waters around the Pribilof Islands north of Area 4A and the closed area that are east of longitude 171°00' W., south of latitude 58°00' N., and west of longitude 168°00' W.

Area 4D - all waters of the Northwest Bering Sea north of Areas 4A and 4B, north and west of Area 4C, and west of longitude 168°00' W.

Area 4E - all waters of Bristol Bay north and east of the closed area, east of Areas 4C and 4D, and south of 65°34' N.

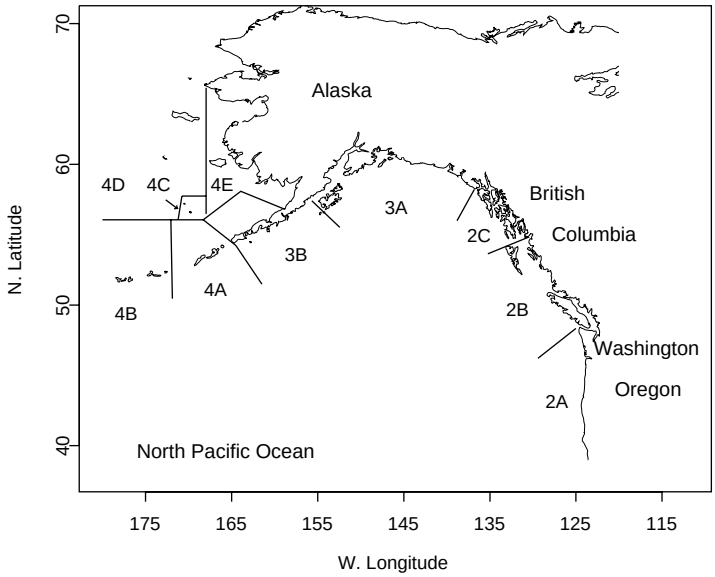


Figure 1. IPHC regulatory areas for 2002.

Changes to the regulations for 2002

Regulations for the 2002 fishery were adopted at the Commission's 2002 Annual Meeting in Seattle and were later approved by the Canadian and United States governments with one exception. The Canadian government again chose not to approve the requirement that commercially caught halibut have its gills and entrails removed before being offloaded, in order to allow the landing of live halibut caught in British Columbia waters. Such live deliveries were a very minor part of the overall BC fishery.

Court-ordered adjustments in halibut allocations in Area 2A remained in effect in 2002. After the PFMC allocation between tribal (35 percent) and non-tribal (65 percent) was applied, 25,000 pounds of catch limit were transferred from non-tribal to tribal fisheries.

Commercial harvesters in Area 2A found there were many decisions to make about how they would retain halibut.

Licensing regulations remained the same in Area 2A as fishers had to choose between a commercial or sport charter license. Additionally though, commercial fishers had to choose between either retaining halibut caught incidentally during the salmon troll fishery or fishing in the directed commercial halibut fishery south of Point Chehalis/retaining halibut caught incidentally in the sablefish fishery north of Point Chehalis.

IPHC program manager Heather Gilroy cutting an otolith. Photo by Levy Boitor.

The customary and traditional use of halibut for subsistence fishing in Alaska was officially recognized, although specific regulations regarding gear, eligibility, and daily bag limits for such a fishery had to be first published by NMFS. While the Commission authorized a season of January 1 to December 31 for this fishery, the regulations could only go into effect after the U.S. government approved the proposal. In the end, the U.S government did not adopt subsistence regulations in 2002 so no subsistence fishing occurred under these regulations.

In Alaska, the regulations were changed to allow fishing vessels carrying crab pots to use halibut heads and carcasses as bait, provided they had documentation of the legal purchase or acquisition of the bait.

The Commission re-authorized the regulations allowing CDQ harvesters in Area 4E to retain undersized halibut caught with commercial gear for personal use and not for sale or barter. The regulation was expanded to

include Area 4D CDQ vessels that land all of their trips in Area 4E or Area 4D. The regulations again required the manager of each of the authorized CDQ organizations to report the total number and weight of undersized halibut to the Commission annually.

Regulations were adopted to specify which commercial fishing regulations apply to the commercial treaty Indian fishery in Area 2A-1. The commercial fishing regulations that applied include size limit, careful release of halibut, maintaining a logbook, receipt and possession of halibut, and fishing gear restrictions. The 72-hour fishing restriction preceding the halibut period does not apply in this fishery.

The regulations were not changed to allow vessel monitoring systems or transponders in place of Area 4 clearance procedures. However, NOAA Enforcement worked with harvesters to provide waivers to clearance procedures if the vessel had the appropriate vessel monitoring systems in place.

Dressing halibut aboard the survey vessel *Angela Lynn*. IPHC photo archive.

NOAA Enforcement worked with harvesters to provide waivers to clearance procedures if the vessel had the appropriate vessel monitoring systems in place.

Commercial catch and seasons

Area 2A

Area 2A was managed to provide a total allowable catch of 1,310,000 pounds for all user groups. Allocations between user groups were recommended by the PFMC and adopted by the IPHC. The sport fishery was allocated 476,111 pounds and is discussed in another section of this report. The treaty Indian fishery was allocated a total of 483,500 pounds (16,000 pounds for ceremonial and subsistence use and 467,500 pounds for their commercial fishery).

The PFMC catch-sharing plan stated that if the total Area 2A allocation was over 900,000 pounds, the primary limited entry longline sablefish fishery north of Point Chehalis would be allocated any Washington sport allocation poundage in excess of 214,000 pounds. As a result, there was an incidental halibut fishery during this sablefish season with a catch limit of 88,389 pounds. The remaining non-treaty commercial catch limit was 262,000 pounds with 222,700 pounds allocated to the directed fishery and 39,300 pounds to the incidental catch in the salmon troll fishery. The directed commercial fishery was restricted to waters south of Point Chehalis and the incidental halibut fishery during the sablefish season was restricted to waters north of Point Chehalis under regulations published by NMFS.

In 2002, the IPHC issued 714 Area 2A vessel licenses: 331 licenses for the incidental commercial catch of halibut during the salmon troll fishery; 253 for the directed commercial fishery and the incidental halibut during sablefish fishery; and 130 for the sport charter fishery. There was little change in the number of sport charter or incidental halibut licenses during the salmon fishery issued from the previous year but approximately 70 fewer licenses were issued in 2002 for vessels fishing in the directed commercial fishery/incidental during the sablefish fishery.

In the incidental commercial halibut fishery conducted during the salmon troll season, the allowable incidental catch ratio was one halibut per three Chinook, plus one "extra" halibut regardless of ratio, but the total number of incidental halibut landed per vessel could not exceed 35. The ratio of halibut to number of Chinook has remained the same since 2000 but had increased from the 1:20 ratio seen in the first year of the program. There was no rollover regulation for the catch limit from the incidental troll fishery to the directed fishery in 2002 so the incidental commercial halibut fishery during the salmon season opened on May 1 and closed on August 21 slightly under the catch limit.

In Washington and Oregon over the last few years, more halibut has been sold directly to the consumer at public docks and to restaurants instead of the traditional plant landings.

The directed commercial fishery consisted of three 10-hour fishing periods with fishing period limits. The fishing period limits by vessel class remained high for all of the openings with H-class vessels receiving 4,000 pounds or over. In Washington and Oregon over the last few years, more halibut has been sold directly to the consumer at public docks and to restaurants. It is difficult to account for these landings in-season. As a result not all landings were accounted for in-season and the total directed commercial catch was over the catch limit.

IPHC port sampler Levy Boitor collecting logbook information from skipper John Eide, *F/V Melissa Lynn*. Photo by Lara Hutton.

The incidental halibut fishery during the limited-entry sablefish season opened earlier in 2002, on May 1 compared to August 15 the previous year. Even so, the catch fell under the limit by 25 percent.

The treaty Indian catch of 472,000 pounds was slightly over the catch limit by 4,500 pounds, or less than one percent. There were three unrestricted fishing periods on March 18-20, April 2, and April 30 that produced a combined catch of 390,000 pounds. The restricted fishery had limits of 500 pounds and produced a total of 82,000 pounds.

Area 2C Metlakatla fishery

The Metlakatla Indian Community is authorized by the U.S. government to conduct a commercial halibut fishery within the Annette Islands Reserve. Twelve 48-hour fishing periods took place between May 10 and October 13 and produced a total catch of 42,390 pounds that was included in the Area 2C commercial catch. The 2002 catch was 20,000 pounds less than last year's catch. Over the years, the Metlakatla harvest has varied from a low of 12,000 pounds in 1998 to a high of 126,000 pounds in 1996.

The quota share fisheries

The Quota Share (QS) fisheries of British Columbia and Alaska were open for eight months from March 18 to November 18.

Area 2B

Canada's Individual Vessel Quota (IVQ) fishery was in effect for the 12th year, and allowed each participating vessel to catch a predetermined quota set by DFO based on the 11.75 million pound catch limit. An additional 371,943 pounds were available as carryover from the underage/ overage program in the 2001 fishery. The final Area 2B catch was just under the 12.1 million pound combined catch limit including carryover.

There were 214 active vessels in the fishery in 2002, down from 234 vessels the previous year. When the initial IVQ program was implemented in 1991, 435 vessels received IVQs split into two shares called blocks. Beginning in 1993, the blocks could be transferred between vessels but no single vessel could fish more than four blocks. Fleet size decreased under the transfer program and from 1995 to 1998, it remained at around 280 vessels. In 1999, vessel owners were allowed to make unlimited permanent or temporary reallocation of halibut IVQ, subject to minimum and maximum holdings. In 2002, 8,454,000 pounds, or 70 percent of the catch limit were transferred, with 603,822 pounds permanently transferred among vessels.

In British Columbia, Twenty fewer vessels participated in the IVQ fishery compared to the previous year.

Several small sub-areas of Area 2B were closed to halibut fishing to protect localized stocks of non-halibut species and to provide access to fish for the aboriginal community. The Native Communal Commercial Fishing Program (F licenses) had 14 active licenses in 2002 compared to 13 in 2001. Total landings amounted to almost 487,000 pounds from 89 separate deliveries. This was an increase from the 354,000 pounds landed in 2001 on 51 trips.

Alaska

For the 8th year, the Individual Fishing Quota (IFQ) halibut and sablefish fisheries were in effect in Alaska. NMFS allocated halibut quota to recipients by IPHC regulatory area. Quota share transfers were permitted with restrictions on the amount of QS a person could hold and the amount that could be fished per vessel. In December 2002, NMFS reported that 3,503 persons held quota shares, down from the initial 4,830 persons at the start of the program.

2002 marked the eigth year of IFQ fishing in Alaska.

The total 2002 catch from the IFQ/CDQ halibut fisheries for the waters off of Alaska was 60.6 million pounds, 2 percent under the catch limit. For Areas 2C, 3A, 3B, and 4A the commercial catches were within 1 percent of the catch limits and the Area 4B catch was within 5 percent of the limit.

In 2002, the IFQ regulations allowed Area 4D CDQ to be taken in Area 4E and vice-versa. This was not a biological concern to the IPHC because Areas 4CDE are managed as a single stock. Although Area 4E was over the catch limit by 41 percent, the combined Area 4DE catch was 5 percent under the combined limit. The Area 4C catch was substantially under its limit.

Homer was again the top halibut landing port boasting 19 percent of the commercial landings coastwide.

Landing patterns and highlights

Once again, Homer was the top halibut port in the Pacific with landings of over 13 million pounds of halibut, or about 22 percent of the Alaska commercial catch. Kodiak and Seward were the second largest ports, each moving over 7 million pounds of halibut or 13 percent of the Alaska harvest. Juneau was the top port in Southeast with landings of 2.7 million pounds, and Sitka and Petersburg each received over 2 million pounds. Out west, Adak and Sand Point saw increases in their halibut landings in 2002, continuing a trend seen in recent years. Only 3.7 percent of the Alaska QS catch was landed outside of Alaska.

Prince Rupert/Port Edward, Port Hardy, and Vancouver were again the major landing locations in British Columbia, receiving about 88 percent of the Area 2B commercial catch. A total of 1,025 commercial trips from Area 2B were delivered into 15 different ports in 2002.

The Area 2C Alaska landings in March 2002 were similar to those of the previous year with approximately 9 percent of the total catch landed in the first two weeks of the season. March landings in Area 3A, however, decreased slightly to 12 percent of the total catch. As in the previous two years, May was the busiest month for Alaska landings, while April was busiest for Area 2B.

As mentioned earlier, the landing of live halibut in Area 2B was legally allowed by DFO. In 2002, live fish landings totaled approximately 43,000 pounds compared to a low of 7,900 pounds in 1998 and a high of 103,000 pounds in 1999. Six vessels made a total of 30 landings with live halibut and no halibut were penned.

A new twist on swivels?

Beginning last year, port samplers in British Columbia began asking fishers whether their snap-on gear had swivels attached. Swivels have been added to snap-on gear in recent years in an attempt to reduce loss of hooked rockfish. It's thought the swivel reduces the coiling and snarls created when a rockfish spins on the hook and prevents the gangion from parting. Swivel gear usually incorporates perlon, a clear, heavy monofilament line, as a gangion, which is thought to increase catch rates because of its invisibility.

Snap, gangion, and hook fitted with a swivel. IPHC photo archive.

It is unknown how this affects halibut catch rates but is possible the loss of halibut off hooks would be reduced as well. While no formal studies have been made on the subject, the logbook data on this change in gear type is now being compiled and a catch comparison will be forthcoming in 2003.

Electronic reporting for Alaska

The IPHC is working cooperatively with NMFS and ADF&G to set up an electronic reporting system for fishery information.

In 2002, IPHC staff was involved in an interagency effort that looked into electronic reporting of fishery information as a way to replace fish ticket records, IFQ card-swipe landing data, and other processor reports. The goal is cooperative reporting of groundfish and halibut landings by ADF&G, NMFS, and IPHC.

Several issues will be addressed as the project continues in 2003 with the goal of obtaining a memorandum of understanding to ensure each agency's interests are protected and that the agencies are committed to working toward a cooperative electronic fishery information system. A contractor will be hired to design and implement a technology demonstrator to determine the feasibility of an electronic reporting system .

CLOSE ENCOUNTERS: THE HALIBUT SPORT FISHERY

"Science is first common sense, and in a way, the discoveries of the fisherman are science in an elemental state. The first effort of the scientist is to acquaint himself with those elemental facts."
William F Thompson, 1915

The thrill of hauling in a halibut by hand remains as popular with the public as ever and sport harvests by individual anglers and charter operators remained at historically high levels in 2002.

The total sport catch of halibut in 2002 is estimated at 8,663,000 pounds, the third largest sport catch on record. It's important to note though that this estimate is only a projection and it will be another year at least before the information is fully compiled. The 2002 estimate was slightly less than catches of just over nine million pounds landed in 1997 and 2000, and compares to 8,106,000 pounds landed in 2001. As in previous years, most of the sport catch was taken from the Gulf of Alaska Area 3A, 4.5 million pounds; and Southeast Alaska Area 2C, 2.5 million pounds.

The 2002 sport catch is estimated to be the third largest on record.

Sport fishing for halibut in Cook Inlet, Alaska. Photo by Steve Kaimmer.

Sport fishing regulations in Alaska and British Columbia remained the same as those in effect in 2001. Allocative regulations for sport, commercial, and treaty Indian fisheries in Area 2A specified by the Pacific Fishery Management Council as a Catch Sharing Plan were adopted by the IPHC at its 2002 Annual Meeting.

Sources of sport harvests and estimates

Information regarding the 2002 Area 2A sport harvest was provided by the Departments of Fish and Wildlife in Oregon and Washington, mainly

from in-season creel census estimates. The Area 2B harvest was provided by DFO and modified by the IPHC to include the Canadian catch landed at Neah Bay, Washington.

The Alaska Department of Fish and Game provided harvest estimates for Areas 2C, 3, and 4. The Alaska estimates are derived from the statewide harvest survey and lag the current fishery by one year. Current year projections are made annually by ADF&G staff and are based on creel surveys in Area 2C, and port sampling in Area 3A.

Pacific Northwest Area 2A

The sport fishery in Area 2A was divided into several subareas where seasons were managed by catch limits. Charter vessels were required to obtain a license from the IPHC to possess halibut during open seasons. Vessels were also required to declare whether they intended to operate as a charter or commercial vessel. Licenses could be held for only one category. Minor modifications to the plan were implemented to facilitate management strategies, for example, providing for split seasons in Washington Inside Waters (WIW).

The harvest from Area 2A in 2002 was 398,750 pounds, about 14 percent under the catch limit of 476,111 pounds. For the WIW, the harvest estimate was 39,915 pounds, about 70 percent of the 57,393 pound catch limit. The Washington North Coast fishery caught all but 4,000 pounds of the 108,030-pound quota. The Washington South Coast fishery, centered principally out of Westport, closed 4,221 pounds below the quota. Halibut fishing was open considerably longer than in recent years because of an abundant source of salmon and offered an alternate fishery.

Poor weather and lower effort resulted in more openings and underharvests of the catch limit in Area 2A.

The Columbia River area closed 1,450 pounds short of its quota due to concerns the allocation would be exceeded. Most of this catch was attributed to the Washington fleet, but catch was taken in Oregon, as well.

Weather was a factor in the Oregon fishery and resulted in several more open days than were expected. Effort was also down, possibly due to the national recession. Difficulty in estimating effort lead to an underage of about 33,000 pounds for the Oregon Central and South Coast. The nearshore fishery under-harvested its quota by a considerable margin, catching just 11.5 percent of the 20,000 pounds allocated.

British Columbia Area 2B

The Pacific Region of DFO provided to the Commission the catch in numbers of halibut for 2001 in both a minimum and expanded estimate. Since average weight information is lacking from British Columbia waters, average weights compiled in adjacent areas are used. The Commission will use average weights from British Columbia waters as soon as they are made available.

In 2002, Washington anglers caught 9,114 halibut off Swiftsure Bank in Canadian waters and landed them in Neah Bay, 1,200 fewer halibut than in 1999. Using the average weight of 20 pounds provided by WDFW, the estimated harvest is 182,390 pounds.

Southeast Alaska

The updated 2001 sport harvest for Area 2C is estimated at 1.925 million pounds, 15 percent lower than the projected harvest. The charter industry harvested 62 percent of the halibut by weight, taking both higher numbers of fish and averaging a higher weight than those taken by private anglers.

Gulf of Alaska Area 3A

For Area 3A, the updated estimate of harvest biomass for 2001 is 4.675 million pounds, or seven percent higher than last year's estimate. The charter industry took 67 percent of the harvest in Area 3A. The Area 3A harvest biomass was also estimated for each user group from numbers supplied by the Statewide Harvest Survey and average weight generated from length data collected from the primary ports of sport landings.

Bering Sea and Aleutian Islands

ADF&G estimates the 2001 sport catch in Area 3B at just 10,000 pounds, down from the averages of 16,000 pounds landed in recent years. The bulk of the catch was concentrated at Chignik Bay, Cold Bay, and Sand Point.

Halibut weighing in excess of 300 pounds are not uncommon in the western ports such as Dutch Harbor.

The Area 4 harvest which came primarily from Dutch Harbor, fell over 50,000 pounds between 2000 and 2001. Large halibut over 300 pounds live weight were not uncommon in these areas, particularly in Dutch Harbor.

Harvest in Area 4A was expected to be similar to the 2001 level. The harvest estimates have fluctuated over time due to the small sample size, and estimates may be biased low because remote fishers may not always have obtained licenses and they may have confused sport use with subsistence.

In 2002, we used the average weight obtained from ADF&G sport fish sampling on Kodiak Island to estimate the Area 3B and 4 sport harvests in pounds. Anecdotal information from sport fish publications and local charter operators suggest the average weight was quite high in Dutch Harbor and Unalaska, and the final harvest figure for Areas 3B and 4 may be higher than initially reported.

COUNTING THE LOSSES: WASTE IN THE COMMERCIAL FISHERY

"We should become conscious that our study of the halibut fishery is one of a continually developing strain upon a living species and we must gauge in some way this strain and its results." William F. Thompson, 1930

In a fishery in which the catch totals in the tens of millions of pounds, some waste is inevitable through lost gear and the mortality of some sublegal size halibut that are returned to the sea. This loss needs to be documented as part of the management equation and in 2002 the news was generally good.

Preliminary estimates of wastage during the 2002 commercial halibut fishery due to lost or abandoned gear are the lowest on record. Estimates put such waste at 175,000 pounds, down from 238,000 pounds in 2001 and a mere fraction of levels in excess of two million pounds recorded prior to 1991.

Estimates of sublegal halibut killed in the commercial fishery have changed little in the past 15 years.

The estimates of sublegal halibut killed in the commercial fishery, just under 1.4 million pounds in 2002, was comparable to last year's level and that of the past 15 years.

IPHC sampler Renee Rensmeyer holding a sublegal halibut. Photo by Levy Boitor.

Calculating waste

Since 1997, the commercial fishery wastage estimate included in stock assessment has represented legal-sized removals occurring from lost or abandoned gear. Sublegal halibut are accounted for when setting the exploitation rate. In addition, wastage can also occur if more gear is set than is needed to obtain fishing period limits in Area 2A or QS in Alaska and Canada. Halibut may occasionally be discarded at sea due to poor quality caused by sand flea, shark, or other predation, and this is also included. The amount of legal-sized halibut caught in excess of quota, or catch limits, and discarded at sea is recorded during logbook interviews but is not currently included in wastage.

Lost or abandoned gear

Gear loss is generally more prevalent in Area 4 where strong tides and inclement weather are the norm.

Information on the amount of gear lost or abandoned in the halibut longline fishery was collected through logbook interviews and fishing logs received through the mail. Fishery-wide estimates are extrapolated from logbook's catch and effort statistics and applied to total catch values. While gear varies considerably as to the length of skates, hook size, and hook spacing, the data are standardized for use in subsequent calculations. Some log data that cannot be standardized are not used in the calculation, such as the Area 2A and Alaska IFQ vessels that target both halibut and sablefish.

Wastage is calculated from the ratio of skates lost to skates hauled, multiplied by total catch. The calculation is done using both fixed hook and snap gear in all areas. Prior to 1998, the gear type used for the wastage calculation was the gear type used to calculate catch per unit effort (fixed hook gear was used in Alaska and a combination of fixed hook and snap gear was used in B.C. and Area 2A). The Area 2A catch includes the non-treaty directed commercial catch, treaty commercial catch, and incidental catch during the sablefish fishery.

The ratios of effective skates lost to effective skates hauled by regulatory area in 2002 are: Area 2A = 0.006; Area 2B = 0.003; Area 2C = 0.003; Area 3A = 0.001; Area 3B = 0.002; and Area 4 = 0.004.

Since the implementation of the quota share fisheries in 1995, the ratios have fluctuated somewhat between years, but are lower than during the derby days. The Area 2A ratio is typically the highest due to the derby type fishery. More gear is generally lost in Area 4 due to strong tides and other factors that make the Bering Sea difficult to fish. The Area 4 ratio has ranged from 0.005 to 0.014 but was lower this year at just 0.004.

Discard mortality of sublegal halibut

Prior to 2000, the amount of sublegal halibut caught in the commercial fishery was estimated from the setline survey catch ratio of sublegal to legal pounds. The current method used to estimate sublegal catch by the commercial fleet is to calculate the sublegal/legal ratio from the grid survey stations that represent the highest one-third of the legal catch weight. By targeting the highest third, the catch rates better emulate commercial fishing practices. This followed suggestions that survey vessels tend to catch more sublegal fish because of the standardized survey pattern.

The ratios of sublegal to legal pounds calculated from the 2002 grid survey data are: Area 2A = 0.10; Area 2B = 0.09; Area 2C = 0.08; Area 3A = 0.13; Area 3B = 0.17; and Area 4 = 0.07. In comparison to 2001, the 2002 ratios of sublegal to legal pounds increased in Areas 3A and 3B and decreased in Areas 2B and 4.

The discard mortality rate used since 1995 is 16 percent for all areas. This rate was originally based on the bycatch discard mortality observations of the Bering Sea/Aleutian Islands sablefish fishery in the early 1990s, which had a pace similar to that of the quota fisheries. This rate was

confirmed by observer data from the sablefish IFQ fishery that also found a 16 percent discard mortality rate.

To calculate the pounds of sublegal-sized halibut in the commercial fishery, the calculated ratios of sublegal halibut from the surveys were multiplied by the estimated commercial catch in each regulatory area. The resulting poundage was then multiplied by the discard mortality rate, 16 percent, to obtain the estimated poundage of sublegal-sized halibut killed in the commercial fishery.

Waste is figured using data collected on the IPHC setline surveys.

FEASTING WITH THE FAMILY: PERSONAL USE

"The halibut was one of the most important foods of the (Pacific coast) Indians. Their fishery had a well-developed technology and a high degree of efficiency. To the European, the large awkward looking hooks appeared crude, but to the Indian they were actually better than our modern barbed hook." William F. Thompson, 1930

Halibut is taken for personal use from several sources including the treaty Indian ceremonial and subsistence fishery in Area 2A, the sanctioned First Nations fishery in Canada, and the retention of sub-legal fish retained in Areas 4D and 4E under IPHC regulations. Estimates for the personal use harvest in 2002 total 760,000 pounds, little changed from levels in 2001 despite a significant decrease in the amount of sub-legal halibut retained by the Areas 4D and 4E Community Development Quota (CDQ) fishery.

In Area 2A there is full accounting of all halibut removals due to the PFMC catch sharing plan.

Reported harvests by area

Washington, Oregon, and California

In Area 2A, the Pacific Fishery Management Council allocates the catch limit to directed and incidental commercial fisheries, sport fisheries, and treaty Indian fisheries operating off northwest Washington. For 2002, the treaty Indian ceremonial and subsistence fishery was allocated 16,000 pounds.

State regulations require that personal use fish from the halibut fisheries be recorded on the fish tickets. The personal use removals from the directed commercial fishery have been included in the commercial catch, which is consistent with the procedure used in the quota share fisheries.

British Columbia

Fish kept for personal use by commercial fishers is accounted for on fish tickets.

The primary source of personal use halibut in British Columbia is the First Nations food fish fishery. Fisheries and Oceans Canada (DFO) estimates the catch at 300,000 pounds. In the Individual Vessel Quota (IVQ) fishery, take-home fish is monitored and weighed at the time of landing and is included as part of the vessel's quota.

Alaska

With the implementation of the Individual Fishery Quota (IFQ) system, the take-home fish or the amount recorded as "retained weight" is now accounted for as part of an individual's IFQ. Personal use fish includes only the non-commercial and non-sport halibut.

Methodology for estimating subsistence catches in Alaska includes household interviews and mail surveys conducted by ADF&G, which have been used since 1998. The interview and survey results were adjusted to

account for some amount of overlap in the reporting of sport fishery catches and for areas where no data were collected.

The estimate of personal use for all areas of Alaska in 2002 is 444,000 pounds. This represents a rollover of the 2001 estimate plus the addition of sublegal halibut retained in the Area 4D/4E Community Development Quota (CDQ) fishery. Personal use has been estimated intermittently since 1991 and for some years estimates covered two or more regulatory areas. Until better information becomes available, the IPHC intends to rollover current estimates.

Sublegal retention in Areas 4D and 4E

Since 1998, sublegal halibut (those less than 32 inches) have been retained by the Area 4E CDQ fishery under an exemption approved by the IPHC. The amount of retained halibut has ranged from 3,590 pounds in 1998 to 30,267 pounds in 2001. In 2002, a total of 18,437 pounds was reported by three CDQ organizations: the Coastal Villages Regional Fund, Bristol Bay Economic Development Corp., and Norton Sound Economic Development Corp.

Fishers in Area 4E have been allowed to keep undersized halibut for personal use since 1998 and the program was extended to Area 4E in 2002.

The IPHC initially approved a 2-year exemption to the retention of sublegal halibut in Area 4E in 1998 and it was extended for another two years in 2000. In 2002 the IPHC agreed to extend the allowance to CDQ operations in Area 4D, and amend the regulation to apply only to vessels that land all of their annual catch in Areas 4D or 4E.

The staff agreed to review the regulation at the end of 2002 to see if it was still necessary under the subsistence fishery regulations being drafted by the North Pacific Fishery Management Council and NMFS.

LONGLINES TO TRAWLS: INCIDENTAL CATCH

"Trawl-line fishing destroys as many fish of other species as are caught of halibut. At times on certain banks, the catch is exclusively of undesired species, and all of these are usually discarded, often so badly injured that it is safe to say that few escape mortal hurt." William F. Thompson, 1915

Total bycatch mortality of halibut amounted to almost 13 million pounds in 2002.

The second largest take of halibut every year is not intended. It's called bycatch, the incidental catch of halibut by nets, hooks and other fishing gear that are trying to target pollock, cod, shellfish, and other species. Regulations require that such incidentally caught halibut be returned to the sea with no additional injury, but some fish are killed each year by being caught and handled and the amount is substantial. Bycatch mortality of halibut in 2002 is estimated at 12.76 million pounds, which is down slightly from last year and the lowest level since 1987. Bycatch mortality increased slightly in Areas 2 and 4 but decreased in Area 3. Changes in fishery openings and closure of some Alaska fishing grounds to protect sea lions affected halibut bycatch patterns off Alaska.

Multispecies catch. Photo by Lara Hutton.

A brief history of halibut bycatch

Halibut bycatch mortality was relatively small until the 1960s, when it increased rapidly due to the sudden development of the foreign trawl fisheries off the North American coast. The total bycatch mortality peaked in 1965 at about 21 million pounds and that does not include Japanese directed fisheries in the Bering Sea. Bycatch mortality declined during the late 1960s, but increased again to about 20 million pounds in the early 1970s. During the late 1970s and early 1980s, bycatch levels dropped to about 13 million pounds. By 1985, bycatch mortality had declined to 7.2 million pounds, the lowest level since the IPHC began its monitoring bycatch nearly 25 years earlier. But as the U.S. groundfish fishery grew in the late 1980s, bycatch mortality increased again, peaking at 20.3 million pounds in 1992. Since then, bycatch mortality has declined. Most of the decrease is attributed to more detailed bycatch management by NMFS, Individual Vessel

Bycatch Quotas in the Canadian trawl fishery, and the Careful Release program in the Alaska hook & line fishery.

Sources of bycatch information and estimates

For most fisheries, the IPHC relies upon information supplied by observer programs for bycatch estimates. The NMFS observer program for the groundfish fisheries off Alaska provides most bycatch information. Research survey information is used to generate estimates of bycatch in those cases where fishery observations are unavailable. Estimates for 2002 were based on estimated bycatch reported from fishing through mid-November and projections for fishing for the remainder of the year.

Estimates of bycatch mortality in crab pot and shrimp trawl fisheries off Alaska have been made by IPHC staff from previous studies and are based on bycatch rates observed on research surveys because direct fishery observations are lacking.

Observer programs provide the bulk of information used to estimate bycatch.

The amount of information varies for fisheries conducted off British Columbia. For the trawl fishery, bycatch is managed with an individual bycatch quota program instituted in 1996 by Canada's DFO. Fishery observers sample the catch on each bottom trawler, collecting data to estimate bycatch. Bycatch in other fisheries, such as the shrimp trawl, sablefish pot, and rockfish hook & line fisheries, is largely unknown but is believed to be relatively low, particularly for the shrimp trawl fishery.

Halibut bycatch in the Area 2A domestic groundfish trawl fishery is estimated using data collected from 1995-1998 by the Oregon Enhanced Data Collection Program. This program sought out vessels that would agree to take an observer on a voluntary basis and the data they returned established a methodology for estimating bycatch using commercial fishery effort from logbooks and known bycatch rates. Shrimp trawl fishery bycatch estimates are provided by Oregon Department of Fish and Wildlife from examinations of halibut bycatch during gear experiments. The estimates are considered rough approximations given the limited amount of data available but appear to be reasonable and are updated every few years. Bycatch in the hook and line fishery has been determined through comparisons with the Alaska sablefish fishery.

Discard mortality rates and assumptions

In fisheries and areas where there are no observers, assumptions are made regarding the number of halibut that do not survive the capture and release process.

Discard mortality rates (DMRs) are used to determine the fraction of the estimated bycatch that dies and these rates vary by fishery and area. Where observers are used for fishery sampling, DMRs are calculated from data collected on the release viability or injury of halibut. For areas without observers, assumed DMRs are used, based on the similarity of fisheries to those in other areas where data are available.

The IPHC assumes DMRs for most other fisheries. For Area 2A, the domestic groundfish and shrimp trawls are assumed to have a 50 percent mortality rate, whereas the unobserved hook and line fishery for sablefish is

assumed to have a DMR of 25 percent. The midwater fishery for whiting is assumed to have a 75 percent DMR, based on the large catches of whiting typical of this type of fishery. In Area 2B, observers monitoring the Canadian trawl fishery examine each halibut to determine survival. Data collected by observers in the state-managed scallop fisheries indicate a 50 percent discard mortality rate is appropriate.

2002 halibut bycatch mortality by regulatory area

Area 2

Bycatch mortality in Area 2 in 2002 was estimated at 1.42 million pounds, a slight increase from 2001 but on par with the average of 1.4 million pounds recorded since 1996. The primary sources for bycatch mortality are the groundfish trawl fisheries in Areas 2A and 2B, and the crab and shrimp fisheries in Area 2C.

In Area 2B, trawl fishery bycatch mortality jumped up in 2002, largely due to higher-than-normal bycatch in the summer months.

In 2A, bycatch is estimated based on data collected from the 1995-1998 Oregon Enhanced Data Collection Program applied to current-year fishery effort data. Trawl fishery effort has been declining for the past few years in Area 2A and will likely decline even further in response to large-scale area closures instituted by the Pacific Fishery Management Council. A coast-wide observer program was started in 2A in the fall of 2001 and is expected to provide data for an improved estimate for 2002. The most recent estimate provided by NMFS was for 2001 and was rolled forward to 2002. Similarly, no new estimate is available for the shrimp trawl fishery, so the most recent estimate is rolled forward. In Area 2B, trawl fishery bycatch mortality increased slightly in 2002, largely due to higher-than-normal bycatch in the summer months.

In Area 2C, crab pot fishing and shrimp trawling occur in various locations and harvests have held steady over the years. IPHC staff has not reviewed these fisheries since the early 1990s, but we assume mortality has been relatively unchanged since then.

Area 3

Bycatch mortality in Area 3 was estimated at 4.12 million pounds in 2002, a 12 percent decrease from the 2001 estimate. Bycatch declined in Area 3A but increased a modest amount in Area 3B.

In Area 3A, the Gulf of Alaska, trawl bycatch dropped to one of the lowest levels in the past 10 years, as did hook and line fishery bycatch, largely due to the fishery closures inside sea lion critical habitat that forced vessels to fish in less productive areas and ultimately reduced effort. In addition, lower quotas for Pacific cod reduced the hook & line and pot fishery bycatch of halibut.

In Area 3B, trawl fishery bycatch increased to the highest level in the past seven years; hook and line fishery bycatch was the highest in four years. As in 3A, these changes were in response to changes in where fishing took place.

Area 4

Bycatch mortality in Area 4 increased slightly in 2002, to 7.22 million pounds, but remained at roughly the same amount observed in the past 3-4 years. Total mortality was lower for hook & line fisheries due in part to lower quotas for cod. Trawl bycatch went up slightly, also reflecting lower quotas for cod and closures of prime grounds to protect Steller sea lions. Pot fishing for cod continued to remain at 1998 catch and bycatch levels, resulting in a low amount of mortality.

The Community Development Quota (CDQ) fishery targeted mainly on pollock and resulted in 200,000 pounds of bycatch mortality, more than in 1998 when the CDQ fishery focused more on cod.

Putting bycatch to good use: The Bering Sea donation program

Since 1998, some halibut bycatch from the Bering Sea has been donated to food banks in the Pacific Northwest. The program, operated by SeaShare (formerly Northwest Food Strategies) of Washington was reviewed and approved by NMFS and the North Pacific Fishery Management Council, and after several years of development was later approved by the IPHC. Limited to shore-based trawlers that land their catch in Dutch Harbor and have no ability to sort their catch at sea, there is no limitation on the amount of fish that can be donated nor a requirement that the halibut bycatch only come from specific fisheries.

Preliminary 2002 results and final results from 2001

Two Dutch Harbor processors participated in the donation program in 2002 and delivered an estimated 30,000 to 35,000 pounds of halibut. The fish were cut into steaks, sleeved, and repackaged for delivery to regional food banks and represent over 75,000 meals. Seafreeze's Quality Assurance manager reported that the fish donated in 2002 were of excellent quality. Any substandard fish was discarded at the time of processing.

The amount of halibut bycatch donated to the program is down from the 43,579 pounds collected by SeaShare in 2001. Unisea was the leading contributor in 2001, followed by Alyeska. Recipients of the processed halibut included America's Second Harvest Food Bank of the Inland Empire (formerly the Spokane Food Bank) and Food Lifeline in Seattle. Since the program's inception, donations to the food banks have totaled over 120,000 pounds of halibut. The bycatch donation program will be reviewed in 2003.

The over 120,000 pounds of halibut donated since 1998 represents about 250,000 meals for foodbanks.

TAKING STOCK: ASSESSMENT OF HALIBUT ABUNDANCE IN 2002

"Who could study a fish a hundred fathoms deep in the ocean, without even a vessel? I promptly got off the 'bandwagon' of the most popular and overcrowded fields of endeavor and into a very new one where I was alone on the ground floor." William F. Thompson

No question is more important in fishery management than answering the deceptively simple: "How many fish are there in the deep, blue sea?" An accurate population assessment is crucial to managing any renewable resource and when the subject is a dynamic, highly migratory flatfish that dwells at the bottom of the sea at depths of hundreds of meters, answering that question is no easy task.

The Commission's catch limit recommendations are based on work done by the assessment scientists and staff.

Each year, the IPHC collects all available data from the commercial fishery and the annual Standardized Stock Assessment survey. Once the abundance assessment is made, a target for total removals can then be calculated by applying a fixed harvest rate of 20 percent to the estimate of exploitable biomass. This target level is called the "constant exploitation yield" or CEY for each area.

The target level for the directed commercial catch, called the "setline CEY," is calculated by subtracting an estimate of all other removals including sport catches, bycatch, waste, and fish taken for personal use. Catch limits in each area are based on the estimates of setline CEY but IPHC staff recommendations may vary depending on a number of statistical, biological, and policy considerations. Similarly, the Commission's final quota decisions are based on the staff's recommendations but may also be higher or lower.

IPHC sampler Levy Boitor measuring halibut aboard the *F/V Kristiana* during the setline survey. Photo by Tracee Geernaert.

At the end of 2002, the exploitable biomass of halibut in the North Pacific was conservatively estimated at 655 million pounds. This is up from last year's estimate of 605 million pounds. Good news to be sure.

The methodology and fits of halibut assessment

Since 1982, halibut stock assessments were based on a relatively simple age-related mathematical model called CAGEAN, an acronym for Catch Age Analysis. CAGEAN worked fairly well until the early 1990s when it became apparent that the size of halibut was changing. Halibut simply weren't growing as big as they used to and change was dramatic. Halibut over 20 years old that used to average around 190 cm in the 1980s were averaging less than 120 cm in the 1990s. The cause is believed to be long-term fluctuations in climate known as the Pacific Decadal Oscillation that affect overall productivity of the ocean in combination with effects of density of halibut. The result was a persistent underestimating of recruitment into the fishery and total stock size.

In 1995, a new model was introduced that factored in both age and length of halibut and included information from the annual setline survey as well as commercial catch information. The new model produced substantially higher biomass estimates, especially in Area 3A due to the new growth figures and in Area 2B due to the new survey information.

Exploitable biomass at the end of 2002 was estimated at 655 million pounds, up slightly from the previous year's estimate of 605 million pounds.

The differences led to the consideration of two alternatives in 1996 for fitting the model in which survey selectivity was a function of either age or length. To be on the safe side, the target harvest rate was reduced from 30 percent to 20 and still the overall catch quota increased. The following year's setline survey found substantially more halibut, especially in western Alaska Areas 3B and 4.

In succeeding years, biologists considered other factors to better fit the model to the survey results, including the rate of natural mortality of halibut, and even the effect on survey results of changing bait from herring to salmon. A new age-based formula was adopted as the standard assessment, one that factored in far more components than the old CAGEAN model, and yet still other fits are being considered to more closer count a population that we cannot see.

Standard assessment results in 2002

Estimated exploitable biomass in Area 2B at the end of 2002 is 63 million pounds, close to last year's estimate of 66 million and consistent with the gradual decline indicated by the model.

In Area 2C this year's estimate of 61 million pounds is 15 percent higher than last year's 53 million. The Area 3A assessment is nearly 30 percent higher 198 million pounds compared to 155 million. To some extent these large increases are the result of higher survey and commercial catches in both areas in 2002, but the increases are too large to be explained entirely by that.

Examination of the 3A assessment shows a clear pattern in the recent years. Through 1999, the fits are quite consistent from year to year, with each year's estimates of historical abundance approximately matching the

previous year. Since the 2000 assessment, however, the fits have drifted upward year by year, a pattern that is symptomatic of a change in catchability or selectivity in the stock that is not allowed for in the model, just like what happened to the CAGEAN model fits in the early 1990s. The 2B assessment shows no such pattern, and the 2C assessment very little.

We believe the pattern in 3A is the result of the decline in size at age that has occurred over the last two decades. In the mid-1980s the oldest fish in Area 3A, those fish 20 years and older, averaged 189 cm in length. At that time, full vulnerability to setline gear was reached by about age 14 when the fish were about 125-130 cm in length. Since then mean length at age has dropped steadily, and in the last few years even the oldest fish in 3A were no more than 120 cm.

We are convinced that setline survey selectivity depends at least partly on size and not just age.

The reappearance of a retrospective pattern in 3A is in itself evidence that setline survey selectivity depends at least partly on size and not just age. We also have by now a fairly long series of comparable IPHC setline and NMFS trawl surveys in Area 3A that show good agreement on long-term trends in CPUE at length during a period when the age composition of all the legal-sized length groups changed dramatically. This indicates strongly that selectivity in both surveys is mainly determined by length not age.

Alternative assessments

This year's results show that the standard assessment has been underestimating abundance, particularly in Area 3A, for two reasons. First, age-specific survey selectivity has declined in the stock but not in the model fits, so recent catch rates actually indicate higher abundance than estimated. Second, the surface ages that constituted the bulk of the data through the 1990s tend to understate survival; hence the excess of old fish in the catches. Actual survival must have been higher than estimated, and therefore abundance as well.

In Area 2B all of the fits give similar estimates of abundance. In Areas 2C and 3A there is a range from the standard model fit at the low end to the fixed length-specific fit at the high end, about 25 percent greater. Given the preliminary nature of the alternative fits, it seems prudent to choose a value at the low end of the range in each area by rounding the lowest value in each area to the nearest 5 million pounds.

For the other areas where there is no analytical assessment, the standard procedure is to compute a survey index of absolute abundance in each area by multiplying the average of the three most recent survey CPUE values by the bottom area between 0 and 300 fm. For example, the Area 2A index is 14 percent of the 2B index, and 2A exploitable biomass is estimated as 14 percent of the analytical estimate for 2B. Estimates for Areas 3B, 4A, 4B, and 4CDE are similarly calculated from the 3A analytical estimate. The Area 2A:2B scaler is the same as last year's, but the scalers for 3B and 4 relative to 3A are all lower than last year.

In Area 3A, a low 1999 value dropped out of the 3-year average and a high 2002 value entered. In Areas 3B, 4A, and 4B, relatively high 1999

values left the 3-year averages and relatively low 2002 values entered. As a result, the estimate of exploitable biomass in Area 3A is about 30 percent higher this year, while the estimates of exploitable biomass in the western areas are little changed from last year.

Age sampling indicates more older fish in Area 3A

Both survey and commercial catches in Area 3A contain a large and growing number of old fish, those 20 years of age and older. The difference between the actual catch of older fish and what the model predicted was apparent in the commercial catch beginning in 1998 and by 2002 the discrepancy was very large. An excess of old fish is worrisome because it means that actual mortality is lower and abundance is higher than estimated. This feature appears strongly in the 3A assessment and it is also detectable in Area 2C.

Chopping bait aboard the *F/V Star Wars II*. Photo by Donna Hauser.

Changes in age reading practices are contributing to the fact that we are seeing more older fish in the catch.

After considering some possibilities such as highgrading in the commercial fishery, we have concluded that the unexpected increase in old fish is the result of a recent change in age reading practices, specifically the increase in the otoliths that are aged by the break/burn technique rather than surface reading. At the same time, there also has been an increase of older fish in the catches as the large year classes spawned since the late 1970s have aged and as fishing mortality on younger fish has decreased due to reduced growth.

Before the 1990s, the proportion of fish with a surface age of 15 or greater was 5-15 percent in all areas. During the 1990s it rose to almost 25 percent in Areas 2B and 2C, and to almost 40 percent in 3A. In Area 3B, it was 46 percent in 2002.

There was a steady increase in break/burn readings from 1994 on. In 2002 the proportion of break/burn readings was higher in Area 3A than in 2B and 2C, and it was of course higher in the commercial samples than in the survey samples because the commercial size limit results in a higher proportion of older fish in commercial catches. The gradual increase of break/burn readings explains both the appearance of the excess older fish and the differences among areas, years, and whether the sample comes from

the survey or commercial catch. It is still true that surface and break/burn readings agree quite well through about age 15, but there are now many fish older than that in the catches.

New answers to an aging question – More breaking and burning in 2002

Since the 1920s, the standard method of aging halibut has been by counting the annual growth rings on the surface of a halibut's ear bones or otoliths. A year's growth consists of an opaque zone formed during periods of faster growth that typically occurs in the summer, and a translucent zone that marks slower growth in the winter.

Preparing otoliths for aging by the break/burn method. IPHC photo archive.

Surface reading still provides an accurate age for younger fish, but studies show that by about 10 years of age, the break and burn method might work better.

But the technique wasn't perfect, especially for older halibut. As the fish grows, the ring pattern changes and some rings of older fish aren't as readily visible from the surface. In 1992, the IPHC tried a new way to get a better view of these hidden rings by breaking the otolith and viewing the rings in cross-section. Heating or "burning" the cross section increases the contrast between the opaque and translucent zones and makes the cross sections easier to read. Thus was adopted the use of "break and burn" aging of halibut otoliths.

The criteria for using the break/burn technique has evolved over the years and led to increasing numbers of readings by this method. Criteria for performing a break/burn reading include old age indicated by the surface rings, thickness of the otolith, steep edges or a difficult surface pattern, discrepancy in readings between different sites on the otolith, discrepancy in age readings between different readers, and damage to a preferred surface reading site.

A comparison of surface and break/burn ages indicated a divergence at age 15 that led to the recommendation that all otoliths with a surface age of 15 and older be aged by the break/burn technique. Another study, in 2001, found greater consistency between surface and burnt readings beginning at age 12 and yet another comparison of the different techniques indicated the cutoff for performing break/burn readings should be even lower, between 7 and 10 years.

As most age discrepancies came from fish aged 15 or older, the cutoff age for break and burn was set at 15 for 2002. Preparing and reading a burnt otolith section takes at least twice as long as making a surface reading. Breaking and burning everything over surface age 14 resulted in a three-month increase in the aging workload in 2002, Break/burning all otoliths older than 7 or 10 years would have resulted in an estimated 15,000 and 20,000 more readings, about 8 to 10 months of additional work.

Even so, because of its accuracy, aging all halibut by the break/burn technique is being considered. Between 17,000 and 22,000 otoliths less than 15 years old are collected each year. Burning these otoliths in addition to otoliths 15 and older would equate to an increase of nine to 10 months of full-time aging over the 2002 workload.

In fact, given the dramatic results from the break/burn sampling this year, consideration is being given to re-age otoliths from previous years with the new technique, although this would be a very time consuming and labor intensive project and likely will not be implemented in 2003.

Pacific Almanac: Halibut Factoids from the 2002 Assessment

- 0.6 – Increase in years of the average age of halibut from all areas in 2002. The average age of samples increased from the previous year in Areas 2A, 2C, 3, 4B, and 4C, while it decreased in Areas 2B, 4A, and 4D.
- 4 – Age in years of the youngest halibut in the 2002 commercial samples. The precocious halibut was captured in Area 2C and was legal, measuring 91 cm.
- 14.7 – Average age in years of all halibut caught in 2002. The average age of commercially caught halibut is two years older than it was in 1993.
- 50 – Age in years of the oldest fish recorded in the 2002 catch. There were two half-centenarians, both landed in Area 4B, one with a fork length of 104 cm, the other 121 cm.
- 99 – Percent of otoliths surfaced-aged 15 or more years that were re-aged by the break/burn technique in 2002. In the prior year, only 38 percent of such samples were aged by the more accurate technique.
- 106.7 – Average length in cm of all halibut sampled in 2002. Average fork length increased in Areas 2C, 4A, and 4B; decreased in Areas 2A, 2B, 3, 4C, and 4D; and for all areas combined was slightly larger than 2001.
- 209 – Length in cm of largest halibut in the 2002 commercial samples. Landed in Area 4A, the barn door was determined to be 21 years old.
- 1987 – Year of the largest age class in 2002. Fifteen-year olds accounted for 17 percent of the commercial catch in 2002. The class of ’88 ranked second overall, followed by 1989.
- 4,903 – Number of halibut fishing logbooks collected in 2002 from all Pacific ports.
- 18,261 – Number of otoliths collected in 2002 from all regulatory areas, more than have been collected since the mid-1980s.
- 655,000,000 – conservative estimate of biomass of Pacific halibut at the end of 2002, in pounds.
- 1 – ranking of the 2002 commercial harvest of Pacific halibut compared to catches in the previous 20 years.

GOING RIGHT TO THE SOURCE: AT-SEA SURVEYS

"It is perhaps natural to ask why is was not possible to examine the fish when they were brought ashore, and thus avoid the disagreeable living and working conditions at sea. It cannot be too strongly emphasized that work of that sort would have been nearly worthless." William F. Thompson, 1915

William F. Thompson immediately recognized the importance of going to sea to get accurate information about halibut populations. The IPHC has returned to the fishing grounds ever since to collect independent catch information and biological data that is needed to understand the status and changes in this dynamic resource. Called the Standardized Stock Assessment (SSA), the annual survey conducted with standardized methods, bait, and gear each summer provides an important comparison with data obtained from commercial catches.

Biological data collected on the surveys such as the size, age, and sex composition of halibut are used to monitor changes in biomass, growth, and mortality in the population.

During the 2002 SSA, a total of 1,233 grid stations were fished, and landed 1,262,081 pounds of halibut, 74,000 pounds of Pacific cod, and 37,211 pounds of rockfish. Biological data collected on the surveys such as the size, age, and sex composition of halibut are used to monitor changes in biomass, growth, and mortality in the population. Records of other species caught during the survey provide insight into the abundance of these species and bait competition.

Setline surveys: What does it take?

An undertaking such as assessing halibut stocks commands a considerable effort. The Commission employed 21 seasonal hires that worked a total of 1,151 days. Three permanent staff contributed 45 days and three port samplers worked another 177 days aboard vessels.

A total of 13 vessels participated, six Canadian and seven U.S., that made 63 trips and a combined 630 days under charter.

Vessel	Home Port	Stations Completed
Angela Lynn	Vancouver, BC	91
Barren Islands	Homer, AK	12
Blackhawk	Fort Bragg, CA	84
Bold Pursuit	Comox, BC	131
Clyde	Kodiak, AK	66
Free to Wander	Vancouver, BC	154
Heritage	Kodiak, AK	140
Kristiana	Seattle, WA	63
Norska	Kodiak, AK	92
Pacific Sun	San Francisco, CA	45
Pender Isle	Vancouver, BC	85
Star Wars II	Vancouver, BC	126
Waterfall	Ladysmith, BC	144
Totals		**1,233**

All legal-sized halibut retained were sold to offset costs of the program. Fish sales were awarded based on price and distribution among different buyers and ports. Rockfish and cod taken as bycatch were also retained since these species

are killed by the process of being landed. Most vessel contracts provided a lump sum payment and 10 percent of the halibut proceeds, as well as 50 percent of the proceeds of the allowable bycatch.

Survey design and procedures

The survey design encompassed all offshore waters from Oregon to the farthest Aleutian Islands, divided into 27 separate regions. Within each region, a grid, 10 nautical miles square, was established and fishing took place at the corners using standardized gear. Five skates, 1,800-feet long with 16/0 circle hooks spaced 18 feet apart, were fished at each station, with each hook baited with a quarter pound piece of No. 2 chum salmon. Each vessel set one to four stations daily beginning at first light and allowed the gear to soak a minimum of five hours before hauling.

Survey work aboard the *F/V Pender Isle* with IPHC biologist Steve Kaimmer. Photo by Kelly Van Wormer.

During gear retrieval, 20 consecutive hooks of each skate were monitored and the hook status, such as species hooked, returned bait, broken gangion, etc., was recorded. The fork lengths of all halibut landed from survey stations were recorded to the nearest centimeter. Each length was converted to weight in pounds using a standard formula and was used to generate catch per unit of effort (CPUE) data. All halibut greater than 81 cm were dressed by the vessel crew, then passed to a sampler for sex and maturity determination. All legal-sized and some sub-legal halibut were sampled to determine the sex and stage of maturity. Otoliths were collected from a random sample of all halibut caught.

Halibut CPUE dropped in most areas surveyed, but not in Areas 2C, 3A, and 4D.

Results

In comparison to the most recent surveys, halibut CPUE dropped in all areas except for IPHC Regulatory Areas 2C, 3A and 4D in 2002. The distribution of sub-legal and legal-sized halibut by depth was consistent with previous surveys, showing higher abundance of sub-legal fish in shallow waters, and a wide variation in depth occurrence for legal-size fish.

The sex ratio for mature halibut from the survey catches showed considerable variation across most areas, ranging from 38.4 percent to 73.7

Area	Survey CPUE (lbs/skate) 1998	1999	2000	2001	2002
2A	-	37	-	41	33
2B	94	88	103	101	93
2C	224	201	226	234	258
3A	281	241	273	255	310
3B	436	441	378	365	304
4A	293	368	276	200	168
4B	216	204	218	171	119
4C	-	-	-		
4D	-	-	213	201	263

Areas where there have been historically lower exploitation rates also tend to have a lower percentage of females.

percent female, and is consistent with last year's results. Individual statistical areas within regulatory areas showed even greater variation, ranging from 11 to100 percent female. In general, the regions to the west of the central Gulf of Alaska, Areas 3B, 4A, 4B, and 4D tended to have lower percentages of females in the catch. Coincidentally, these areas have had the lowest historical exploitation rates. Generally most female halibut caught during the summer months when the survey is conducted are in the ripening stage and are expected to spawn later in the fall and winter.

Bycatch

Approximately 90 separate species of fish and invertebrates were caught as bycatch during the 2002 survey. The most common bycatch in Area 2A and 2C was sablefish. Common bycatch in Areas 2B and 3A were sharks, mostly dogfish. Common bycatch west of Kodiak Island in Areas 3B, 4A, and 4D was Pacific cod. Skates and Irish lord sculpins were prominent in other areas of the Bering Sea. No birds or marine mammals were caught this year.

Special projects

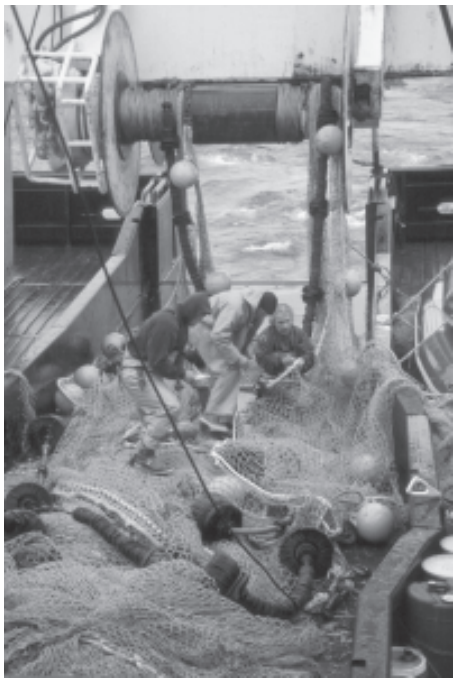
In conjunction with the Alaska Department of Environmental Conservation (ADEC), the IPHC collected halibut flesh and liver samples for a large-scale study of environmental contaminants in Alaska fish. Samples were taken from eight different areas as part of a study involving 13 species of fish and a broad suite of environmental contaminants such as pesticides, dioxins, furans, PCBs, mercury, and heavy metals. Results of this year's tests will be published at a later date, and will be used to identify future research needs. Future collaborative work between ADEC and IPHC is anticipated. Also new in 2002, the samplers recorded the presence and abundance of seabirds attracted to the vessel at the end of hauling operations to track seasonal distribution.

Cruising the Bering Sea

Pacific halibut occupy a vast area of the Bering Sea shelf, but the Commission lacks the resources to survey them across this area. Enter the NMFS. Each year, the NMFS hires two trawl vessels to conduct an extensive groundfish survey which encompasses the area from Bristol Bay to Nunivak

Island. Since 1998, we've been fortunate enough to be involved in this research and are grateful to the NMFS RACE division for the opportunity to participate.

The 2002 survey was carried out between May and July, and included two vessels; *F/V Aldebaran* and *F/V Arcturus*. On board were scientific crew who carried out objectives related to stock assessment and year-class strength for several species. An IPHC biologist was aboard the *Aldebaran* for the duration of the cruise to collect vital statistics on the halibut caught at each station.



Repairing a net aboard the NMFS trawl survey. Photo by Hilary Emberton.

Each year, the NMFS allows us to tag along on their trawl surveys to take information on halibut that are caught.

The survey spanned a geographical area on the eastern Bering Sea continental shelf from inner Bristol Bay to the shelf break, and between Unimak Pass to north of St. Matthew Island. The survey consisted of approximately 380 stations positioned on a 20 nautical mile square grid at depths ranging from 0-200 m using a standardized NMFS 83-112 Eastern flatfish otter trawl that has been used in the survey since 1982.

Trawl gear has limitations that make it difficult to include the data in the IPHC stock assessment. Halibut are vulnerable to the trawl from about 20-100 cm in length, but a proportion of the commercial-sized population exceeds the upper limit. Still, the information can be used in varying capacities and for forecasting purposes.

Halibut were sampled for length, otoliths, gender, maturity, and prior hooking injuries. Flesh samples were taken from half of all fish caught measuring 30 cm in length or more. As part of a special otolith study, all fish less than 30 cm were sampled for length, gender, and prior hooking injuries in the field and were subsequently packaged and shipped back to the IPHC lab for the remaining data collection. The information was then used along with data from other sources such as the IPHC setline surveys and commercial catch information to create a data series describing total abundance and year-class trends.

On one of two trawl vessels conducting the survey, 843 halibut were caught and sampled between May and July.

Trawl survey results

The *F/V Aldebaran* performed 188 standard survey, eight yellowfin sole, and 11 crab tows. Halibut were subject to sampling in all standard and yellowfin sole tows, but were only measured and then discarded alive, if possible, on the crab tows. A total of 843 halibut, 435 female and 408 male

were captured and sampled, and flesh samples were taken from a total of 364 halibut.

By expanding the survey catches from the area swept by the trawl to the total survey area, NMFS scientists are able to derive estimates of relative abundance. In 2002, abundance was estimated at 36 million fish, its lowest level since 1996. This is down considerably from the 55 million fish estimated in 2001 and the peak abundance estimated by the trawl survey of 67 million fish in 1991, but this could be due partly to annual variability in the survey itself.

Prior hook injuries

The incidence of PHIs increased in all areas compared to 2001, although by only small percentages.

Data on the occurrence of prior hooking injuries (PHI) of halibut caught on the standardized stock assessment surveys have been collected since 1997. Although groundfish longline fishers in Alaska are required to practice careful release techniques for halibut returned to the sea, it was suspected that halibut were being inflicted with worse damage than originally thought. The survey provided a means of examining trends in hook injuries across the entire range of halibut in the north Pacific and Bering Sea.

Of the 78,000 halibut examined on the 2002 setline survey, slightly more than 4,400 halibut were found to have a prior injury. The percentage of halibut with an injury ranged from a low of 4 percent in Area 3B to a high of 26 percent in Area 4D.

The incidence of PHIs increased in all areas compared to 2001, although the increases in Areas 2B, 3A, and 3B were minimal, on the order of 2 to 5 percent. Increases in Areas 2A and 2C ranged from 15 - 20 percent and dramatic increases of 50 percent and more were seen in all the Area 4 regions. Overall, the 2002 coastwide average of 5.7 percent was up slightly from the 2001 result of 5.2 percent and the PHI incidence in sublegal halibut was up only slightly from 2001.

Among sublegal halibut, the incidence of PHI was the lowest in Areas 2 through 4A, 0.6 - 2.6 percent, and highest in the Bering Sea portion of Area 4A and Areas 4B and 4D, where it exceeded 8 percent. PHI rates for sublegals in the Bering Sea mirrored the rates for all sizes of halibut, showing increases over 2001.

Samplers on board NMFS trawl surveys in the Bering Sea region also gathered PHI data. Their Bering Sea results were higher than what was found on the IPHC surveys, but the SSA survey only covered a portion of the areas covered by the NMFS Bering Sea trawl survey. Of the 843 fish that were inspected, 54 were found with PHI, a rate of 6.3 percent, and significantly higher than the 4.4 percent observed in 2001. None of the injuries were judged to be severe, most injuries fell into the minor classification.

A Brave New World: Biological Research

"The decks were always so slippery and slimy that it was necessary to lash the fish down 'fore and aft' to guard against the rolling movements of the vessels as they lay in the troughs of the seas. It need only be said that accurate work under such conditions was time consuming." William F. Thompson

Nothing is more fundamental to the completion of the mission of the IPHC than biological research. That was true over 80 years ago, when William F. Thompson's pioneering work documented a resource in grave danger of depletion and pointed to measures to preserve it. Our understanding of halibut populations is greatly improved today thanks to the continued work of scientists through the years, to better monitor and assess halibut populations, understand their migration patterns, and address the complicated issues regarding their management and marketing.

The IPHC is engaged in several projects that should give us a better idea of how halibut populations are distributed and move.

The summer of 2002 marked the beginning of three new research projects to study the movement, behavior, and distribution of halibut to address a number of industry concerns. While each has unique objectives, the three studies draw upon each other to give a better understanding of how halibut populations are distributed and move. The ultimate goal is to better understand whether local sub-units exist that can be treated independently in terms of management strategy.

IPHC biologist Kelly Van Wormer measuring halibut during the setline survey. Photo by Tracee Geernaert.

The three studies include using elemental fingerprinting or the use of juvenile otolith (earbone) chemistry to determine the nursery origin of individuals; tagging mature adults with archival satellite tags to examine seasonal migration; and investigating relationships between water temperature and catch in the southeast Bering Sea.

Otolith chemistry as a marker in juvenile halibut

Conventional wisdom, verified by IPHC studies, is that halibut larvae drift north and west after hatching and find nurseries in shallow water from the Gulf of Alaska to the Bering Sea. Tagging studies suggest that juveniles then migrate in the opposite direction, moving southeastward from nurseries to the adult feeding grounds. This model is generally accepted but there are competing views about the relative importance of different nursery grounds to various management units. There is no reliable way of gauging whether recruitment to the fishable stock is generated from nurseries that are dispersed coastwide, or whether a few critical nursery areas generate the bulk of the fishery. Conventional tagging of juvenile halibut has not been effective as few of these individuals have been recaptured. There is, however, a possibility that all halibut possess a chemical tag within their earbones that indicates their nursery origin.

We are starting to look at the chemistry of otoliths in juvenile halibut because we think there is a possibility that each fish has a unique chemical tag that can eventually be traced back to specific nursery grounds.

Otoliths are comprised primarily of calcium carbonate, the same compound that makes up clamshells and limestone, but other elements are also present in lesser amounts. Metals in seawater and seafloor sediments such as iron, lead, magnesium, manganese, strontium, barium, and lithium, move from the seawater into the fish's blood and eventually into the otolith.

While bones and scales change with age, the chemical composition of otoliths remain unchanged throughout the lifetime of the fish and constitutes a life-long record of the environmental conditions to which the fish was subjected. Juvenile halibut that remain within a small geographic region will assume a similar chemistry, an Otolith Elemental Fingerprint, or OEF. The hope is these OEFs can be used as natural tags to track fish as they move from one environment to another or to distinguish between substocks of fish.

Our project will determine whether juvenile halibut from different nursery grounds possess unique OEFs, develop methods for quantifying the natal OEFs found at the core of adult otoliths, and use these to determine the nursery origin of halibut throughout the fishery. The project was funded at a modest level during 2002 to test the concept, comparing OEFs of one and two year old halibut from a few sites to see whether OEFs are site-specific and predictable enough to serve as regional tags. Collaborating with other researchers we obtained otoliths from juvenile halibut from Southeast Alaska, the Gulf of Alaska, and the Bering Sea.

The samples will allow us to assess whether OEFs change in predictable ways over a large scale and a close range. We will be able to examine changes in OEFs over relatively small distances such as neighboring locations in Bering Sea and Aleutian Islands, and even fish captured on opposite sides of Morzhovoi Bay. On a larger scale, we will compare sites that are spaced uniformly from Bristol Bay, the southern Alaska Peninsula, and eastern, central and western Gulf.

If successful, the use of elemental fingerprinting could help us understand which nursery areas are most important to various regions of the fishery. We would also be able to estimate how early juvenile bycatch and habitat degradation of specific nursery areas might effect fishery recruitment, and which areas are most important to protect from human impacts.

Otolith extraction was completed in December and chemical analyses, using specialized equipment at the Woods Hole Oceanographic Institution, are planned for the fall of 2003. Project updates will appear on the IPHC web site.

Satellite tagging to study seasonal migration of mature halibut

The satellite-tagging study aims to increase our understanding of how stock distribution differs between summer and winter, which is important as we consider an extended season that allows fishing during the winter. Tagging data suggest that halibut distribution will be significantly different as the fish move to spawn, but this is not confirmed. This summer we began a study that uses a novel tagging technology, pop-up satellite-transmitting archival tags or PSATs, which will allow us to determine the location of fish during winter months without needing to recapture them.

This summer we began tagging halibut with archival tags that record movements of the fish and then on a pre-determined date, pop off, float to the surface and transmit this information to a satellite.

IPHC sampler Ayala Knott placing a satellite tag on a halibut. Photo by Bonnie Gauthier.

An archival tag, PSATs collect and store information about temperature, depth and light at regular intervals, every four minutes in the case of our tags. PSATs are relatively large, about 1 inch in diameter, 6 inches long, and with a 5-inch antenna. They are darted onto the halibut about half way along the body.

On a pre-programmed date, the tag releases and floats to the surface (or "pops up") and its stored data are transmitted via satellite. The satellite can also determine the tag's location like an EPIRB locates a vessel in distress. If a fish is captured with a PSAT still attached, it can provide highly detailed temperature and depth data and the IPHC offers a $500 reward for the return of any recovered PSAT.

Twelve halibut were tagged during our 2002 summer setline survey in the Gulf of Alaska from Sanak Island in the south to near Seward, and along a second line in the eastern Gulf from the north end of Vancouver Island to Icy Strait. Another 12 tags were deployed in August near St. Paul Island.

The tags were programmed to pop up in January and February of 2003, at the peak spawning time when the tagged fish should be close to their

winter grounds. By analyzing the location of winter pop-ups from fish tagged in the Gulf, we will get a better idea of whether fish might redistribute to the northern Gulf during winter, or remain dispersed across their range. From the St. Paul fish we hope to learn whether they remain near the Pribilof Islands within the Bering Sea or move into the Gulf during the winter.

Relating catch to oceanographic conditions in the southeast Bering Sea

Localized halibut depletions, such as near the Pribilof Islands where the 2002 catch fell far below the quota, have led to speculation that local abundance is either in decline or affected by halibut movement due to changes in habitat. For a small fleet that operates near its homeport, even small changes in movement patterns can have big impacts on the local economy. Better understanding of the environmental needs and preferences of halibut will help assess whether localized decreases in catch might be due to stock redistribution in response to habitat change, and whether such changes are caused by human activities or represent natural changes over which we have little control.

Temperature may have an affect on halibut distribution and abundance, which could be related back to local depletion such as that seen in recent years in the Pribilof Islands.

One factor that may influence distribution and abundance is temperature. There is evidence that the abundance and distribution of juvenile halibut is governed by temperature, and the same is probably true for adults. During surveys conducted in the 1960s, the majority of juvenile halibut were captured at 4-5° C, and very few were encountered at or below 2° C. Adults are likely to have preferences that influence movement and distribution, something common to marine fishes that migrate within water masses of consistent and predictable temperature.

In the southeast Bering Sea, halibut also undergo large seasonal migrations. Spawning occurs in winter along the shelf-edge in locations such as the Pribilof and Bering Canyons, while summer fisheries occur in widespread shallow waters from the Pribilofs to St. Matthew Island, and as far northeast as Norton Sound. For some fish, seasonal migrations could cover more than 400 miles each way. Migration routes and timing may be affected by changing water temperatures in the fall, spring, and summer, and regional conditions could cause fish to follow different routes each year, taking them either closer to or farther from coastal fisheries depending on the conditions.

In order to study the relationship between catch rates and oceanographic conditions in a small coastal fishery, we initiated work at St. Paul Island using funds provided by the Central Bering Sea Fishermen's Association. Ten water data recorders were purchased and deployed to record temperature at pre-determined intervals. Rugged and simple, the recorders are snapped to the gear for the duration of the fishing season. At the end of the season, the units are retrieved and the data downloaded by computer. The downloaded data provide a record of water temperature that can be compared to catch on a set-by-set basis.

The data have not been fully analyzed but interesting phenomena are apparent. Temperature appears to have varied little from the beginning of the season to its end. This was unexpected. We anticipated considerable warming as the summer advanced, and that the timing and extent of warming might be responsible for timing the arrival of fish.

Additionally, two rather different temperature profiles emerged. In most cases, water temperature was either stable or changed slowly throughout the set. But during a few sets, water temperature went through a dramatic change: a pulse of rapid warming usually followed by cooler conditions. We hypothesize that these warm pulses were generated by tides that caused warm surface water to be driven to the bottom as the tide moved into shallow water. Once this mass of warm water passed, cooler bottom water moved in to replace it.

During a few sets, water temperature went through a dramatic change: a pulse of rapid warming usually followed by cooler conditions.

Over the winter we will begin analyzing accumulated data and search for relationships between temperature and catch. We will seek to determine whether average temperature and variability, including the occurrence of tidal fronts, correlates with catch. In addition, we will use information retrieved from PSATs to compare thermal preferences to temperatures observed by the fishery.

In addition, we plan to analyze long-term trends in CPUE to better understand the fishery in this area. Relationships between long-term CPUE and decadal-scale changes in ocean conditions, using regional temperature records, will be examined. We hope that patterns can be identified this year, but a single year's data may not be sufficient. Long-term processes can only be understood through continued observation and we view this as the beginning of a longer investigation that will be expanded in the future to include direct experimental research.

The work at St. Paul Island is also intended to teach us more than just the cause of catch histories in that particular region. Localized depletions of halibut stocks have been reported from the Bering Sea to British Columbia. It is clear that we still have much to learn about behavior, life history, habitat requirements, and spatial population structure of halibut. For communities that rely on the resource, a better understanding of local dynamics may be vital to ensure healthy fisheries over the long term.

Tagging studies

The IPHC has been tagging halibut since 1925, releasing over 380,000 tagged halibut and receiving over 46,000 tag recoveries. The tags are used to study migration, utilization, age, growth, and mortality of halibut. In 2002, a total of 104 tags were released as part of the annual Homer halibut derby and 60 tags were recovered. Most tags were collected in Homer, Seward, and Kodiak, ports that have the largest commercial halibut landings and are within the same regulatory area where the most recent tag experiments have taken place.

Growth rates could be calculated for 22 of the tagged fish recoveries. The tagged fish were at large for 6 to 21 years and growth rates varied from

0.9 to 6.8 cm per year. The average growth rate for these fish was 3.0 cm/yr and falls below the rate seen in previous experiments. There was no significant difference seen between growth of female and male fish.

Coast-wide tagging project planning

Much work was done in 2002 in preparation for a large-scale, coast-wide halibut tagging program planned for next year to provide an estimate of exploitation rate that is independent of the current stock assessment model. The program will check the model-based estimates used for Areas 2 and 3 where halibut stocks have been fully utilized for decades but there are reasons to believe that estimates may be low. It will check on the survey-based estimates in Areas 3B and 4, which lack long histories of full utilization and survey data, and model-based population estimates may also be too low. And since recoveries of tagged fish will continue for years, the program will also help estimate movement of legal sized halibut between areas.

PIT tags alleviate the problem of variable reporting rates since they are embedded in the skin and can be detected only by special equipment.

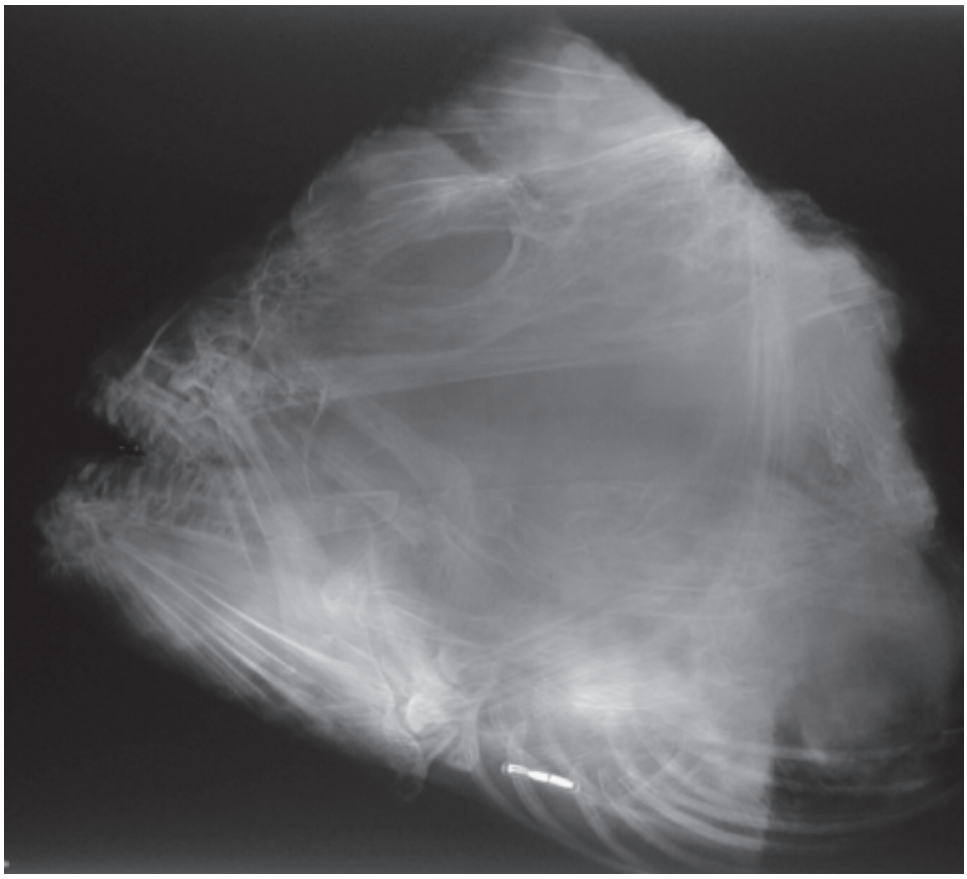
Previous halibut marking experiments used external tags, which were subject to variable reporting rates. The 2003 program will use Passive Integrated Transponder or "PIT" tags that offer more reliability and avoid biases due to reporting rates. The 11.5 mm (or just under ½ inch) glass and metal tags are implanted within the fish with a hypodermic needle and the information can be read by an electronic scanner while the tag is still inside the fish.

In the project, approximately 45,000 halibut will be tagged during the standard survey assessment. Port samplers will scan a proportion of commercial landings and the recovery rate of PIT tags will be used to estimate stock size. A successful experiment requires reliable portside detection of PIT tags and several tests of equipment and methods for detecting PIT tags in halibut were conducted in 2002. The program was originally planned for 2002 but was postponed to allow more time to develop protocols about the location, tagging, and detecting of PIT tags.

PIT tagging protocols: Tag placement and shedding studies

PIT tags are not unlike the kind used to tag family pets in recent years.

Several studies were conducted in 2002 to find the best location for the PIT tag. The head was preferred as a tag location as it isn't discarded at sea or destined for the consumer, but exactly where? Several studies on location of PIT tags were conducted, both onshore at the Seward Marine Center where tagged halibut were held in tanks for up to 84 days, and at sea where tagged halibut were held aboard vessels for several days. One location, near the opercular groove, just below the mouth on the underside of the halibut, was tried but it was found that the motion of the jaw could push the tag back out through the same route by which it was injected. A better location was found nearby, beneath the opercular plate. While tag shedding on the order of 2-5 percent was experienced in this location, the shedding mostly occurred during the first few days after tagging. Alternate tag sites including the tail and near the eye socket were considered but rejected.



X-ray of a halibut that has been injected with a PIT tag. IPHC photo archive.

PIT tagging and detection

Several tests were conducted in 2002 on methods to detect PIT tags.

The testing of tagging operations under real life conditions had to be considered as well as detecting the tags on the processing line. The *F/V Pender Isle* was chartered to mimic a combined survey and tagging operation.

Meanwhile, several tests were conducted in 2002 on methods to detect PIT tags. In a blind hand scanning, no differences were found between two different hand scanners or different individuals using the equipment. A second test was designed to evaluate the effectiveness of a "plate" or "gate" scanner. The idea was to speed up the scanning process by either sliding heads across an antenna "plate" or dropping them through an antenna field "gate." In trials of both "gate" and "plate" setups, the detection rate averaged only 82 percent, mainly because the tags didn't remain in the field long enough to be energized and read.

A second study was done under real-life conditions using halibut tagged on board vessels, put in the hold along with untagged fish, and then delivered for scanning at a shoreside processing plant at Adak. In the first test, a two-person crew was used: one person counted heads while the other scanned for tags. Scanning took 45 minutes for 433 fish, a rate of 577 heads per hour, and 97 percent of the tags were detected.

During the second offload, a single person scanned heads and attempted to keep a running count. Counting was eventually abandoned after numerous distractions. All 60 tags were detected but scanning was much slower with one person, taking one hour and 45 minutes for 555 heads, a rate of 317 heads per hour.

Conclusions and recommendations

Based on the Bellingham and Adak tests, recommendations were made including the use of two-person scanning crews and choice of the Allflex-Boulder reader for use in portside scanning. Designed primarily for cattle and veterinary uses, the simplicity and low price of the Allflex stick reader convinced us to continue with this equipment. The unit quickly read the tag and saved its information into a personal-data-assistant.

It was recommended that samplers use a "dummy tag" embedded in a piece of foam rubber or sponge to test the equipment before starting to scan and then periodically to ensure the scanner is working properly. We also learned that protocols may have to be modified for each facility, since nearby machinery and electronic equipment can interfere with the scanner's performance.

The year 2002 saw considerable progress in development of the PIT tagging program. We refined our tagging protocol to the point where we are comfortable with the procedures and that justified postponement of the project to 2003.

Ongoing studies

Crystallization is a defect that impairs the readability of an otolith to the point that it cannot be properly aged.

Incidence of crystallized otoliths

Since 2000, staff on IPHC setline surveys have collected both right and left otoliths where the left otolith of a sampled halibut is crystallized. Crystallization is a defect that impairs the readability of an otolith to the point that it cannot be properly aged. Crystallized otoliths are made up of the same calcium carbonate as normal otoliths but have a rougher texture than normal. Some are almost completely transparent with no visible banding patterns. Others are partially crystallized in which age rings are visible in some parts of the otolith but other areas are translucent. The cause of otolith crystallization is unknown, although theories have been suggested ranging from pollution to genetic defects, and the effects of this condition on the fish are unclear.

Electronic monitoring of seabird avoidance devices and seabird mortality

The Endangered Species Act requires that NMFS address potential seabird bycatch in the commercial fleet and the IPHC and NMFS have investigated the use of Electronic Monitoring Systems (EMS) to monitor incidental seabird catch and seabird avoidance devices. The pilot project was conducted on two of IPHC stock assessment vessels in Alaska waters.

Electronic monitoring systems were installed on two stock assessment vessels that included four digital cameras, a GPS unit, hydraulic pressure sensor, and a custom-built computer controller for data logging and video recording. The data logger automatically recorded GPS data on the vessel speed, direction, location, time, date and the hydraulic pressure data that indicated a hauling event. The image-recorder saved images from the four cameras onto interchangeable 36-gigabyte hard drives using surveillance software.

Salted seabird assessments were performed to simulate the accidental hooking of a seabird and to determine how an incidentally caught seabird would appear on the hook-and-line gear as viewed by the EMS. Salted birds were dead frozen seabirds provided by NMFS that were deliberately attached to the hook-and-line gear before deployment.

Understanding the physiology of chalky halibut

Chalky halibut continues to be a problem in the halibut fishery but the type of condition is not unique to halibut. There is so-called "PSE" pork (for pale, soft, and exudative), and "burnt" tuna, to name a couple. Post-mortem acidic conditions have been documented in beef and studies have examined the effects of lactic acid in post mortem changes to poultry.

IPHC sampler Linda Gibbs watches a plant worker check for chalkiness. Photo by Steve Kaimmer.

The IPHC has conducted studies on chalky halibut since 1997, including surveys to determine the extent and distribution of chalkiness, and field studies to investigate possible causes of the condition. However, we still have a poor understanding of just why certain halibut end up being chalky and others do not.

In 2002, the IPHC and the Halibut Association of North America awarded a contract for a private study aimed at furthering our understanding of the physiological processes associated with chalky halibut. In the study, 75 halibut were caught in November and placed in holding tanks in Kodiak. Twenty of the fish were sampled for baseline information, the other fish will be used to test two suspected causes of chalkiness: catch induced stress and water temperature.

In 2002, the IPHC and the Halibut Association of North America awarded a contract for a private study aimed at furthering our understanding of the physiological processes associated with chalky halibut.

APPENDICES

The tables in Appendix I provide catch information for the 2002 commercial and tribal fisheries. The areas specified are the IPHC regulatory areas, depicted in Figure 1 of this report. Appendix II shows the fishing period limits used during the 2002 seasons, and Appendix III reports on the most current sport fishing statistics.

All of the weights used are dressed (eviscerated), head off. Round weight can be calculated by dividing the dressed weight by a factor of 0.75.

Appendix I.

Table 1. The 2002 total removals of Pacific halibut by regulatory area (thousands of pounds, net weight).

Table 2. Commercial catch (including IPHC research catch) and catch limits of Pacific halibut by IPHC regulatory area (thousands of pounds, net weight), 1994 - 2002.

Table 3. The total catch (thousands of pounds, net weight) from the 2002 commercial fishery, including IPHC research, of Pacific halibut by regulatory area and month.

Table 4. Number of vessels and catch (thousands of pounds, net weight) of Pacific halibut by vessel length class in the 2002 commercial fishery a) for Area 2B, Alaska, and the Alaskan regulatory areas, and b) Area 2A commercial fisheries not including the treaty Indian commercial fishery.

Table 5. Fishing periods, number of fishing days, catch limit, commercial, research, and total catch (thousands of pounds, net weight) by regulatory area for the 2002 Pacific halibut commercial fishery.

Table 6. Commercial landings (thousands of pounds, net weight) of Pacific halibut by port, country of origin and IPHC research catch for 2002.

Table 7. Commercial halibut fishery catch (thousands of pounds, net weight) in 2002 by country, statistical area, and regulatory area.

Appendix II.

Table 1. The fishing period limits (net weight) by vessel class used in the 2002 directed commercial fishery in Area 2A.

Table 2. Metlakatla community fishing periods, number of vessels, and halibut catch (net weight), 2002.

Appendix III.

Appendix I.

Table 1. The 2002 total removals of Pacific halibut by regulatory area (thousands of pounds, net weight).

Area	2A	2B	2C	3A	3B	4	Total
Commercial[1]	851	12,074	8,602	23,131	17,313	12,689	74,660
Sport	399	1,194	2,512	4,511	10	37	8,663
Bycatch Mortality:							
Legal-sized fish	530	150	180	1,180	730	3,960	6,730
Sublegal-sized fish	307	93	160	1,014	1,194	3,263	6,031
Personal Use	16[2]	300	170	74	20	180[3]	760
Wastage:							
Legal-sized fish	5	36	26	23	34	51	175
Sublegal-sized fish	4	182	110	484	484	132	1,396
Total	**2,112**	**14,029**	**11,760**	**30,417**	**19,785**	**20,312**	**98,415**

[1] Commercial catch includes IPHC research catch.

[2] Treaty Indian ceremonial and subsistence fish authorized in the Catch Sharing Plan.

[3] Includes 18,437 pounds of sublegal halibut retained in the Area 4D/4E Community Development Quota.

Appendix I.

Table 2. Commercial catch (including IPHC research catch) and catch limits of Pacific halibut by IPHC regulatory area (in thousands of pounds, net weight), 1994 - 2002.

Regulatory Area	Commercial Catch[1]								
	1994	1995[2]	1996[2]	1997	1998[2]	1999[2]	2000[2]	2001	2002
2A[4]	370	297	296	413	460	450	482	680	851
2B	9,911	9,623	9,545	12,420	13,172	12,705	10,811	10,288	12,074
2C	10,379	7,766	8,872	9,920	10,196	10,143	8,445	8,403	8,602
3A	24,844	18,336	19,693	24,628	25,698	25,316	19,288	21,541	23,131
3B	3,860	3,125	3,662	9,072	11,161	13,835	15,413	16,336	17,313
4A	1,803	1,617	1,699	2,907	3,418	4,369	5,155	5,015	5,091
4B	2,017	1,680	2,069	3,318	2,901	3,571	4,692	4,466	4,080
4C	715	668	680	1,117	1,256	1,762	1,737	1,647	1,210
4D	711[5]	643	706	1,152	1,308	1,891	1,931	1,844[6]	1,753[7]
4E	120[8]	127	120	251	188	264	351	479[6]	555[7]
Total	54,730	43,882	47,342	65,198	69,758	74,306	68,305	70,699	74,660
Regulatory Area	Commercial Catch Limits								
	1994	1995	1996	1997	1998	1999	2000	2001	2002
2A[4]	355.3	278	275	374.2	440.9	412.5	468.1	681.4	817.9
2B	10,000	9,520	9,520	12,500	13,000	12,100	10,600	10,510	11,750
2C	11,000	9,000	9,000	10,000	10,500	10,490	8,400	8,780	8,500
3A	26,000	20,000	20,000	25,000	26,000	24,670	18,310	21,890	22,630
3B	4,000	3,700	3,700	9,000	11,000	13,370	15,030	16,530	17,130
4A	1,800	1,950	1,950	2,940	3,500	4,240	4,970	4,970	4,970
4B	2,100	2,310	2,310	3,480	3,500	3,980	4,910	4,910	4,180
4C	700	770	770	1,160	1,590	2,030	2,030	2,030	2,030
4D	700[5]	770	770	1,160	1,590	2,030	2,030	2,030	2,030
4E	100[7]	120	120	260	320	390	390	390	390
Total	56,755.3	48,418	48,415	65,874.2	71,440.9	73,712.6	67,138.1	72,721.4	74,427.5

[1] Commercial catch includes IPHC research catch and in Area 2C, the Metlakatla fishery catch.
[2] Poundage figures have been updated from previous publications.
[3] Preliminary.
[4] Does not include treaty Indian ceremonial and subsistence fish.
[5] Includes Subarea 4D-N: 1994 = 18,000.
[6] Areas 4D and 4E CDQ could be fished in either area regardless of quota share designation by NMFS enforcement waiver.
[7] Area 4D CDQ could be fished in Area 4E by IFQ regulation.
[8] Area 4E includes Area 4E-SE (Bristol Bay fishery) and Area 4E-NW (Nelson Island fishery).

Appendix I.

Table 3. The total catch (thousands of pounds, net weight) from the 2002 commercial fishery, including IPHC research, of Pacific halibut by regulatory area and month.

Reg Area	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Total
2A	108	148	231	136	179	28	11	10	-	851
2B	1,004	2,407	1,510	1,328	1,338	1,406	1,499	1,281	301	12,074
2C	736	1,606	1,536	1,454	968	866	985	359	92	8,602
3A	2,650	3,940	4,680	3,605	2,412	2,078	1,881	1,284	601	23,131
3B	113	1,467	4,175	3,283	2,882	2,130	1,739	1,139	385	17,313
4A	-	138	476	501	1,211	1,759	718	198	90	5,091
4B	56	163	592	655	759	974	448	296	137	4,080
4C	-	-	-	128	519	479	60	24	-	1,210
4D	-	-	98	128	492	428	465	98	44	1,753
4E	-	-	29	242	144	89	38	13	-	555
Alaska Total	3,555	7,314	11,586	9,996	9,387	8,803	6,334	3,411	1,349	61,735
Monthly Total	4,667	9,869	13,327	11,460	10,904	10,237	7,844	4,702	1,650	74,660

Appendix I.

Table 4a. Number of vessels and catch (thousands of pounds, net weight) of Pacific halibut by vessel length class in the 2002 commercial fishery for Area 2B, Alaska, and the Alaskan regulatory areas.

Overall Vessel Length	Area 2B		Alaska	
	No. of Vessels	Catch (000's lbs.)	No. of Vessels	Catch (000's lbs.)
Unk. Length	12	378	76	547
0 to 25 ft.	0	0	245	535
26 to 30 ft. [1]	-	-	142	984
31 to 35 ft. [1]	8	168	265	4,991
36 to 40 ft.	57	2,036	222	3,011
41 to 45 ft.	61	3,106	185	5,009
46 to 50 ft.	27	2,063	156	6,225
51 to 55 ft.	23	1,796	74	4,006
56 + ft.	30	2,527	287	36,427
Total	218	12,074	1,652	61,735

Overall Vessel Length	Area 2C		Area 3A	
	No. of Vessels	Catch (000's lbs.)	No. of Vessels	Catch (000's lbs.)
Unk. Length	53	162	14	137
0 to 25 ft.	76	140	40	104
26 to 30 ft.	50	280	36	194
31 to 35 ft.	111	1,031	97	1,719
36 to 40 ft.	131	999	100	1,484
41 to 45 ft.	94	1,193	112	2,112
46 to 50 ft.	92	1,686	94	2,538
51 to 55 ft.	42	931	49	1,747
56 + ft.	102	2,180	214	13,096
Total	751	8,602	756	23,131

Overall Vessel Length	Area 3B		Area 4	
	No. of Vessels	Catch (000's lbs.)	No. of Vessels	Catch (000's lbs.)
Unk. Length [2]	5	161	8	90
0 to 25 ft. [2]	-	-	129	289
26 to 30 ft.	0	0	57	510
31 to 35 ft.	28	794	70	1,447
36 to 40 ft.	26	450	5	77
41 to 45 ft.	37	1,063	5	641
46 to 50 ft.	37	1,473	10	528
51 to 55 ft.	23	1,096	4	231
56 + ft.	162	12,276	86	8,876
Total	318	17,313	374	12,689

Appendix I.

Table 4b. Number of vessels and catch (thousands of pounds, net weight) of Pacific halibut by vessel length class in the 2002 commercial fishery for Area 2A commercial fisheries not including the treaty Indian commercial fishery.

Overall Vessel Length	Area 2A Directed Commercial	
	No. of Vessels	Catch (000's lbs.)
Unk. Length [3]	6	3.0
0 to 25 ft. [3]	-	-
26 to 30 ft.	0	0.0
31 to 35 ft.	5	2.0
36 to 40 ft.	25	41.0
41 to 45 ft.	21	66.0
46 to 50 ft.	19	47.0
51 to 55 ft.	16	45.0
56 + ft.	17	69.0
Total	109	273.0

Overall Vessel Length	Area 2A Incidental Commercial (Salmon)		Area 2A Incidental Commercial (Sablefish)	
	No. of Vessels	Catch (000's lbs.)	No. of Vessels	Catch (000's lbs.)
Unk. Length [4]	-	-	4	6.1
0 to 25 ft.	5	0.3	0	0.0
26 to 30 ft.	0	0.0	0	0.0
31 to 35 ft.	13	2.5	0	0.0
36 to 40 ft.	28	7.6	6	3.6
41 to 45 ft.	27	26.4	9	13.8
46 to 50 ft.	14	3.9	6	6.5
51 to 55 ft. [4]	3	0.2	-	-
56 + ft.	0	0.0	16	34.7
Total	90	40.9	41	64.7

For reasons of confidentiality:
[1] 26 to 30 ft vessels were combined with 31 to 35 ft vessels in Area 2B
[2] 0 to 25 ft vessels were combined with unknown length vessels in Area 3B
[3] 0 to 25 ft vessels were combined with unknown length vessels in the Area 2A directed commercial fishery
[4] 51 to 55 ft vessels were combined with unknown length vessels in the Area 2A incidental commercial (sablefish) fishery

Appendix I.

Table 5. Fishing periods, number of fishing days, catch limit, commercial, research and total catch (thousands of pounds, net weight) by regulatory area for the 2002 Pacific halibut commercial fishery.

Area	Fishing Period	No. Of Days	Catch Limit	Commercial Catch	Research Catch	Total
2A treaty Indian	3/18 – 3/20	2.0		81		
	4/2	1.0		106		
	4/30	1.5		203		
	Restricted: 3/20-4/19			69		
	Restricted: 5/5 -5/9			13		
treaty Indian total			467.5	472		472
2A Commercial Incidental in Salmon fishery	May 1 – Aug 21		39.3	41		41
Incidental in Sablefish fishery	May 1- Oct 31		88.4	65		65
Directed	June 26[1]	10-hrs		125		
	July 10[1]	"		78		
	July 24[1]	"		57		
			222.7	260	13	273
Commercial total			350.4	366	13	379
2A Total			817.9	838	13	851
2B	3/18 – 11/18	245	11,750[2]	11,987[3]	87	12,074
2C	3/18 – 11/18	245	8,500[4]	8,455[5]	147	8,602
3A	3/18 – 11/18	245	22,630[4]	22,614	517	23,131
3B	3/18 – 11/18	245	17,130[4]	17,003	310	17,313
4A	3/18 – 11/18	245	4,970[4]	5,002	89	5,091
4B	3/18 – 11/18	245	4,180[4]	4,030	50	4,080
4C	3/18 – 11/18	245	2,030[4]	1,210		1,210
4D	3/18 – 11/18	245	2,030[4]	1,693[6]	60	1,753
4E	3/18 – 11/18	245	390	555[6]		555
Alaska Total			61,860	60,562	1,173	61,735
Total			74,427.5	73,387	1,273	74,660

[1] Fishing period limits by vessel class.

[2] An additional 371,943 pounds available as carryover from 2001.

[3] Includes the pounds that were landed by Native communal commercial licenses (F licenses).

[4] Additional net carryover pounds (thousands) from the underage/overage program were: 2C = 303; 3A = 420; 3B = 309; 4A = 83; 4B = 137; 4C = 57; 4D = 28.

[5] Includes 42,390 pounds taken by Metlakatla Indians during additional fishing within reservation waters.

[6] Areas 4D CDQ could be fished in Area 4E by IFQ regulation.

Appendix I.

Table 6. Commercial landings (thousands of pounds, net weight) of Pacific halibut by port, country of origin and IPHC research catch for 2002.

Port Region	Canada	United States	IPHC Research	Total
California & Oregon		391	13	404
Seattle		31		31
Bellingham		1,937		1,937
Misc. Washington		552		552
Vancouver	1,695		19	1,714
Port Hardy	4,135		26	4,161
Misc. Southern BC	962		4	966
Prince Rupert & Port Ed.	4,797	53	172	5,022
Misc. Northern BC	398			398
Ketchikan, Craig, Metlakatla		1,011	8	1,019
Petersburg, Kake		2,275		2,275
Juneau		2,780	49	2,829
Sitka		2,255	50	2,305
Hoonah, Excursion, Pelican		1,596		1,596
Misc. Southeast Alaska		1,422		1,422
Cordova		1,342	45	1,387
Seward		7,562	181	7,743
Homer		13,665	80	13,745
Kenai		185		185
Kodiak		7,391	211	7,602
Misc. Central Alaska		6,217	163	6,380
Akutan & Dutch Harbor		6,318	202	6,520
Bering Sea		4,417	50	4,467
Total	11,987	61,400	1,273	74,660

Appendix I.

Table 7. Commercial halibut fishery catch (thousands of pounds) in 2002 by country, statistical area, and regulatory area.

Stat Area Group	Catch			Regulatory Area	Catch for Reg. Area
	Commercial	Research	Grand Total		
00-03	260	3	263		
04	128	1	129	2A	851
05	450	9	459		
06	295	3	298		
07	295	1	296		
08	599	2	601		
10 - I	2,120	28	2,148		
10 - O	987	1	988		
11 - I	1,874	20	1,894		
11 - O	170		170	2B	12,074
12 - I	396	5	401		
12 - O	241		241		
13 - I	3,407	11	3,418		
13 - O	874	6	880		
9 - I	450	7	457		
9 - O	279	3	282		
14 - I	370	24	394		
14 - O	251	20	271		
15 - I	1,386	18	1,404		
15 - O	543	34	577		
16 - I	1,475	11	1,486	2C	8,602
16 - O	1,403	19	1,422		
17 - I	419	4	423		
17 - O	825	8	833		
18S - I	753	4	757		
18S - O	1,030	5	1,035		
18W	1,784	15	1,799		
19	748	30	778		
20	1,344	28	1,372		
21	694	18	712		
22	1,068	13	1,081		
23	868	20	888	3A	23,131
24	4,233	39	4,272		
25	3,469	85	3,554		
26	3,433	116	3,549		
27	2,916	82	2,998		
28	2,057	71	2,128		
29	6,599	55	6,654		
30	3,449	74	3,523		
31	1,825	62	1,887	3B	17,313
32	2,941	55	2,996		
33	1,623	42	1,665		
34	566	22	588		
35	531	8	539		
36	622	3	625		
37	365	11	376		
38	1,199	10	1,209		
39	11	2	13	4	12,689
40	401	2	403		
41	224	3	227		
42+	1,071	27	1,098		
Bering Sea	8,066	133	8,199		
Total	73,387	1,273	74,660		74,660

Appendix II.

Table 1. The fishing period limits (net weight) by vessel class used in the 2002 directed commercial fishery in Area 2A.

Vessel Class		Fishing Periods (Pounds)		
Letter	Feet	June 26	July 10	July 24
A	0-25	405	335	335
B	26-30	505	420	420
C	31-35	805	670	670
D	36-40	2,220	1,850	1,850
E	42-45	2,390	1,990	1,990
F	46-50	2,860	2,385	2,385
G	51-55	3,190	2,660	2,660
H	56+	4,800	4,000	4,000

Table 2. Metlakatla community fishing periods, number of vessels, and halibut catch (net weight), 2002.

Fishing Period Dates	Number Of Vessels	Catch (Pounds)
May 10 - 12	5[1]	619
May 24 - 26	6	1,602
June 10 -12	8	3,369
June 21 - 23	12	5,171
July 5 - 7	10	4,137
July 19 - 21	14	7,892
August 2 - 4	10	5,009
August 16 - 18	10	3,580
August 30 - September 1	9[1]	4,314
September 13 - 15	4	2,721
September 27 - 29	4	3,976
October 11 - 13	0	0
12 Fishing Periods		42,390

[1]one vessel fished but had zero halibut catch

Appendix III.

Table 1. Fishing dates, opportunity, size limits, and bag limits for the 2002 Pacific halibut sport fishery.

Area	Fishing Dates	Fishing Days	Days Open	Size Limit	Bag Limit
2A					
WA Inside Waters (east of Low Point)	5/9-7/12	47	5 (Thur-Mon)	No	1
WA Inside Waters (Low Point to Sekiu River	5/23-7/26	47			
WA North Coast (Sekiu River to Queets River)	5/1-5/28	23	5 (Tues-Sat)	No	1
	7/3 - 7/4		2 (Wed-Thur)		
	8/3		1 (Saturday)		
WA South Coast (all depths) (Queets River to Ledbetter Point)	5/1-7/11	52	5 (Sun-Thur)	No	1
	7/12-9-27	24	2(Fri-Sat)		
WA South Coast (near shore)	5/1--9/30	153	7	No	1
Columbia River (Leadbetter Point to Cape Falcon)	5/1-5/25	25	7	First @ 32”	1
OR Central Coast (all depths) (Cape Falcon to Siuslaw River)	5/10-5/11	8	2 (Fri-Sat)	First @ 32”	1
	5/17-18		2 (Fri-Sat)		
	6/7-6/8		2 (Fri-Sat)		
	6/21-6/22		2 (Fri-Sat)		
OR South Coast (all depths) (Siuslaw River to Humbug Mt.)	5/10-5/11	8	2 (Fri-Sat)	First @ 32”	1
	5/17-18		2 (Fri-Sat)		
	6/7-6/8		2 (Fri-Sat)		
	6/21-6/22		2 (Fri-Sat)		
OR Coast (<30 fathoms)(Cape Falcon to Humbug Mountain)	5/1-9/30	153	7	First @ 32”	1
OR Coast (all depths) (Cape Falcon to Humbug Mountain)	8/2-8/3	8	2 (Fri-Sat)	First @ 32”	1
	8/23-8/24		2 (Fri-Sat)		
	9/18-9/21		4 (Wed-Sat)		
OR/CA (south of Humbug Mt.)	5/1-9/30	153	7	First @ 32”	1
2B, 2C, 3 and 4	2/1-12/31	334	7	No	2

Appendix III.

Table 2. 2002 harvest allocations and estimates (pounds, net weight) by subarea within Regulatory Area 2A.

Sub Area	Allocation	Catch Estimate	Over/Under
WA Inside Waters[1]	57,393	39,915	-17,478
WA North Coast	108,030	104,147	-3,883
WA South Coast (all depths)[2]	42,739	38,518	-4,221
WA South Coast (near shore)		0	0
Columbia River	11,188	9,764	-1,424
OR Central Coast (all depths)	156,835	113,576	-43,259
OR South Coast (all depths)	14,609	12,672	-1,937
OR Coast (<30 fathoms)	19,797	2,268	-17,529
OR Coast[3]	57,660	70,030	+12,370
OR/CA (south of Humbug Mt.)	7,860	7,860	0

[1] Season estimate is still preliminary

[2] The Washington South Coast all-depth fishery was restricted to two defined areas and reduced fishing - commencing on July 12.

[3] After accounting for underages and overages in previous openings from Cape Falcon to Humbug Mountain, about 100,000 pounds remained to be harvested.

Table 3. Harvest by sport fishers (millions of pounds, net weight) by regulatory area, 1977-2002.

Year	Area 2A	Area 2B	Area 2C	Area 3A	Area 3B	Area 4	Total
1977	0.013	0.008	0.072	0.196			0.289
1978	0.010	0.004	0.082	0.282			0.378
1979	0.015	0.009	0.174	0.365			0.563
1980	0.019	0.006	0.332	0.488			0.845
1981	0.019	0.012	0.318	0.751		0.012	1.112
1982	0.050	0.033	0.489	0.716		0.011	1.299
1983	0.063	0.052	0.553	0.945		0.003	1.616
1984	0.118	0.062	0.621	1.026		0.013	1.840
1985	0.193	0.262	0.682	1.210		0.008	2.355
1986	0.333	0.186	0.730	1.908		0.020	3.177
1987	0.446	0.264	0.780	1.989		0.030	3.509
1988	0.249	0.252	1.076	3.264		0.036	4.877
1989	0.327	0.318	1.559	3.005		0.024	5.233
1990	0.197	0.381	1.330	3.638		0.040	5.586
1991	0.158	0.292	1.654	4.264	0.014	0.127	6.509
1992	0.250	0.290	1.668	3.899	0.029	0.043	6.179
1993	0.246	0.328	1.811	5.265	0.018	0.057	7.725
1994	0.186	0.328	2.001	4.487	0.021	0.042	7.065
1995	0.236	0.887	1.759	4.511	0.022	0.055	7.470
1996	0.229	0.887	2.129	4.740	0.021	0.077	8.084
1997	0.355	0.887	2.172	5.514	0.028	0.069	9.025
1998	0.383	0.887	2.501	4.702	0.017	0.096	8.585
1999	0.338	0.859	1.843	4.228	0.017	0.094	7.379
2000	0.344	1.021	2.258	5.305	0.015	0.073	9.017
2001	0.446	1.015	1.925	4.675	0.016	0.029	8.106
2002[1]	0.399	1.194	2.512	4.511	0.010	0.037	8.663

[1] Only Area 2A is current; all other areas are projected harvests.

PUBLICATIONS

The IPHC publishes three serial publications - Annual reports, Scientific reports, and Technical reports - and also prepares and distributes regulation pamphlets and information bulletins. Items produced during 2002 by the Commission and staff are shown below and a list of all Commission publications is shown on the following pages. In addition, a listing of articles published by the Commission staff in outside journals is available on our website.

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