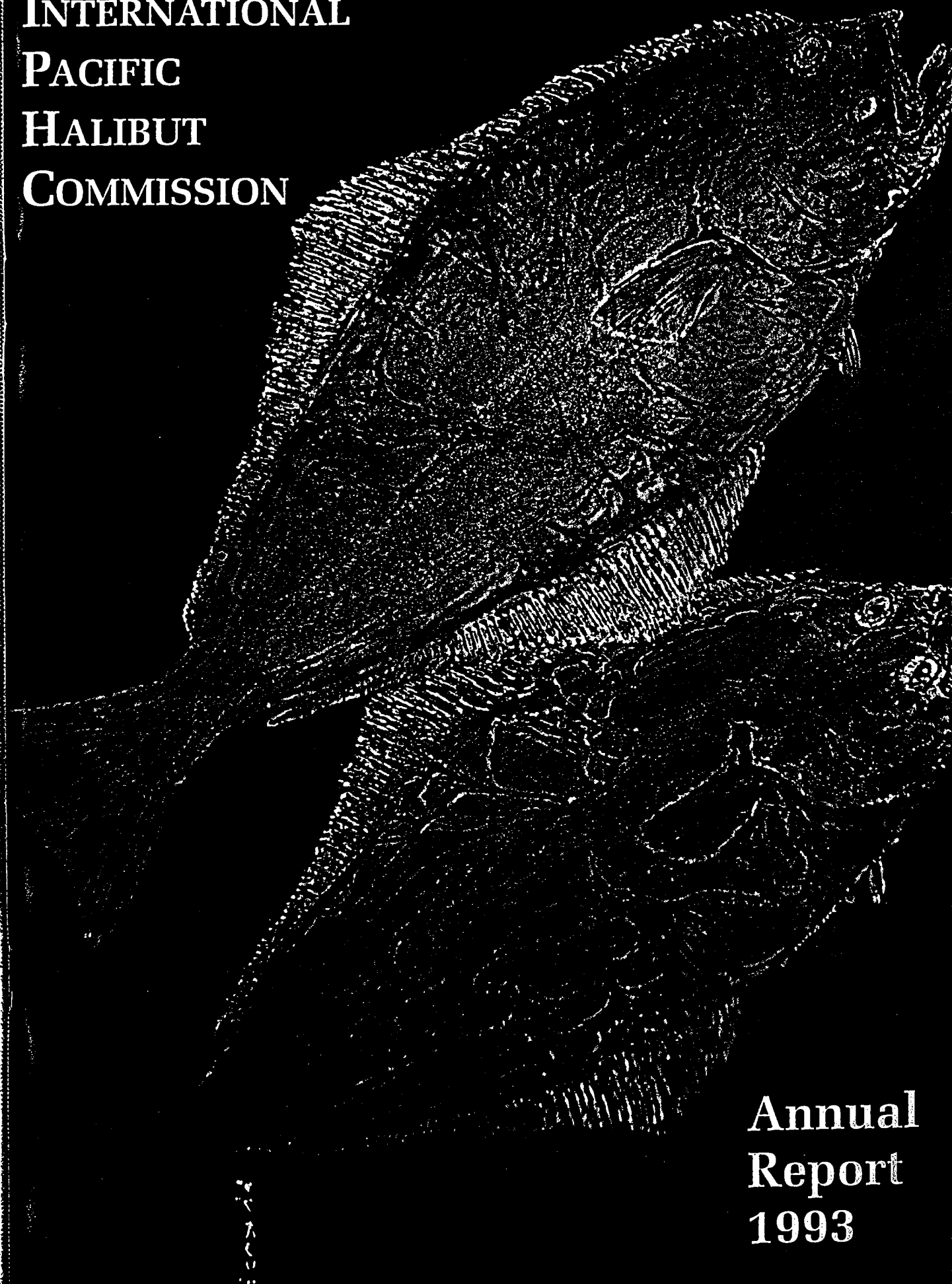


**INTERNATIONAL
PACIFIC
HALIBUT
COMMISSION**



**Annual
Report
1993**

INTERNATIONAL PACIFIC HALIBUT COMMISSION

Annual Report
1993

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

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| Allan T. Sheppard | Richard Eliason |
| Steven Pennoyer | Brian Van Dorp |

Director

Donald A. McCaughran

Scientific Advisors

Bruce Leaman
Loh-Lee Low

Produced jointly by the IPHC staff
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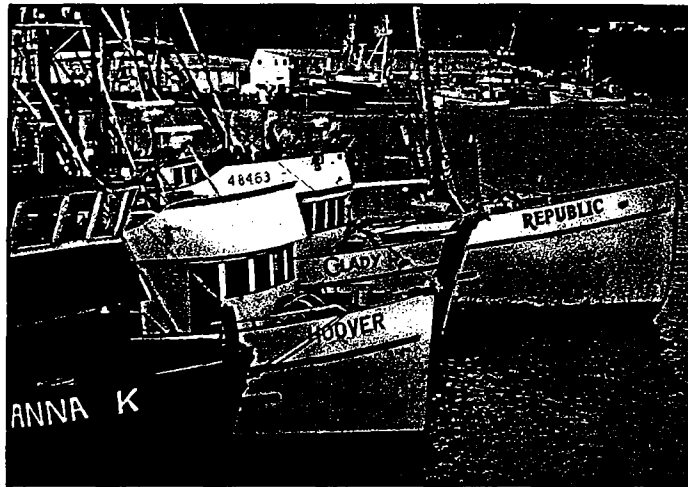
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PREFACE

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. Each country pays one-half of the Commission's annual expenses, as required by the Halibut Convention. 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 the Conference Board, which represents vessel owners and fishermen. 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 International Pacific Halibut Commission 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 numbering of that series has 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 multiplying the dressed weight by a factor of 1.33.

ABOUT THE COVER

North America is discovering gyotaku art, thanks in part to Doug Olander's unique watercolor impressions printed on rice paper from fresh fish. This Japanese tradition uses fish, painted on one side, as "rubber stamps." Olander printed this Pacific halibut on a boat anchored near Work Channel, British Columbia, where he caught the fish on a jig. Olander's gyotaku has been featured in newspapers, the international journal *Wildlife Art News* (July, 1994) and a book—*Gyotaku Fish Impressions: The Art of Japanese Fish Printing* by Doug Olander—available in bookstores nationally or from the author. He may also be contacted about purchasing original paintings of fish captured/printed from Alaska to the Amazon: (407) 628-4802.

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ACTIVITIES OF THE COMMISSION 1993

DANCING AT THE CONTINENT'S EDGE

6

Along the Pacific ridge of the North American continent, ocean currents kick up nutrients that feed an array of marine creatures, from the otherworldly phytoplankton to the great whales. Here, along the continental shelf between the Monterey Canyon and the Aleutian Basin of the Bering Sea, some of the sea's most edible treasures arrange themselves. Is it the hunger for food from another world that drives us to the sea for fishing? Is it simply money?

Some combination, perhaps, drives thousands of fishermen from



Bodega Bay to St. Lawrence Island to jump into boats and stare down storm fronts to drop their hooks over the side. There are, indeed, plenty of fish in the sea, but one in particular holds its place in the hearts of fishermen everywhere: the Pacific halibut. The world of the halibut is changing, and so is the world of the halibut

harvester. Sport, commercial and traditional fisheries are learning to adapt to their changing environment, even as the grand flatfish themselves learned, somehow, to lay low and keep both eyes open. After seventy years of studying Pacific halibut, we who observe and harvest and who live by its lessons have amassed volumes of data, statistics, biological knowledge, theorems, supporting information and a greater understanding of the ocean and its inhabitants.

IN THE BUSINESS OF THE SEA

All education transforms. As the IPHC studies Pacific halibut and its environs, we sometimes can transform what we learn into improvements in fishery management. In early 1993, the IPHC adopted six new regulations to help explore new fishing grounds, to refine management policies, and to improve data collection.

1. The Commission created a new sub-area within Area 4D, called 4D-N, to allow exploratory fishing around St. Lawrence Island in the Bering Sea. A special catch limit of 20,000 pounds was allocated to this area out of the

- total 4D catch limit. Unharvested poundage from that allocation reverted back to the general Area 4D after August 12.
2. An amendment to Canada's Individual Vessel Quota (IVQ) fishery increased the allowable catch overage from 5% to 10%. With this increase, quota holders who harvest up to 10% more or less than their remaining quota on the last trip and will find their quota increased or decreased accordingly the following year. Any overharvest of more than 10% is penalized, either by confiscation or fines or both.
 3. The IPHC now requires that fishermen record all harvested halibut, including take-home fish, in their log books.
 4. Fishermen are now required to follow careful handling procedures when releasing fish. This regulation will help undersized fish, or those released after fishing period limits are exceeded, to survive.
 5. As usual, the IPHC set catch limits and fishing period schedules for all halibut fishing areas. We maintained our policy of setting catch limits based on harvesting 30% of the exploitable biomass.
 6. The IPHC also adopted the catch sharing plan as requested by the Pacific Fishery Management Council. This plan divides the harvest limit between commercial, sport, and treaty Indian uses in Area 2A, off the U.S. West Coast.

NEW RULES ONSHORE AS WELL

The fiscal year was amended to run October 1 through September 30. This resulted in a short budget period of 6 months starting April 1, 1993 and ending September 30, 1993. The budget set for this short year was \$833,500, 50% of the previous year's budget. The research budget for this period was set at \$125,000 to be funded from sources other than appropriated government funds.

The IPHC's overall budget is funded equally by the Canadian and U.S. governments, under a convention established in 1923 - the first international agreement between two countries to cooperatively manage a common marine resource. Within the Commission's overall budget, the research budget funds the kind of projects that bring us a deeper understanding of the Pacific halibut: investigations into migratory patterns, into genetic differentiation, into the underwater behavior of halibut, into the many forces that boost or deplete halibut populations.

At its January, 1993 Annual Meeting in Vancouver, chaired by Commissioner Richard J. Beamish, the IPHC made several administrative decisions of interest. The Commission asked the IPHC staff to review mortality estimates for halibut bycatch, and to work with the Pacific Fishery Management Council to refine bycatch estimates for Area 2A. Government attorneys were asked to investigate the legalities of a requirement that all incidentally caught halibut must be returned to the sea immediately. This request was in response to reports that in some trawl operations, halibut are not always sorted from the groundfish catch until the vessel has landed. The Commission directed the staff to step up cooperative efforts with other agencies to improve the accuracy of personal use and other poorly documented harvests of halibut. Also, the Commission instructed Director

Hot topics for 1993 What issues caused the most concern for the IPHC this year? This list won't surprise anyone.

1. Reducing incidental catches of halibut in other fisheries;
2. Obtaining better information about personal-use and other undocumented harvests;
3. Proposals to allow bycatch retention for charitable purposes.

McCaughran to express to the North Pacific Fishery Management Council its disapproval of a proposal that would allow trawlers fishing off Alaska to land some incidentally caught halibut for charitable purposes.

In other administrative business, the U.S. fiscal year was changed to October 1 - September 30; Coopers and Lybrand was retained for the 1993 financial audit; and Commissioner Steve Pennoyer (U.S.) was elected chairman of the IPHC for 1993. Dr. Richard Beamish (Canada) was named vice-chairman.

DIRECTOR'S REPORT

In the 1987 Annual Report I recommended the Pacific Halibut Fishery be converted to an individual transferable quota (ITQ) system. In 1991 the Canadian Government implemented such a system in the Canadian fishery and the U.S. Government plans to implement a similar system in the spring of 1995. The preliminary results from the Canadian system and the planned U.S. system are worthy of comment.

The Canadian system was fairly easy to implement since there was already a license limitation in place and only 437 licensed halibut fishermen to work with. Initial allocation was based on historical landings and vessel length. The fishermen are charged \$.08 per pound to pay for enforcement and monitoring. The monitoring of catches is conducted by a private company. Each vessel must give notification of landing and all landings are monitored. Extra enforcement officers have been hired and combined with self policing by the fleet the fishery is well controlled. The Commission receives the log of each fishing trip. This has upgraded our fishery data program and, consequently, the management of the fishery. Most halibut caught in the Canadian fishery go to the fresh market and the fishermen benefit from the higher price paid for their fish. Canadian fishermen average approximately \$1.00 per pound (U.S.) more than their U.S. counterparts. Most halibut produced in the U.S. is frozen. The consumers have benefitted from the constant supply of fresh fish over an eight month period. The fishery is safer and value of the resource has increased.

The U.S. system is based on historical participation and has no limitation on quota size. There are roughly 6,700 fishermen qualifying for the initial quota distribution. This represents a tremendous cost to harvest this resource, but hopefully as time goes on, the fishery can be consolidated. The advice from other countries that have implemented ITQ programs is to go slowly and carefully and involve the harvesters.

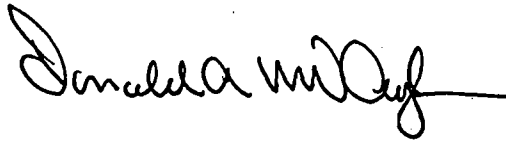
The Canadian system allowed no transfer of quotas for the first two years and only now will allow limited transfer. Maximum transfer will only cause the fleet to consolidate to one half its present size. The U.S. system has three vessel size classes and will not allow transfer between the classes. These restrictions come about for several reasons (1) the desire to use fisheries to create jobs, (2) the perception that the larger more efficient vessels will eventually own most of the quota shares, and (3) the desire to maintain a small boat fleet in Alaska to quiet the political pressure of



the many part-time fishermen who wish to supplement their income with the sale of a few hundred pounds of halibut. These constraints are social/political in nature and may have merits to some, but they detract from the economic efficiency ITQ systems are designed to promote. However, both systems are such a great improvement on the "status quo" that these criticisms are small in comparison to their positive advantages. As time goes on however, both U.S. and Canadian systems need to relax the transferability rules in order to promote economic efficiency.

The Canadian ITQ system has adequate enforcement and monitoring. The U.S. system is untried and some doubt remains whether adequate monitoring of the catches by area will be accomplished. Managers from other countries claim "paper trail" systems are inadequate and monitoring must be done at time of unloading. Accurate monitoring of catches is crucial to IPHC management. The Commission will, therefore, be a keen observer of the U.S. system.

While growing pains are to be expected, the potential economic and conservation gains are great; we applaud the fishermen and managers in both countries for their wisdom and effort in changing the 100 year old open access system.



Donald A. McCaughran

Director

THE FISHERY

WE GATHER WHAT WE DID NOT SOW

Halibut schooners have plied the waters of the North Pacific since 1890, when the first block of ice hit the wooden hold of the *Oscar and Hattie* opening the gates to the distant-water fisheries of the North Pacific. It was not bravery that opened the halibut fishery to exploitation a century ago, not hunger for the fish or stout adventuresomeness of the fisherman; it was the ability to make ice. For all our romance about the sea, technology rules us. We venture not because we have to. We venture because we *can*.

In 1993, fishermen coastwide harvested more than 85 million pounds of Pacific halibut; commercial fishermen harvested 59.3 million pounds, sport fishermen 7.3 million pounds and personal use take accounted for 1.1 million pounds. Bycatch mortality accounted for 15.2 million pounds of halibut. About 2.3 million pounds of halibut were wasted in 1993, victims of lost or abandoned gear or simply of bad timing. An estimated 1.4 million pounds of those wasted halibut were smaller than legal size (32 inches long) and were discarded but did not survive.

Fishermen throughout the North Pacific are exploring ways to help decrease halibut bycatch and waste and these efforts have paid off. Both bycatch and waste dropped significantly between 1991 and 1992 (as a percentage of total harvests), but in 1993 the percentage remained about the same. To try and keep the harvest in check, the commercial catch is cut to adjust for other harvests such as bycatch and waste. This procedure is used because the Commission has direct control of only the

commercial fishery. In 1993, the commercial catch comprised 69% of the total take of Pacific halibut. This percentage has stayed about the same for a few years. The sport harvest has generally increased over the last six years, and this year accounted for 8% to 9% of total removals.



Snapshot of the 1993 take: Commercial harvest
59.3 million pounds
Sport harvest
7.3 million pounds
Personal Use
1.1 million pounds
Bycatch mortality
15.2 million pounds
Waste mortality
2.3 million pounds

THE COMMERCIAL FISHERY

Halibut Regulatory Areas for 1993

Pacific halibut populate the waters off western North America, from the central Bering Sea all the way south to Morrow Bay, California. Some halibut migrate nearly this entire range in their lifetime, starting as juveniles, moving southward as they mature.

"Nothing is more tedious than a landscape without names," wrote Prosper Merimee Colomba in 1840. To the halibut, whose lexicon is saltwater and biology, names are meaningless. But for the halibut fisherman the open range needs demarcation, if only for purposes of fishery management. The range of the Pacific halibut within two hundred miles of the North American coastline is partitioned into ten areas (not including a new subarea created this year within Area 4D. The Commission sets catch limits for each area, and fishing periods are determined separately for each area as well.

The map of the halibut fisheries looks about the same in 1993 as it has in previous years, with the addition of Subarea 4D-N, around St. Lawrence Island, created to facilitate development of a commercial fishery among local fishermen. The halibut nursery grounds in the Southeastern flats of the Bering Sea (excluding Bristol Bay) remained closed to all halibut fishing, as they have been since 1967.

The halibut areas are shown in Figure 1. Following is a brief description:

- 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 Alaska, south and east of Cape Spencer
- Area 3A - all waters between Cape Spencer and Cape Trinity, Kodiak Island
- Area 3B - all waters between Cape Trinity and a line extending southeast from Cape Lutke, Unimak Island
- Area 4A - all waters west of Area 3B and the Bering Sea closed area that are south of 56°20'N and east of 172°00'W
- Area 4B - all waters in the Gulf of Alaska and the Bering Sea west of Area 4A and south of 56°20'N
- Area 4C - all waters in the Bering Sea 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 in the Bering Sea north of Areas 4A and 4B, north and west of Area 4C, and west of longitude 168°00'W
- Subarea 4D-N - the portion of Area 4D that is north of latitude 62°30'N
- Area 4E - all waters in the Bering Sea north and east of the closed area, east of Areas 4C and 4D, and south of 65°34'N.

A Richer Harvest

In 1993 commercial longliners hauled aboard 59.3 million pounds (dressed weight) of Pacific halibut, topping the catch limit by 5.2 million pounds. This year's catch was .6 million pounds smaller than the 1992

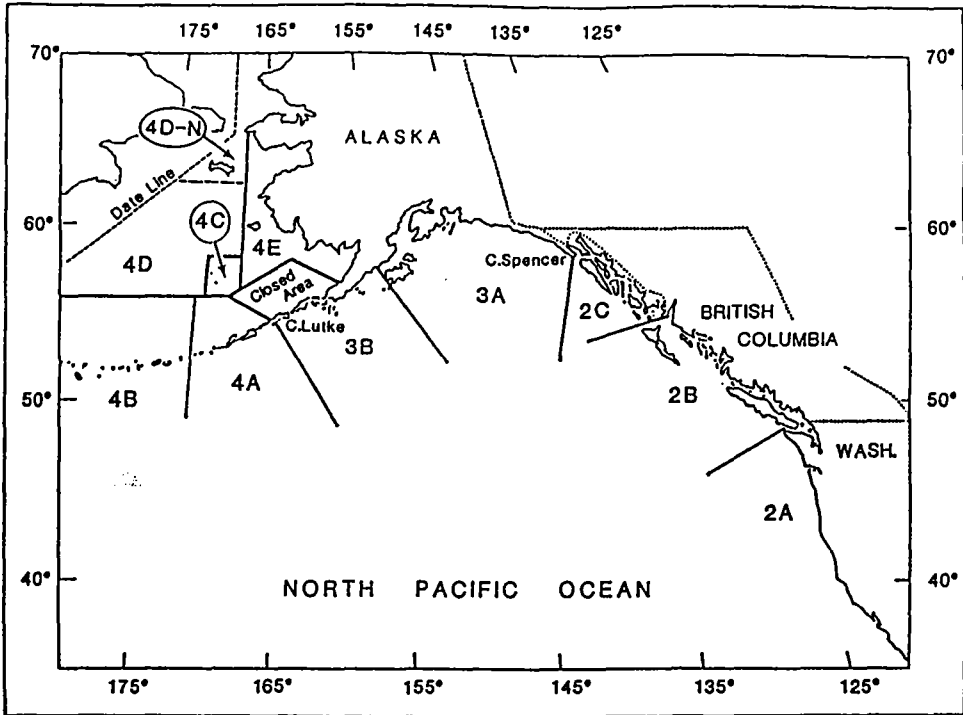
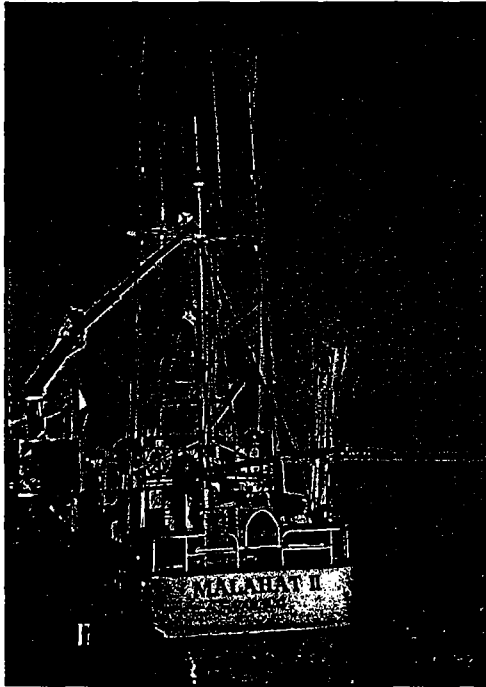


Figure 1. IPHC regulatory areas in 1993.

harvest, which undershot the limit by a small margin.

The commercial halibut fishery draws thousands of U.S. and Canadian fishing vessel owners, in addition to their crews. In 1993, 5,577 commercial vessel license applications were processed for U.S. waters, 11% fewer than the year before. Most, 4,942, were licenses for vessels intending to fish waters off Alaska (compared to 5,619 in 1992). Washington license applicants numbered 244 this year (265 in 1992); Oregon saw the only increase, to 332 permits (327 in 1992) and California only 59 (compared to 62 the year before). Canadian halibut grounds are managed under an Individual Vessel Quota (IVQ) system, and this year 435 Canadian vessels were eligible to receive IVQ shares.



Since 1989, the total Pacific halibut catch by commercial fishermen decreased 11%, from 66.9 million pounds to 59.3 million pounds.

Each year, the IPHC sets catch limits for each fishing area. Seasons are limited and fishing period limits may be used to help fishermen reach the catch limit without exceeding it.

New in 1993 was a provision in Canada's halibut management plan which allowed limited transferrability of IVQs between eligible ("L" license) vessels. Each vessel's IVQ allotment was split into two equal "shares". A vessel could then fish its two shares, transfer one or both of its shares to other eligible vessels, or could obtain one or two additional shares from other vessels thereby allowing it to fish a maximum of four shares during the year. This transferrability provision resulted in the total Area 2B catch being harvested by 355 vessels.

Some New Dance Steps

Since 1989, the total Pacific halibut catch by commercial fishermen decreased 11%, from 66.9 million pounds to 59.3 million pounds. The IPHC tries to regulate the commercial fisheries primarily to maximize the health of the stocks, and secondarily to provide for the greatest opportunity and flexibility for harvesters. All the IPHC's recommended regulations are forwarded to the U.S. and Canadian governments for approval, and in 1993 every recommendation was approved and implemented.

Catches have decreased most dramatically in Area 3A, and have actually increased in other areas, most significantly in Area 2C, and in Area 4. In Area 2B, off British Columbia, harvests dropped after 1989 but rose again in 1993 to slightly higher than 1989 levels.

Each year, the IPHC sets catch limits for each fishing area, and also tries to build flexibility into the regulations, using fishing period limits and other regulations, to help fishermen reach the catch limit without exceeding it. Fishing period limits restrict the poundage (measured by dressed, head-off weight) that a vessel can deliver within a certain time period. Landings over the vessel limit are subject to forfeiture; gross violations can bring a fine as well. Fishing period limits are an effective management tool that controls catch without restricting fishing time, thereby giving the fleet more fishing opportunity than they otherwise would have at the end of an opening when catches climb up around the limit.



Some new regulations are creating opportunities for a portion of the halibut fleet. In 1993, the area off St. Lawrence Island received its own catch limit of 20,000 pounds. This subarea (4D-N) was created to give fishermen more time to fish an area outside the pressure of the large Bering Sea fleet in Area 4D.

Subarea 4D-N was open to fishing during a series of 24-hour fishing periods between June 6 and August 10; the rest of Area 4D was open for halibut fishing August 11 to 13, and absorbed any unused portion of the 4D-N allocation. As it turned out, fewer than 1,000 pounds were harvested in the new subarea, so 19,000 pounds reverted to Area 4D. The new subarea may see more concentrated effort in future years, as the local fleet gears up.

This year for the first time, a vessel operator was required to record in the logbook, within 24 hours, any halibut taken home for personal consumption - whether by the skipper, the crew, or anyone else. Recording personal-use fish will help us better estimate the actual removals of halibut from the sea, and thus provide better data on stock trends.

This year for the first time, a vessel operator was required to record in the logbook, within 24 hours, any halibut taken home for personal consumption - whether by the skipper, the crew, or anyone else.

Snapshot of a Season

Dates and poundages don't tell the real story of the fishery, the split thumbs and bad coffee; the burn deep in the shoulders after a good day, and even deeper after a bad one; the echo of spirited music from the wheelhouse as the sun rises over a lazy sea. Every one of these numbers is a chapter in the story of the '93 halibut season of the North Pacific.

Area 2A

Catch limit: 361,000 pounds

Actual catch: 504,000 pounds

The waters off Washington, Oregon and California are managed to provide halibut for commercial, sport and tribal Indian fisheries. Three different user groups across three separate states can't help but disagree on how allocations should be set, and conflicts indeed arose in 1993 that may result in management changes in the future. Also, uncertainties about actual mortalities from halibut bycatch by other fisheries in Area 2A continue to vex fishermen, managers, and biologists alike. Lack of reliable statistics is the biggest problem - and one we hope to solve in upcoming years.

In 1993, 600,000 pounds of halibut were allocated for all user groups. Of that, the Washington State Treaty Indian Fishery was allocated 150,000 pounds. This fishery, created in 1985 and written into IPHC regulations in 1988, provides a separate halibut allocation to twelve Indian tribes of northwest Washington for both commercial and traditional uses. Of the 150,000 pounds allowed in 1993, 136,000 pounds were designated for commercial harvest, and 14,000 pounds were reserved for ceremonial and subsistence fishing. The Indian commercial fishery launched at 6:00 a.m. on March 1 in the face of a brawling storm. The storm won, and tribal leaders called off the opener within a few hours. Six vessels had landed only 3,000 pounds of fish.

In a second, 72-hour opening between March 8 and 11, tribal fishermen landed 91,000 pounds. A third 24-hour fishing period March 18 to 19, an opening that included an 1,800-pound vessel restriction, produced 29,000 pounds. The last 15,000 pounds were harvested as incidental troll catches between May 1 and July 19, and also by a directed hand-line or rod-and-reel fishery between July 3 and 19. During this last period, vessels were

limited to small deliveries. Even so, the final Indian commercial fishery landed 138,000 pounds, 2,000 pounds over the catch limit.

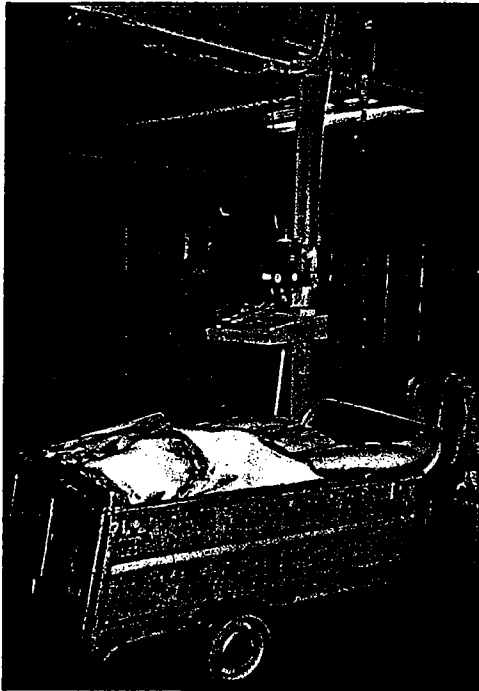
Fishermen coastwide joined in a ten-hour spree for the non-treaty commercial catch on July 27, landing 366,000 pounds - 141,000 pounds over the catch limit. The commercial opener was subject to fishing period limits, which restricted maximum deliveries depending on the size of the vessel.

Area 2B

Catch limit: 10.5 million pounds

Actual catch: 10.628 million pounds (including adjustments)

An amendment to the IVQ program increased from 5% to 10% the amount each quota holder could carry forward as overharvest or underharvest against a quota. Now, any quota holder may deliver up to 10% more or less than the quota remaining at the start of his final trip - or 400 pounds, whichever is greater.



This year, halibut fishermen off British Columbia entered their third year under the Individual Vessel Quota (IVQ) management system, and for the most part they liked what they saw. Harvests have increased in Area 2B over the past five years, and this year some adjustments to the program helped quota share holders compensate for missing the mark, which is sometimes easy to do. An amendment to the program increased from 5% to 10% the amount each quota holder could carry forward as overharvest or underharvest against a quota. This means that any quota holder may deliver up to 10% more or less than the quota remaining at the start of his final trip - or 400 pounds, whichever is greater. Overages will be subtracted from, and leftover poundage added to, the next year's

quota. Any amount of more than 10% of the quota is forfeited.

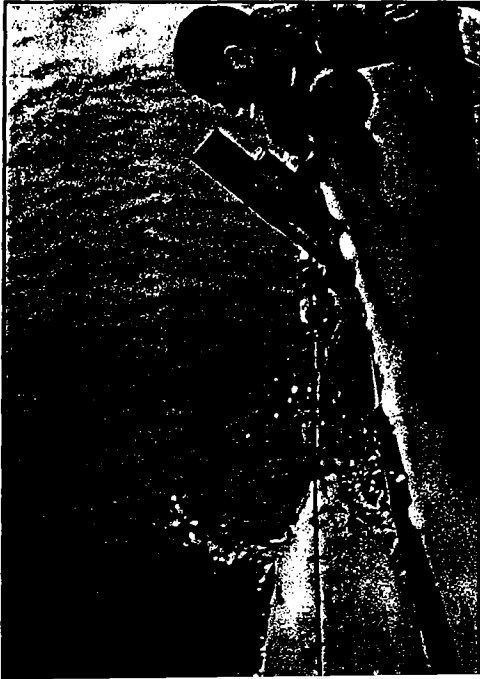
This year, commercial halibut fishing was open to quota share holders from noon on March 1 to noon on October 31. The 10.5 million-pound catch limit was divided among the 435 qualifying quota holders by the Canadian Department of Fisheries and Oceans. By season's end, 10,628,000 pounds had been harvested with about 140,000 pounds of this as compensation for underharvests in 1992. About 100,000 pounds will qualify as underharvest for this year and be added to various IVQs in 1994.

Area 2C

Catch limit: 10.0 million pounds

Actual catch: 11.29 million pounds

Area 2C is a wedge of sea and island and underwater mountain range off the coast of Southeast Alaska. Halibut fishing is, here as everywhere, a part-time venture. Area 2C fishermen caught 11.29 million pounds during one



unrestricted 24-hour period June 10 to 11, and one 48-hour fishing period, with fishing period limits, held September 8 to 10. The longer opening gave fishermen some flexibility in the event of bad weather, but catch limits prevented overharvest. The limits were fairly restrictive but even so, sublime fishing conditions prevailed and the catch limit was topped by 1.29 million pounds.

The Southeast Alaska halibut catch includes a special Annette Island fishery, authorized by the U.S. Secretary of the Interior, that takes place in waters inside the 3,000-foot Annette Islands Reserve boundaries. Each year the Metlakatla Indians of this region harvest a limited catch of halibut for commercial use. This year, they caught 21,464 pounds in eight 48-hour fishing periods, running two to ten vessels in each opening.

Areas 3A and 3B

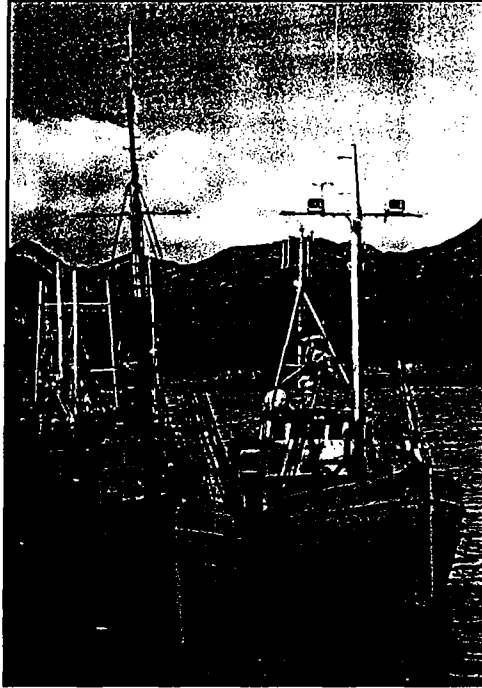
Combined catch limit: 27.2 million pounds

Combined actual catch: 30.593 million pounds

Areas 3A and 3B span the northern portion of the Gulf of Alaska. The northern Gulf's thousands of square miles are divided into two areas for management purposes, but to acknowledge the interrelation of these two areas, both are closed to fishing when the combined catch limit is reached. In 1993, the commercial fisheries were allocated 20.7 million pounds for Area 3A and 6.5 million pounds for Area 3B.

The gun went off on the first 24-hour opening at noon on June 10, and fishing conditions across the Gulf could not have been better. Central Gulf fishermen landed 13.6 million pounds, and the western Gulf fleet landed 5.3 million pounds. For the September 9 opening, also for 24 hours, we imposed fishing period limits. Clement weather and good fishing prevailed over conservative management measures, and; harvests were far better than expected. Area 3A fishermen hauled in 9.1 million pounds that day, and Area 3B fishermen hauled 2.6 million, for an overharvest of 2.0 million and 1.4 million pounds, respectively.

Clement weather and good fishing prevailed over conservative management measures in Areas 3A and 3B; fishermen overharvested the combined catch limit by 3.4 million pounds.



Areas 4A and 4B
Combined catch limit: 4.32 million
pounds
Combined actual catch: 4.523
million pounds

When writer Corey Ford stood on deck aboard a ship bound for Japan on an early winter morning in the 1940s, peering through the fog at "a string of strange bare mountains [that] resembled heaps of smoking slag," he overheard a shipmate say, "Those are the Illusions." A fitting name, Ford thought. This was his introduction to the Aleutians, the bare-backed archipelago that cups the Bering Sea, and it was as revealing as any misunderstanding in North Pacific literature.

IPHC Areas 4A and 4B straddle the Aleutian Chain Islands. The catch limit was 2.02 million pounds for Area 4A and 2.3 million pounds for

Area 4B in 1993, and here again the areas are managed to achieve a combined catch limit. Fishermen landed 371,000 pounds of halibut in the 24-hour June fishing period in Area 4A. Based on experience from previous years, we set the second fishing period at 24 hours as well, but did not impose fishing period limits because many of the larger vessels were expected to move into adjacent areas where fishing periods were longer. However, more boats stayed than were expected, and the Area 4A fishing period in August produced 2,190,000 pounds - about 541,000 pounds over the area catch limit.

Area 4B was managed so that 10% of the catch limit would be caught during a series of 12-hour fishing periods, with the balance of the catch limit reserved for the general Area 4 fishery that began August 11. The period from June 6 to July 16 saw twenty-one 12-hour fishing periods, during which fishermen landed 206,000 pounds. The August 11 opening was set for 96 hours of unrestricted fishing, but here Mother Nature herself moderated the harvest. Poor weather tied up many boats and only 1,190,000 pounds were landed. Noon on August 26 began the last opening, a 48-hour period with fishing period limits, which yielded 566,000 pounds, bringing the total season's catch to 1,962,000 pounds - 338,000 pounds below the Area 4B catch limit. However, since Area 4A already had topped the catch limit, both areas were closed for the year with the total catch exceeding the combined limit by 203,000 pounds.

Area 4C
Catch limit:
800,000 pounds
Actual catch:
831,000 pounds



Area 4C is a relatively small box outlined in the middle of the Bering Sea, circumscribing the Pribilof Islands.

The area is targeted by the big longline fleet that works the Bering Sea for

halibut and other species, but is also important to the local, smaller-boat fleet that home-ports on St. Paul or St. George Island.

In 1993, the halibut season opened June 6 with a series of 24-hour openings. All vessels were restricted to a maximum delivery of 10,000 pounds per fishing period, under regulations proposed by the North Pacific Fishery Management Council (NPFMC). Eleven fishing periods between June 6 and June 27 produced 671,000 pounds, and the last 160,000 pounds were taken during a single 24-hour fishing period on July 2 to 3. The final harvest was 831,000 pounds, of which Pribilof Island residents caught 325,000 pounds, and non-residents caught 506,000 pounds. The majority of the resident catch was landed at St. Paul.

Area 4D and 4D-N

Catch limit: 800,000 pounds
Actual catch: 836,000 pounds

Area 4D is a wedge of the Bering Sea from which the chip of Area 4C is carved, and this year a line was drawn at 62°30'N to create Subarea 4D-N around St. Lawrence Island. The Area 4D catch limit was 800,000 pounds, of which 20,000 pounds were reserved for an experimental St. Lawrence Island fishery between June 6 and August 10. By August 10, only one fisherman had fished, delivering less than 1,000 pounds, so the remaining quota reverted back to the general Area 4D catch limit. The area opened for halibut fishing at noon on August 11 and closed at noon on August 13. During those 48 hours of unrestricted fishing, 836,000 pounds were landed, topping the catch limit by 36,000 pounds.

The catch limit is seldom exceeded in Area 4E. In 1993, fishermen harvested only 53% of the allowable catch. Here, sparse halibut population and restrictive fishing period limits imposed by the North Pacific Fishery Management Council tends to limit participation to the local vessels.

Area 4E

Catch limit: 120,000 pounds

Actual catch: 64,000 pounds

Area 4E hugs the coastline of the eastern Bering Sea, from Cape Prince of Wales on the Seward Peninsula, southward all the way to Port Heiden. This area was managed so that up to 30% of the allowable catch (36,000 pounds) came from waters southeast of Cape Newenham (Area 4E-SE) and up to 70% (84,000 pounds) came from waters northwest of Cape Newenham (4E-NW). After August 1, half of any available poundage remaining in the 4E-NW area could be taken in 4E-SE.

The catch limit is seldom exceeded in Area 4E. Here, sparse halibut population and restrictive fishing period limits imposed by the North Pacific Fishery Management Council tend to limit participation to the local vessels. The first part of the commercial halibut fishery in this area, running from June 6 through September 18, included a series of 48-hour fishing periods, interspersed with 24-hour closed periods. Then on September 19 the area was open for continuous fishing through October 31. All vessels were restricted to a catch limit of 6,000 pounds per fishing period, under regulations proposed by the NPFMC. In 4E-SE (Southeast of Cape Newenham), fishermen landed 27,000 pounds of halibut. In 4E-NW (northwest of Cape Newenham), the local fleet landed 28,000 pounds and non-residents landed 9,000 pounds, for a subarea total of 37,000 pounds. Still, the area-wide landings totalled only 64,000 pounds, merely 53% of the catch limit.

SWEETNESS ON A HOOK: THE 1993 SPORT FISHERY

Along the great Pacific Coast, halibut provide some of the sweetest, most rewarding sport fishing an angler can find, and this year thousands of fishermen took to the water to find out just how sweet it could be. In all areas, sport charter boats pursuing halibut had to be licensed by the IPHC.

"The object of the game is for you to make the fish think your lure or bait is a delicious little morsel swimming free and clear. The object of the game for the fish is not to be fooled." - Katharine Weber



Sport fishing regulations in Alaska and British Columbia remained the same this year as last. However, in Area 2A (California, Oregon and Washington), the Pacific Fishery Management Council (PFMC) developed a catch sharing plan that outlined how halibut harvests would be divided among users, and

these regulations were implemented by the U.S. Department of Commerce and published as an appendix to the 1993 Pacific Halibut Fishery Regulations.

Fish tales are always hard to tell...

... but halibut fishermen are pretty good about filling out their surveys to help state and federal fisheries agencies total up the sport catches from each regulatory area. Because most sport surveys are post-season mail-outs, our statistics always run about a year behind; this year we are analyzing 1992 sport fishing activities.

Area 4, out in the Bering Sea and Aleutian Islands, doesn't attract too many halibut fishermen who will buck those seas for sport. Recreational harvests out here fell to just more than half of the 1991 catch, or 40,000 pounds. The average weight of the halibut caught in 1992 was about 15 pounds.

In the Gulf of Alaska and Prince William Sound (IPHC Area 3), the 1992 sport catch dropped for only the second time in 15 years. Last year's catch was 3.9 million pounds, about 8 percent under the 1991 harvest. As usual, Homer and the Kenai Peninsula dominated the landings - as you might expect from towns where the halibut scales are anchored into the ground more securely than some homes. The average weight of the halibut caught ranged from 16 pounds in Seward to 27 pounds in Kodiak.

In Southeast Alaska (Area 2C), sport fishermen hauled up 1.7 million pounds of halibut, a slightly better catch than in 1991. The average weight teetered around 24 pounds. British Columbia reported that sport catches from Area 2B are expected to be around 700,000 pounds, but all figures are still under review by Canada's Department of Fisheries and Oceans.

For the waters off Washington, Oregon, and California (Area 2A), we have a few preliminary figures from the 1993 sport fishery. Here, enthusiastic anglers topped the catch limit by 21,453 pounds and catches exceeded the allocation in every area except California, Puget Sound, and Central and Southern Oregon within the 30-fathom curve.

In the Strait of Juan de Fuca and Puget Sound, the average weight of sport-caught halibut increased to 23.0 pounds, slightly higher than the 22.5-pound average weight of the 1991 sport catches. Total harvests here were estimated at 34,753 pounds, well under the allocation.

Anglers of the north Washington coast exceeded that area's 85,507-pound allocation by 19,353 pounds. Here, charter operators explored deeper and newer grounds in late June and early July, and were rewarded, if not by more fish, by significantly larger ones. The average weight increased in 1992 to 20.0 pounds. This in-season shift in tactics wasn't reflected in the weekly harvest estimates, so we initially underestimated the sport catch in this area. The IPHC and the Washington Department of Fisheries subsequently adjusted the weekly harvest estimating procedures to reflect the possibility of such changes.

As in years previous, charter operators from the U.S. slipped north into Canadian waters to catch about 42,500 pounds of halibut which was landed in Neah Bay. This practice is not greatly encouraged by the Canadian government, as U.S. charters must transit through a closed area on the

In the Gulf of Alaska and Prince William Sound, the 1992 sport catch dropped for only the second time in 15 years. Last year's catch was about 8 percent under the 1991 harvest.

In British Columbia, sport catch may be around 700,000 pounds, but these figures are under review.

Washington's south coast fell under quota management this year for the first time. The sport fishery was open only five days in 1993, but fishermen still exceeded the quota by 41%.



Canadian side of Swiftsure Bank in order to fish in Canada. Washington's south coast, between Queets River and Oregon's Cape Falcon, fell under quota management this year for the first time. The sport fishery was open for only five days in 1993, but what a five days they were. Heightened interest

by fishermen, a string of good fishing days, and a small quota kept the season short, but fishermen exceeded the 7,137-pound quota by 2,935 pounds nonetheless. Halibut from this area averaged 21.8 pounds, slightly larger than sport-caught fish in 1992.

In Oregon, despite the efforts of fishery managers to restrict the catch, the statewide harvest of 94,487 overshot the statewide allocation by 9,018 pounds. Charter operators from Garibaldi found some mighty productive grounds, increasing the catch in central Oregon around Nestucca Bay. In Central and Southern Oregon, managers created a 30-fathom fishery that offered small-boat operators who could not fish the deeper, rougher, and more productive halibut grounds, better access to the fishery. This area gave fishermen lots of opportunity, but yielded low landings. Sport-caught halibut off the coast of Oregon averaged 19.5 pounds, down from the 1992 average of 20.2 pounds.

In California, no one counts sport harvests of Pacific halibut separate from other harvests. We use anecdotal information to gain an idea of halibut catches here, and we estimate them to be about equal to the harvest allocation of 2,281 pounds.

We hope that continuing education, careful release practices, and new management measures may help decrease the 2.3 million pounds of halibut wasted per year in the commercial fishery.

SEEK NOT TO SQUANDER: CUTTING WASTE IN THE COMMERCIAL FISHERY

Every year, hundreds of thousands of pounds of Pacific halibut are wasted and lost in the commercial fishery. Longline gear that is lost or abandoned by accident or time or circumstance takes with it all the fish caught on it, and those halibut are lost to the commercial fishery immediately. Also, any halibut smaller than the legal limit have to be returned to the sea, and each year a percentage of those do not survive. Mortality of undersized halibut robs the fishery of the future, as well as draining the halibut population of future reproductive power.

We at the IPHC have been investigating these two kinds of waste in the fisheries for the past several years, and hope that continuing education,

careful release practices, and possibly some new management measures, may help fishermen reduce the amount of halibut waste in the commercial fishery.

Waste from lost or abandoned gear

We use on-the-dock logbook interviews and mail surveys to estimate the amount of gear hauled and lost or abandoned by halibut longliners. Although gear varies considerably, we convert all of it into standard or effective skates, and these we use to determine the ratio of effective skates lost to effective skates hauled. This ratio of lost gear is applied to the total poundage of halibut landed by regulatory area to calculate the probable amount of halibut wasted by lost or abandoned gear. Our estimates show that the waste is decreasing at an encouraging pace; we figure that about 2.2 million pounds of halibut were wasted in 1991, and less than 1 million were lost in 1993.

We estimate that just more than 1.4 million pounds of sublegal halibut were killed by the 1993 commercial halibut fishery.

Treat those babies tenderly

Only halibut at least 32 inches long qualify as legal keepers in the commercial halibut fishery. Fish smaller than that are considered sublegal, and must be carefully returned to the sea as quickly as possible. Unfortunately, not all the sublegal halibut returned to the sea survive their ordeal. Each year, more than a million pounds of undersized halibut are killed in the process of being hauled up and discarded.

To estimate how many undersized halibut are killed in the commercial fishery each year, we calculate how many pounds of sublegals are caught for every pound of legal-sized halibut in each regulatory area. Then we apply the estimated discard mortality rate - that's the fraction of sublegals harvested that observations tell us will probably not survive after being thrown back.

Mortalities of sub-legal halibut are not decreasing as rapidly as waste from lost or abandoned gear. In fact, 1993 saw only a tiny decrease from 1991, and 1992 was the highest of the three years. We estimate that just more than 1.4 million pounds of sublegal halibut were killed by the 1993 commercial halibut fishery.

This year, we recalculated the ratio of sub-legal catch to legal catch, after gaining a more current picture from our research surveys. This ratio varies from area to area. Also, the actual mortality rate varies. In the Bering Sea and the Gulf of Alaska, where short seasons force longliners into intense competition for fish, we estimate a 25% discard mortality. For British Columbian waters, where the Individual Vessel Quota system has relaxed the pace and extended the season, we use a 16% discard mortality rate, because fishermen can afford to take more time to properly release unharvestable fish.

In Area 2A, the treaty Indian catch is excluded from the calculations of mortality of sublegal halibut because those harvesters retain all the halibut they catch: those fish that are under 32 inches are counted as ceremonial and subsistence poundage.

In the Bering Sea and the Gulf of Alaska, where short seasons force longliners into intense competition for fish, we estimate that 25% of the halibut that are thrown back will not live.

OVER THE TRANSOM, TO THE TABLE: PERSONAL USE HARVESTS ARE MOUNTING

In addition to the millions of pounds harvested for commercial sale, sport, and traditional ceremony, thousands of halibut are taken each year for what we call personal use. These are the fish caught or taken home for food that have not previously been accounted for in the managed fisheries. Crew members that take home fish without logging them as commercial catch, sport fishermen that don't report their catches, residents of rural Alaska communities who harvest halibut for food - all contribute to the "personal use" removals from the halibut stocks.

Most of the personal use halibut are taken by residents of rural Alaskan communities. One sampling estimated that rural Alaskans take home about 607,600 pounds (round weight) of undocumented halibut every year.

These harvests are troublesome for several reasons. First of all, because they are not documented, we can only make educated guesses (assisted by some sparse hard numbers) about the distribution and rapidity of personal use take. We don't know for sure how the halibut population might be affected in certain areas where personal use harvests are heaviest. As long as personal use harvest represents a small portion of the total take, our assessment of stock trends is probably alright. Large, undocumented harvests, on the other hand could skew our halibut assessment and management programs.

Most of the personal use halibut are taken by residents of rural Alaska communities. A sampling conducted by the Alaska Department of Fish and Game (ADF&G) estimated that rural Alaskans take home about 607,600 pounds (round weight) of undocumented halibut every year. Most of it is taken in Area 2C, and the least in Area 4. Handline catches vary widely among communities, and the amount of fish taken home by crew members also fluctuates considerably. From a variety of sources, we have compiled estimates of urban and rural commercial permit holders, and the average amount of halibut they and their crew take home (which varies by area). To this we've added the non-Alaskan commercial license holders, many of whom also take halibut home after the season.

All figures reflect round pounds; the total 819,038 pounds would be converted to a net weight (dressed) of 615,835 pounds. These numbers may be soft, but they reflect a solid hope that we can gain more understanding in the years to come of the actual amount of this kind of harvest, and of its impact on the halibut population.

In Canada, all halibut harvested commercially but taken for personal use is counted as



commercial catch, since every pound landed under the IVQ system is figured against a vessel's quota. There is another kind of personal use harvest: The Indian food fishery in British Columbia has grown in recent years, though we only began charting it in 1992. We estimate that various Indian groups harvested about 50,000 pounds of halibut in 1992, and about 75,000 pounds in 1993. For 1994, the Department of Fisheries and Oceans has set aside 300,000 pounds for use by Native residents - ten pounds per capita for about 30,000 people. The DFO will make direct allocations to specific bands or groups individually, and while the entire 300,000 pounds may not be allocated, neither is it a fixed cap on Indian food fishery harvests. How this special fishery will be monitored and reported is still a matter of discussion.

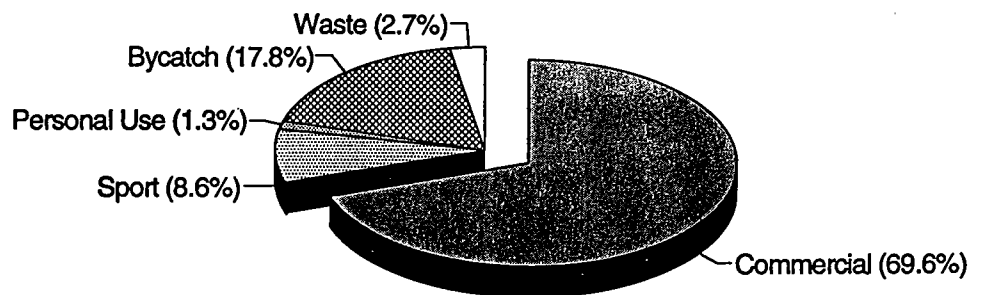
HALIBUT POPULATION ASSESSMENT - 1993

MORE THAN A NUMBER

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“**T**he sea,” writes James Hamilton-Paterson, “so simply keeps all its secrets that are worth keeping.” Some secrets the sea does reveal, however. We have only begun to learn the how and why of sea life, but we do know a little bit about the what, and how long, and how old, and it is from these gathered particles of data that we form an understanding of how halibut populations are changing. No matter how much we know, there is always so much more to learn.

When it comes to stock assessment data, we are blessed with an abundance of information and experience from which we have built a fairly stable foundation of knowledge. In each area, we annually collect catch-at-age data, catch per unit of effort (CPUE), age composition and average weight at age, and from these we can determine the exploitable biomass - the amount of halibut available for harvest each year. The constant exploitation yield (CEY) - the yield at which we can exploit the resource without doing damage - is set at 0.30 times the exploitable biomass. That is, we can harvest about 30% of the exploitable biomass. Given the CEY, we can set a recommended allowable catch that takes all removals into account - commercial, sport, ceremonial and personal-use harvests, wastage, and bycatch (Figure 2.).



We estimate that the total exploitable biomass of Pacific halibut in 1993 was between 249.8 million pounds and 300.4 million pounds.

Figure 2. The division of harvestable halibut in 1993.

FINDING OUT WHO'S WHO

Each year we explore the standard stock assessments for inconsistencies that might crop up from disparate signals given off by catch-at-age and CPUE. When the signals from each of these data packages are quite different, we know to exercise caution when setting catch quotas.

Over the last few years, we have seen an upturn in CPUE while at the same time our catch-at-age information would indicate a downturn in the

stocks. This downturn should reflect diminishing strength of some hardy year-classes and a subsequent period of poor recruitment. Yet all along the coast, the CPUE continues to swing upward. The increase appears



Recruitment of eight year old halibut dropped in all areas - the lowest recruitment that we have seen in nearly two decades. Halibut stocks probably will continue to decline by 10 to 15% per year for the next several years.

consistently in every area, but the degree to which it affects the assessment appears to be area- specific. To explore these disparate signals from the stocks, we prepared a standard stock assessment, and an alternative one that discounts the upturn in CPUE for the years 1992 and 1993.

We estimate that the total exploitable biomass of Pacific halibut in 1993 was 300.4 million pounds (standard assessment); the alternative

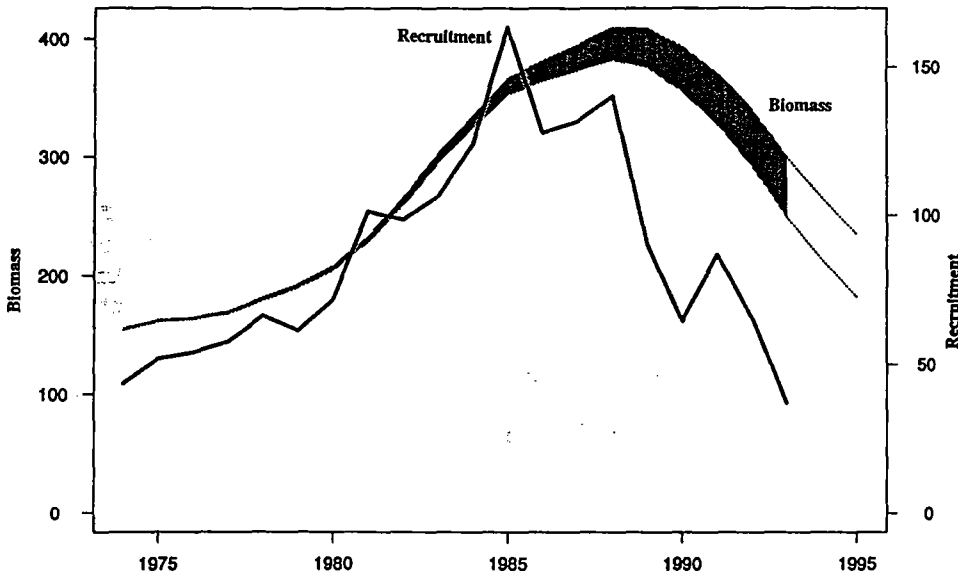


Figure 3. Coastwide biomass and recruitment in millions of pounds for the years 1974 through 1993.

Our halibut stocks, in most areas, are aging. In the past four years, the average age of halibut in the commercial fishery advanced from 11.5 to 12.5 years.

assessment provided a biomass estimate of 249.8 million pounds. The standard assessment shows an overall biomass decline of 12%, and the alternative showed a 15% decline in 1993. (Figure 3)

Once again, recruitment of eight-year-old halibut dropped in all areas. This is the lowest recruitment of eight-year-olds that we have seen in nearly two decades. Also, this year's 16-year-old (the 1977 year class), which recruited strongly as eight year olds in 1985, are now beginning to disappear from the fishery. The low recruitment rates tell us that the stock will continue to decline by 10 to 15% per year for the next several years, despite the recent increase in CPUE.

Each year, we not only estimate current stock levels but also change previous stock assessments by adding the current year's data. Changes in the level of bycatch, waste and sport catch, coupled with the inherent variability we find in the stock dynamics and in our own measuring capacities, require that we constantly look backward and update our estimates of the abundance of halibut off our shores. Sometimes these updated figures allow us to raise the catch limit in an area where stock abundance is on the decline. We only do this when the new data shows enough room between the previous estimates and the new ones to allow some increases in the catch despite the general decline of the resource.

AUTOBIOGRAPHY OF A RESOURCE: AGE COMPOSITION AND SIZE-AT-AGE

The minuet of life is danced to the rhythm of aging and renewal. Halibut are no different from the rest of nature, and neither are we; we age, we learn, and if we pay close attention we can learn some pretty significant things by watching the aging patterns of the fish we feed upon.

Our halibut stocks, in most areas, are aging. In the past four years, the average age of halibut taken in the commercial fishery advanced from 11.5 to 12.5 years. The 1984 through 1979 year classes, which now are 9 through 14-year-olds, dominated halibut landings in 1993. The 1983 year class continued to show relative strength, and accounted for a greater proportion of the catch as ten-year-olds than the 1982 year class provided as ten-year-olds in 1992. All other year classes between 1984 and 1979 contributed less to the catch than their counterparts of the same age had done in 1992. In general, halibut 18 years and older were slightly more abundant among 1993 harvests.

What does this information tell us about the halibut population? Older fish can bring good news to a harvest, in the form of bigger fish, and also because they have reproduced for several years before departing from the gene pool. In Areas 2C, 3A, and 3B in particular, the average age has increased considerably over the last four years. Older fish, however, can also be an ominous sign, revealing a greatly reduced proportion of young halibut recruiting into the fishery.

SETTING THE SENSITIVE NUMBERS

Using the 1993 stock assessments, we can determine how much halibut can safely be harvested or taken from the stocks in 1994. We call this

setting constant exploitation yields - CEY. The overall CEY is set by multiplying the exploitable biomass in each area by 0.30. From the CEY in each area we subtract the amount of halibut that will be taken for sport, ceremonial, traditional or personal use. In addition, we reduce the CEY by an amount equal to the bycatch in order to compensate the stock for loss in reproductive potential. The figure left over is the recommended allowable commercial setline catch for the year.

The relatively new IVQ program for waters off British Columbia (Area 2B) has changed fishing strategies there, and it's difficult to say how those changes might affect CPUE data for that area. Discounting the Area 2B CPUE for the years in which the IVQ program has been in effect might drag biomass estimates even lower than those in the alternative assessment. So, for a number of reasons, we recommended that 1994 catch limits be set conservatively.

HOW WE TRY TO COMPENSATE FOR BYCATCH

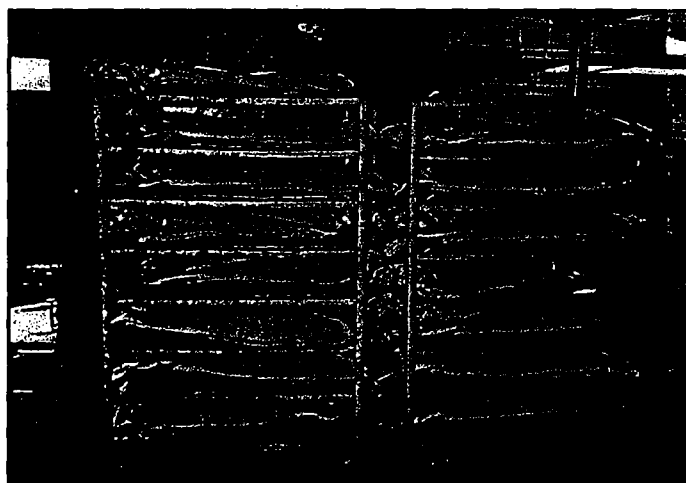
Halibut taken by fishermen targeting on other species represent two kinds of losses to the biomass. The first is the immediate loss of the fish from the resource; the second occurs down the line. Since most halibut caught as bycatch are smaller than those that have recruited into the fishery, the population loses some potential for growth and reproduction when they are harvested. We figure both kinds of losses, and then adjust the commercial catch limit in an attempt to compensate for the loss in reproductive potential. The reduction to each area's catch limit is made in proportion to the estimated exploitable biomass in that area.

Bycatch represents two kinds of losses to the halibut biomass: the immediate loss of the fish, and also the benefit of growth and reproduction in future years. Both must be taken into account.

ON THE STREET WHERE YOU LIVE: TRACKING DOWN HALIBUT

To most of us, learning is a game of leapfrog, scientific gains leaping over the back of knowledge that was set down before. We gain much of our knowledge of the halibut population the same way: formulas leapfrogging over experience; scientific surveys adding to knowledge gained from industry data.

We measure the relative abundance of halibut by an indicator we call catch-per-unit-of-effort, or CPUE. We collect CPUE data from two sources: scientific surveys and commercial data.



Scientific surveys provide more controlled sampling, but are expensive and so the amount of information that can be collected is limited. On the other hand, commercial data are usually of poorer quality but provide a lot more information.

Scientific surveys provide more controlled sampling, but are expensive and so relatively few CPUE observations can be made. On the other hand, commercial data are usually of poorer quality (errors in reporting, inconsistent effort units, the vagaries of real life) but they certainly provide a lot more information. The primary problem with commercial data is that the sampling efforts themselves depend upon fish abundance. In other words, where a research ship would ply all waters evenly in search of accurate data about halibut abundance, a commercial fishing boat by nature heads for the waters with the most fish in them. As useful as a commercial vessel's CPUE data is, does it accurately reflect abundance?

At the IPHC, we're overseeing a project to create an index of abundance that takes into account the spatial distributions of fish and fishing effort. We have created a map of relative fish abundance using both survey and commercial CPUE, and then averaged the local estimates over the whole area to obtain a global index. Commercial CPUE is used for estimating local abundance in the areas for which we have data, and information from scientific surveys allows us to estimate CPUE in those areas where there is little or no fishing effort. This way, our estimates can account for uncertainties in the two kinds of information, and also for changes in distribution of CPUE that commercial data may not explicitly reflect.

We started this study by applying our methods to CPUE data collected off Kodiak Island in 1986, and came up with some interesting results. We hope to expand this method to all areas to more accurately understand changes in CPUE.

NEW WINDOW INTO CATCH STATISTICS

We have looked at Canadian catch statistics between 1988 and 1992 to determine how the IVQ program has influenced our CPUE statistics, age-composition statistics, and overall data quality.

The individual vessel quota (IVQ) system has changed many things in the world of British Columbia halibut fishermen since it began in 1991. The many changes to fishery management and fishing practices also altered the way we collect and interpret catch statistics in Canadian waters. We have spent some time looking at catch statistics of Pacific halibut between 1988 and 1992 to determine how the IVQ program has influenced our CPUE statistics, age-composition statistics, and overall data quality.

We have a lot of information to work with: Our linear model analysis indicates that CPUE statistics are influenced by the year, month, area, vessel class and type of gear used. There are many variations among the year-month, year-area, month-area and vessel class-area comparisons. This at least tells us that changes in fleet behavior over space and time can significantly alter our CPUE statistics. We have now added some other factors to look at - such as average length at age of fish - to expand our understanding of CPUE data, and the amount of information it can reveal about Pacific halibut.

BYCATCH IN THE NORTH PACIFIC

NO INSTRUMENT PLAYS SOLO

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Cosmologists tell us that the universe is expanding, that its structure is becoming more complex and delicate, and the same is true for the universe of the Pacific halibut, as it is true of the Pacific fisherman. Seldom is the universe of Pacific halibut fishermen more complex and delicate than it is when confronted with the issue of incidental catch.

The bycatch of Pacific halibut by fishermen targeting other species is one of the more resounding issues of the North Pacific. Not all incidentally caught halibut die from the trauma; the percentage that survive depends upon the fishery, the season, and the type of gear the halibut are caught in. Recent management measures have helped to decrease bycatch and to decrease the mortality suffered from those that are caught. Still, 15.2 million pounds of Pacific halibut were killed in 1993 as bycatch in other fisheries.

For most of our bycatch information, we rely on federal observer programs and on research survey information. In the U.S., National Marine Fisheries Service (NMFS) oversees an observer program covering the groundfish fishery off Alaska; in Canada, the Department of Fisheries and Oceans (DFO) provides bycatch estimates for the groundfish trawl fishery off British Columbia. These estimates are based on data collected by observers during large-scale programs in the early 1970s and 1980s. DFO's more recent observer program, which began in 1992, is far more limited. In the waters of Area 2A, there are no observer programs for domestic trawl or hook-and-line fisheries. We are developing, with the cooperation of various state agencies, some techniques for estimating bycatch using survey data, logbook information, and results from gear experiments.

HOW MANY DIE?

The most important question about halibut bycatch is, how many actually die in the process? Research over the past several years has taught us how to estimate mortality rates of halibut in various fisheries, among various gear groups, in different locations throughout the Pacific halibut range. Some of the estimates, however, are based on limited data, and further research is needed to fine-tune our numbers. In Area 2A, the bycatch mortality rate among domestic groundfish and shrimp trawl fisheries is 50%; for the hook-



Recent management measures have helped to decrease bycatch and the bycatch mortality of halibut. Still, 15.2 million pounds of Pacific halibut were killed in 1993 as bycatch in other fisheries.

and-line sablefish fishery is 25%; and for the large-scale midwater fishery for whiting it is 75%.

In Area 2B, the Canadian trawl fishery was assumed to have a 40% halibut bycatch mortality rate in 1993. This is an adjustment from the 50% rate assumed prior to 1993, but recent observer data suggested that haul size may not be as large as it was in past years, and smaller hauls would lead to quicker deck sorting times and a faster return to the sea, increasing the odds of halibut survival. It is also based on direct observations showing a greater proportion of fish in better condition. Also, rockfish catches have declined, so there are fewer injuries to halibut from rockfish spines, which have in the past influenced the mortality rate.

Following are the halibut discard mortality rates for the 1993 groundfish fisheries, based on a 1993 study by Williams and Wilderbuer:

Area 4 Trawls

- Midwater pollock: 80%
- Atka mackerel, rock sole and other flatfish: 70%
- Pacific cod, bottom trawl pollock and rockfish: 60%
- Arrowtooth flounder, Greenland turbot, and "other species": 40%

Area 2C, 3A and 3B Trawls

- Midwater pollock: 75%
- Rockfish, shallow water flatfish and "other species": 60%
- Pacific cod, bottom trawl pollock and deep water flatfish: 55%

Area 4 Hook & Line

- Pacific cod: 18%
- Other targets: 12.5% for observed boats, 15% for unobserved boats

Area 2C, 3A and 3B Hook & Line

- Pacific cod: 16%
- Sablefish: 14% for observed boats, 17% for unobserved boats
- Rockfish: 11.5% for observed boats, 14% for unobserved boats

Area 2C, 3B and 4 Groundfish Pots

- All targets: 5%

**A BAD NEIGHBORHOOD TO BE IN:
HOW MORTALITIES CHANGE BY AREA**

Halibut bycatch mortality was pretty minimal until the 1960s, when it increased rapidly as the North American coast was suddenly swarmed with foreign trawl vessels. The total bycatch mortality (excluding the Japanese directed fishery) peaked in 1965 at about 21 million pounds. Bycatch mortality declined again over the next few years, but increased to about 20 million pounds in the early 1970s. During the latter part of that decade and the early part of the next, bycatch mortality dropped to about 13 million pounds. By 1985, it had diminished to only 7.2 million pounds, the lowest level since the IPHC began monitoring bycatch 25 years earlier. In the late 1980s the U.S. groundfish fishery virtually exploded, and by the end of that decade the waters off Alaska saw a tremendous growth in halibut bycatch mortality: 17.5 million pounds in 1990. In 1993, mortality was estimated at 15.2 million pounds, a 7% decrease from 1992.

In 1993, 15.2 million pounds of halibut were killed as bycatch in other fisheries - a 7% decrease from 1992.

Area 2

We estimate the 1993 bycatch mortality here at 3 million pounds, about 10% less than in 1992. Roughly half of the bycatch mortality occurs aboard trawl vessels operating off Canada. The trawl fleet landed less Pacific cod this year than in 1992, and this decline may account for much of the savings in bycatch mortality.

In Area 2C, off Southeast Alaska, most bycatch occurs in the hook-and-line fisheries for sablefish and rockfish. Mortalities increased in 1993, but have not increased significantly in the past three years. The remainder of this area's mortalities occur in the crab pot and shrimp trawl fisheries.

In Area 2A, off the U.S. West Coast, groundfish and shrimp trawl fisheries killed approximately 900,000 pounds of halibut. This figure assumes a 100% discard mortality rate for the shrimp fishery, though state agencies and trawl fishermen in the area suggest that 50% may be more accurate. If so, the bycatch mortality would be closer to 700,000 pounds - a figure we use here, until we and other agencies complete a review of the initial estimates.

We estimate the 1993 bycatch mortality in all of Area 2 at 3 million pounds, about 10% less than in 1992.

Area 3

The overall bycatch mortality in this area in 1993 was 7% higher than 1992, and those increases came from both the trawl and the hook-and-line fisheries, which are responsible for the lion's share of halibut bycatch mortality in the central and western Gulf of Alaska. Trawlers reached the 3.3 million-pound bycatch mortality "cap" imposed upon trawl fisheries as a management tool to reduce halibut mortality. The cod and deep water flatfish (rex and Dover sole) saw the highest halibut mortality, followed closely by the shallow water flatfish fishery. Rockfish trawlers, who traditionally see the highest halibut mortality, reduced theirs after the season opening was delayed until June 28. Also, directed fishing for some species was eliminated, and this also diminished bycatches.

Sablefish longliners exceeded their halibut bycatch mortality cap by almost 100%. The derby-style nature of the fishery makes it extremely difficult for NMFS to close the fishery when the halibut bycatch "cap" is reached. In 1993, a higher sablefish catch limit led commercial longliners to exceed the 1.2 million-pound cap by an additional 930,000 pounds. Less than 7% of this was taken in the January-to-March cod fishery.

Groundfish pots target almost exclusively on cod. This year their halibut bycatch mortality here was 6,600 pounds, roughly half of the 1992 mortality.

Tanner crab fishermen commonly see few halibut mortalities. This year levels were only about 300,000 pounds.

Bycatch mortality in Area 3 in 1993 was 7% higher than 1992, with increases in both the trawl and the hook-and-line fisheries, which already are responsible for the lion's share of halibut bycatch mortality in the central and western Gulf of Alaska.

Area 4

Almost half of the total 1993 coastwide bycatch mortality occurred in Area 4, and most of it is attributable to the domestic trawl fisheries. Trawlers target on many species, most commonly pollock, cod and flatfish (primarily rock sole and yellowfin sole). Hook-and-line fisheries focus on cod, and to a

Almost half of the total 1993 coastwide bycatch mortality occurred in Area 4, and most of it is attributable to the domestic trawl fisheries.

lesser degree, sablefish along the Aleutian Island chain. Pot fisheries for cod are small out here.

Halibut bycatch mortality was estimated at 6.8 million pounds in 1993, a 16% decrease from 1992. Trawlers caught about the same number of halibut, but mortalities by the longline fleet declined by 61% from 1992 levels. Competition for cod was intense between trawl and hook-and-line fishermen, and the cod fishery was fished out by May 15. This meant that the hook-and-line fleet was anchored up during June and July, when halibut bycatch rates usually are highest.

Following the mid-May cod closure, trawl and hook-and-line interest turned to Greenland turbot, a species that wasn't targeted heavily before 1993. But though halibut bycatch rates can be high in this fishery, the Greenland turbot catch was very low - only 7,000 metric tons in 1993 - so actual mortalities were minimal. King and Tanner crab harvesters in the southeast Bering Sea, and king crab vessels in the Aleutian Islands, took roughly 300,000 pounds of halibut.

CHANGES COME SLOWLY

Fishery management, like family management, is not an event; it's a process. The families of fisheries that operate here in the eastern Pacific work together - with relative degrees of cooperation - to live within the limitations set before us by laws natural and political. Bycatch management is a part of the comprehensive fishery management programs set forth by the North Pacific Fishery Management Council (Bering Sea and Gulf of Alaska); Canada's Department of Fisheries and Oceans (waters off British Columbia); and the Pacific Fishery Management Council (waters off Washington, Oregon and California). The IPHC works with all these organizations to help forge rational bycatch programs, and to draft proposals and amendments to help improve those programs.

In 1993, the NPFMC made several changes to its bycatch management measures that may help quantify bycatch mortality better.

In 1993, the NPFMC made several changes to its bycatch management measures that may help quantify bycatch mortality better. They changed the accounting of trawl-caught halibut in the Bering Sea/Aleutian Island (BSAI) areas, and now count bycatch mortality rather than total number of halibut taken. Using the discard mortality rates for the trawl fisheries in the BSAI region, the NPFMC then moved the previous bycatch limit of 5,033 metric tons of halibut to 3,775 metric tons of halibut mortality. The NPFMC also increased the bycatch limit for hook-and-line gear in the BSAI region from 750 metric tons to 900 metric tons. (Pot fishing catches so few halibut that, to encourage fishermen to use them, managers assign no bycatch limits.)

The IPHC staff recommended that the total 1993 BSAI halibut mortality cap be reduced 10% from the 1992 cap, but the NPFMC rejected this proposal. They did, however, vote to allow changes in bycatch limits by regulatory amendment to the fishery management plan, rather than by plan amendment, which means that changes to the bycatch program can be made more quickly.

The NPFMC did implement a new requirement that all halibut be released carefully from hook and line vessels outboard of the roller. The new careful release regulations specify that fishermen must use one of three

methods of release: cutting gangions near the hook to release halibut, using the gaff to straighten the hook, or roll the hook from the halibut's mouth. This regulation went into effect in mid-May, after the longline fishery for Pacific cod - the largest user of longline bycatch - already had closed for the year. Still, the observer data showed that fishermen who voluntarily used careful release techniques helped reduce discard mortality rates from 18% to 17%.

Trawlers also helped reduce halibut bycatch during the August to September pollock season after the NPFMC adopted a new definition of pelagic trawl. This new definition specified rigging and design specifications for the net, and spelled out a maximum number of crab allowed per haul. The bycatch rate in the pelagic pollock fishery decreased from 0.83 kg per metric ton during the June to July fishery in 1992 to 0.06 kg per metric ton during the August to September fishery in 1993. The NPFMC will keep an eye on pelagic trawl halibut bycatch rates to make sure the fleet remains faithful to the intent of the regulation:

In Canadian waters, the DFO operates a voluntary observer program on trawl vessels, and this year they used observer data to re-estimate discard mortality rates for halibut bycatch among trawlers, especially those fishing in Hecate Strait. The new data allowed them to drop the discard mortality rate from 50% to 40%. They revised the bycatch rates for Hecate Strait to reflect CPUE rates, rather than the more variable catch-ratio method.

MORE CHANGES IN 1994...

Reining in halibut bycatch levels has been a priority for the IPHC for several years. One measure we have advocated has been allocating groundfish, especially Pacific cod, to gear groups with low bycatch mortality rates. For 1994, the NPFMC did take bycatch levels into consideration, and allocated Pacific cod from the BSAI region to give trawlers 54%, longline/pot fishermen 44% and jig boats 2%. The Council also split the total allowable catch for longline/pot fisheries for Pacific cod into three seasons to restrict harvests during the summer, when longline bycatch is highest.

Some changes are ahead for Canadian fishermen, too. In 1993, Canada's DFO convened a working group of trawlers, longliners, and agency representatives to prepare a bycatch management program for 1994.

...AND BEYOND

The biggest changes, though, will come in 1995 when a new Individual Fishing Quota (IFQ) program for sablefish and halibut will begin off the coast of Alaska. The IFQ program, which was approved in 1993 after nearly a decade of design and debate, will change the face of the longline fisheries. Most dramatically, harvests under an IFQ system will take place over several months, rather than a few days. Bycatch mortality is expected to drop because sablefish fishermen with halibut IFQ will be able to retain halibut up to the amount of their IFQ (and quota shares can be bought and sold mid-season), and halibut fishermen will have more time to carefully release under-sized halibut.

One new requirement: all halibut must now be released carefully from hook and line vessels outboard of the roller.

With a new definition of pelagic trawl in effect, the bycatch rate in the pelagic pollock fishery decreased from 0.83 kg per metric ton in 1992 to 0.06 kg per metric ton in 1993.

The biggest changes to bycatch management will come in 1995 when a new Individual Fishing Quota (IFQ) program for sablefish and halibut will begin off the coast of Alaska.



In fact, it could be that the North Pacific fisheries will see the end of the Olympic system of groundfish management within this decade. The NPFMC has embarked on an ambitious program to redesign the entire groundfish management system for the waters off Alaska, in hopes of ending the mad race for fish that results, each year in unsafe practices, lost gear, overinvestment in equipment, poor financial planning, and horrendous wastes of fish. The NPFMC is considering both individual transferable quotas and a license limitation program, and now is exploring various forms of both of those programs. In the meantime, the NPFMC has drafted a two-year moratorium on new entries into the overcapitalized groundfish fisheries, designed to give industry (and fishery managers) breathing room in which to design a new,

comprehensive program. It is anticipated that this two-year moratorium will be implemented in 1995.

Because ending the Olympic system could itself reduce halibut bycatch considerably, the NPFMC has chosen not to pursue specific bycatch reduction measures that would delay development of the comprehensive groundfish management program. This year, as in previous years, the IPHC staff submitted a proposal to the NPFMC to reduce the halibut bycatch mortality cap in Alaskan waters by 10%, but this proposal - along with another to adjust bycatch limits as the halibut biomass fluctuates - was rejected.

WE LEARN WHILE WAITING

With regulatory avenues temporarily tied up in the NPFMC's comprehensive project, we at the IPHC have been exploring other ways to reduce halibut bycatch among the various fleets. For example, in 1993 we ran a survey aboard the *F/T Northern Glacier* that confirmed just how effectively bycatch mortality can be reduced by sorting halibut on deck rather than in the factory. Sorting time in the factory is also critical, our study confirmed, as halibut mortality increased with time. From this study, we will prepare a package of recommended sorting and handling procedures to help the fleet reduce bycatch mortality aboard factory trawlers.

We also analyzed NMFS observer data from the BSAI Pacific cod fisheries looking at how halibut bycatch rates shift over time, or from area to area. For example, we saw how bycatch rates leapt higher as adult halibut

moved into the Pacific cod grounds in mid-summer. Halibut also tended to gather in the area north of Unimak Island, boosting the bycatch rates in this area higher than elsewhere in the BSAI region.

However, the lower bycatch rates in winter don't necessarily mean less impact on the halibut resource. Trawl-caught halibut captured in winter tend to be smaller than halibut caught in summer, as the smaller halibut disperse onto the Bering Sea flats and large halibut move out of deep water following spawning. But remember that impact on the resource is measured not just by the immediate losses - mortalities - but also in future losses, which we call yield loss. Large halibut result in a lower yield loss per pound of mortality than smaller halibut do, so low bycatch rates on small halibut may cause as much or more yield loss than higher bycatch rates on large halibut.

Another way we are learning about the effects of bycatch is a tagging project begun in 1993. The data gained from those recovered tags will help us more accurately predict the likelihood of halibut survival based on the condition in which they arrive on deck. We began a similar tagging program for longline-caught halibut bycatch in 1993. As those tags are recovered in 1994 and 1995, we will learn a lot more about predicting survivability of halibut bycatch in the longline fisheries.

Bycatch rates leap higher as adult halibut move into the Pacific cod grounds in mid-summer. Halibut also tend to gather north of Unimak Island, boosting the bycatch rates in this area higher than elsewhere in the BSAI region.

SCIENTIFIC INVESTIGATIONS

STUDYING HALIBUT AND THEIR PARASITES

Some say you are what you eat, others say you are where you eat, but generally everyone agrees that whether you land dark or light side up in the world, it's what you have on the inside of you that counts. Halibut sometimes have parasites on the inside of them - in the tissue, or in the gastrointestinal tract. Usually, they're not harmful to consumers; they may even teach us something about migration and early life history of halibut.

In a project aided by the Department of Fisheries and Oceans and the University of Alberta's Department of Zoology, we are examining patterns of parasitism in Pacific halibut to see if the numbers and kinds of parasites inside halibut can tell us more about who they are. So far, we have examined 224 fish for gastrointestinal and tissue parasites. We took 128 juvenile and 46 adult fish from seven locations in the Bering Sea/Aleutians, northern B.C., southern Vancouver Island, Washington, Oregon and California. We also took an additional 50 fish from several places in the Bering Sea/Aleutian area.

These fish have a captivating - sometimes contradictory - story to tell. We found the greatest number of parasites in the gastrointestinal tracts of halibut from the Bering Sea and from the more southerly areas (Washington to California). The halibut from these extremes of their distribution also had the greatest variety of parasites. However, the species composition appears to be somewhat different between Bering Sea fish and their southerly cousins. Within the Bering Sea area, however, and within the Washington-to-California region, neither the species count nor the numbers of individual parasites seemed to vary significantly. There also were no measurable differences in parasitism related to gender of the fish, or to depth of the fish when captured. In waters off the U.S. West Coast, the juveniles and adults even had about the same numbers and varieties of gastrointestinal residents.

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Generally, fish within a geographic region showed more similarity in parasite patterns with each other than with fish from other regions. Only one significant exception stood out in our results: Halibut from the area around the Queen Charlotte Islands showed inconsistent affinities with one another.

Our hope is that, by learning more about parasite patterns we can learn not only about the life and behavior habits of halibut, but may also be able to determine different stocks of halibut within our vast North Pacific region.

THAT OSSEOUS OTOLITH! READING THE AGE OF THE FISH

One of the most accurate, not to mention charming, tools we have to learn about Pacific halibut is found inside their ears. Otoliths, the small almond-shaped bones nestled in the inner ear, form a series of concentric rings the way trees do, one for each year of life, and these rings describe the seasonal growth, health and even a little bit about the environment of the Pacific halibut. We collect otoliths from landed halibut each year at the major halibut landing ports, and the rich database these otoliths have provided us over the years tells us volumes about the halibut off our shores.

The most important piece of information we glean from otoliths is the age of the fish. By monitoring fluctuations in strength of certain year classes,

we learn a little about the condition and future productivity of the halibut stocks. Generally, we count rings on the magnified surface of an otolith to determine the age of the fish. But there is another method of reading otoliths, called break and burn age reading. The otolith is broken through the nucleus, and both halves are toasted over an alcohol flame, which makes the opaque and translucent zones stand out more vividly. The burned edge is lightly coated with cooking oil and examined under strong magnification (25-50x).

This year, we ran a comparison study to see if the two methods of otolith reading resulted in different readings. We know that in other long-lived groundfish, the burnt-section readings show a fish to be slightly older than the surface otolith reading shows. Is the same true for halibut?

We found that, generally, it is. In fish younger than 20 years old, burnt section readings showed slightly older ages than surface readings showed. For the few otoliths older than 20, there was no significant difference between the two readings; however, there were not enough of this age group to draw statistical conclusions. The two readings gave the most consistent results for fish between the ages of six and 15 years. For fish older than 15 years, the relationship between the two readings was harder to predict. However, this isn't expected to throw off the stock assessment figures, because fish over the age of 17 are pooled together for stock assessment purposes anyway.

Where the burnt-section readings showed older ages, the difference was only one or two years, and was never more than five years. More than 96% of the otoliths showed only one year difference between the two kinds of readings. And both methods give only an estimate of age. We are continuing to learn about the correlation between the two methods. Some of the differences in ages are caused by the thickness and structure of the otolith itself; otoliths that are small and thick are often difficult to age. The 1993 study included otoliths from the Bering Sea and Aleutian Islands, which are among the clearest and easiest to read. However, those small and thick otoliths which yield the greatest difference in age were lacking in the 1993 study. We expect to reach a decision on which method to use by the 1995 fishing season.

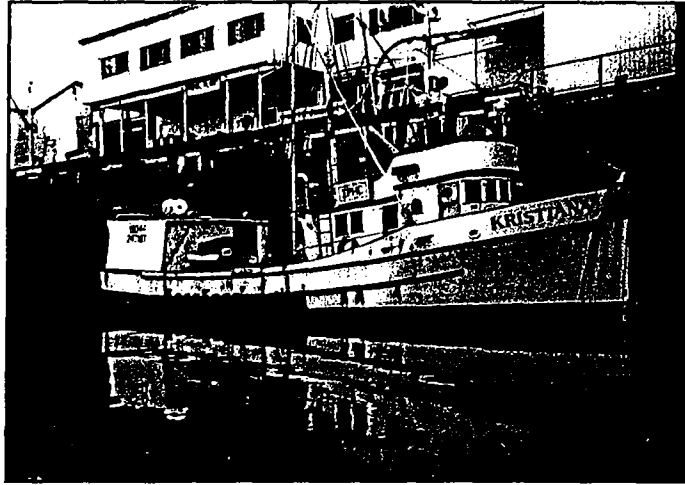
GET'EM WHERE THEY LIVE: SURVEYING THE HALIBUT POPULATION

One of the ways we peer into the private life of the Pacific halibut stocks is by surveying the population with setline gear. We draw a grid inside a certain area and then lay gear along the lines of that grid. From each set we record catch per unit of effort, the size, age and sex composition of the halibut caught, and the species composition of the whole catch. From this information we learn about the growth and distribution of halibut, relative abundance of other species, sexual maturity, and the rate of bait attacks on the gear. In the coming years, we can also use our survey data to interpret the effects of fleet distribution after the new Individual Fishing Quota program begins for waters off Alaska.

The IPHC has conducted setline grid surveys for Pacific halibut in various areas from British Columbia to the Aleutian Islands since 1963. This year, our surveys took us to the waters off Queen Charlotte Islands, in Area

From otoliths we can learn the age of the fish; from this, we gain insight into the condition and future productivity of the halibut stocks.

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2B, and surrounding Kodiak Island, in Area 3A. For the Charlotte area, we chartered the *F/V Kristiana*, geared with 1800-foot conventional longline gear with 18-foot spacing and #3 circle hooks baited with frozen chum salmon. We took four survey trips over a 40 day period, including

27 fishing days, between July 24 and September 1. We fished 606 skates of gear at 101 grid stations and harvested 69,295 pounds of halibut.

We chartered the *F/V Cape Flattery* to fish the Kodiak section of the grid survey. The vessel fished 1500-foot conventional longline gear with 18-foot spacing and #3 circle hooks, also baited with frozen chum salmon. We began fishing July 1 and ran three trips including 24 fishing days, ending on August 2. The *Cape Flattery* fished a total of 540 skates of gear over 90 sampling stations, and harvested 127,144 pounds of halibut.



One of the ways we measure the halibut biomass is in catch per unit of effort, or CPUE - in other words, the amount of halibut landed per baited skate fished. Figures 4 and 5 show the relative CPUE that we encountered in each of the surveyed areas, indicated by the relative size of the circle at each sampling station.

We hope to continue to survey the Kodiak area annually and the Charlotte area every two years to keep an eye on the population dynamics in these areas. If we can, we may also add stations in the Kodiak area to better define the region, especially along the continental shelf.

GRID ON THE TRAWL GROUNDS: THE 1993 NMFS SURVEY

The picture we get from longline surveys every year is complemented by annual Bering Sea trawl surveys that the National Marine Fisheries Service conducts. Their trawl surveys cover a standard area of the eastern Bering Sea shelf, northward to about 60°N, a spread that includes most of the

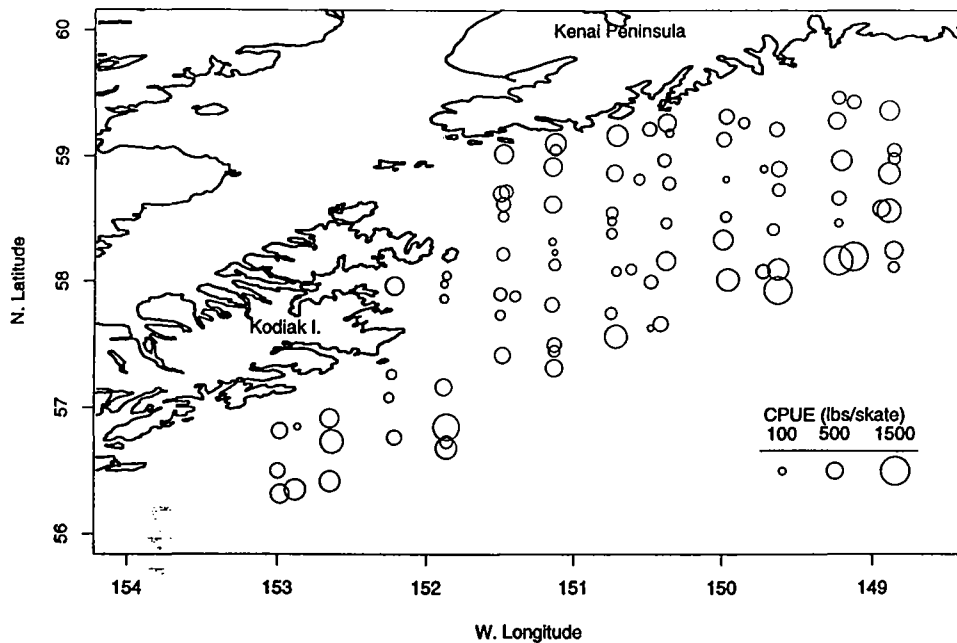


Figure 4. CPUE (pounds/skate) of Pacific halibut for stations fished during Area 3A grid survey in 1993.

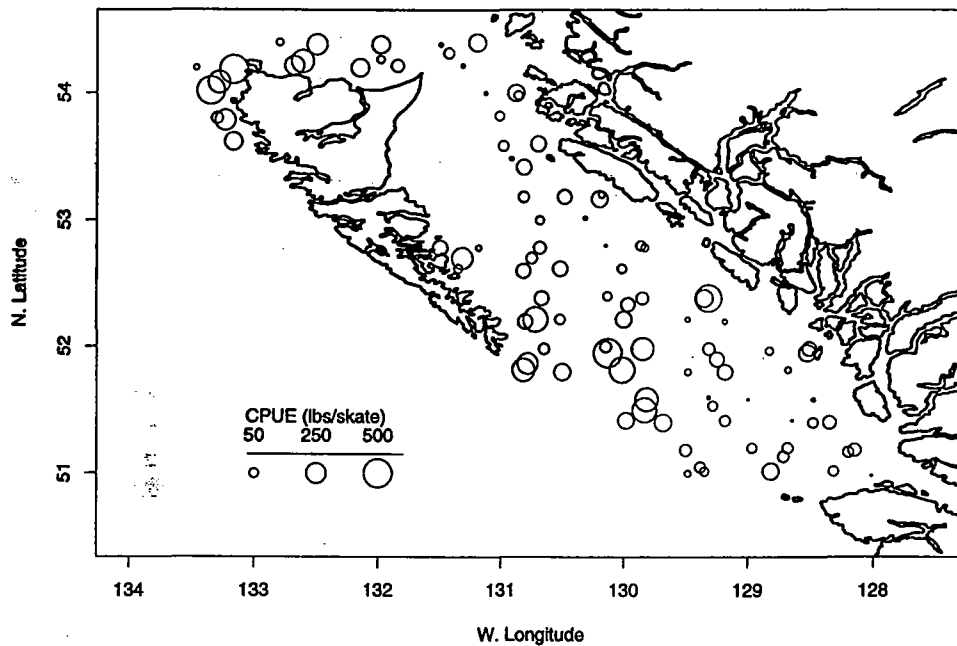


Figure 5. CPUE (pounds/skate) of Pacific halibut for stations fished during Area 2B grid survey in 1993.

summertime playground for juvenile halibut. (Every three years, they add the northern shelf and the slope to the survey area.)

The swept-area estimate of halibut biomass on the eastern Bering Sea shelf showed some interesting news: halibut biomass had increased by 60% in 1993. We attribute this growth to the maturing of fish in the 1987 year class, and to the migration of more large fish than usual from the slope onto

the shelf. We don't think there is reason to assume a real increase in halibut abundance in this area.

The population of juvenile halibut (under 65 centimeters) has swelled for the last few years; there are now twice as many of them as there were in the late 1980s and the greatest increases are among fish between 35 and 50 centimeters.

IT'S KIND OF POST CARD: HALIBUT TAGS AND WHAT THEY TELL US

The best way to find out how halibut move around, where they go, and when, is to look at their luggage tags. Each year we tag a certain number of halibut and release them. Later, when these fish are caught by sport or commercial fishermen, their tags are returned to us along with information about where and when each fish was caught. From these tags we've learned some interesting secrets about Pacific halibut, including information about migratory patterns, survivability after discard, mortality resulting from crucifiers, and other clues to the secret lives of these deepwater creatures.

From tag studies we've learned some about halibut migratory patterns, survivability after discard, mortality resulting from crucifiers, and other clues to the secret lives of these deepwater creatures.

In 1993, almost 4,500 halibut were tagged in four different projects. The largest, involving 3,800 fish, was a longline wire tagging study of discard mortality rates in the Kodiak/Chirikof area in April and May. This project, aboard the 87-foot *F/V Rebecca B*, will help us collect and document information on how to increase halibut survival in the longline cod fisheries.

Next was the annual Homer halibut sport fishing derby, where 48 halibut were marked with lock-on tags and fishermen who catch them win cash awards. The third was a summer-long study of halibut home range in Glacier Bay (Area 2C), during which about 544 fish were wire-tagged and released. The fourth was a small sport fishery tagging program in Alaska and British Columbia, in which charter fishermen were taught how to tag halibut with dart tags and release them. About three hundred were used this first summer of the program.

Returned tags are, in a sense, the halibut's way of checking back in with the IPHC. In 1993, we received 305 tags that had been recovered by commercial and sport fishermen from halibut that were landed at 31 different ports in the U.S. and Canada. A few of the tagged fish had well-stamped passports: One fish moved from waters off Newport, Oregon, in Area 2A, to Area 3A near Kodiak Island; another moved from off the Trinity Islands, in the Gulf of Alaska, to central Oregon. Eleven of the recovered tags were released 13 years ago, and two 14 years ago. One sport-caught fish had grown from 43 centimeters in 1980 to 129 centimeters in 1993.

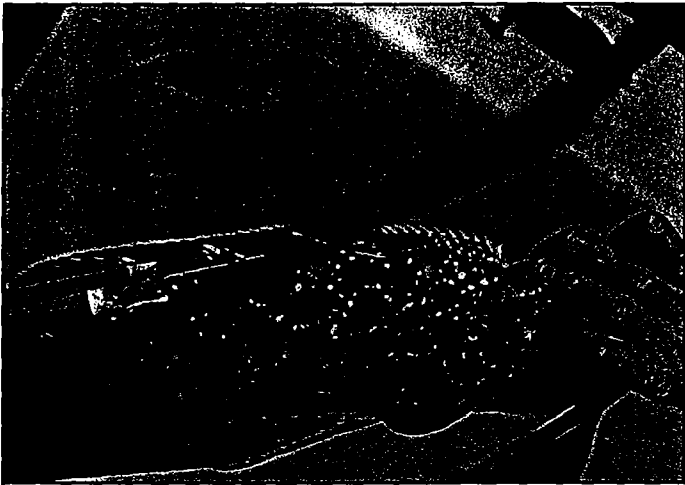
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A badge of honor: Tags in the sport fishery

There is growing support among sport charter operators for a catch and release halibut program in which sport-caught halibut could be tagged and released back to the sea. Fishermen are beginning to see the benefits of non-consumptive recreation. Charter operators also say that most of their clients are most interested in catching, not keeping, these grand fish. They

also like the idea of participating in a tagging program that might contribute to our scientific knowledge of Pacific halibut.

We started the program this year with 300 experimental tags, 100 of each of three sizes, and these we passed out to interested charter operators in July, including a sport lodge in British Columbia and several charter operators in Sitka, Alaska. All tags were numbered sequentially, with the IPHC address and our promise for a reward if the tag is returned after the fish is caught. The two smaller tags are plastic-headed dart tags at the anterior portion of the dorsal fin. The larger tag had a metal head designed for placement in the body close behind the head, in a place that could easily be trimmed off the fish in commercial processing. All of the tag heads were made of medical-grade materials, and were applied with hollow needles with a sharp, beveled cutting end.



What benefits might we see from a tagging program among sport fishermen? It's not easy to say. Many charter operators have supported a catch-and-release program, hoping that it would help enhance the resource and ease some of the conflicts between sport and commercial halibut fishermen. From a scientific point of view, a catch-and-release program for sport fishermen wouldn't protect the resource from the effects of sport fishing, because commercial quotas already are reduced to compensate for the sport catch. It may, however, lighten the atmosphere between commercial and charter halibut fishermen.

We think the scientific value of tagging data would be limited unless there was widespread participation, and unless most of the fishermen who caught tagged halibut - both commercial and sport - were consistent in reporting the tags. But if the idea were to take hold, and the thousands of sport fishermen who pursue halibut every year threw their enthusiasm into the idea - as billfish fishermen have done in the past decade - we could collect some valuable information at a very low cost. The program also might heighten awareness of the fragility of our ocean resources, and if it enhances communication, then it performs a service for us all.

APPENDICES

The tables in Appendix I provide season and catch information for the 1993 fishery. 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 1993 commercial fishing season, and Appendix III shows current sport fishing statistics.

All of the weights used are dressed (eviscerated), head off. Round weight can be calculated by multiplying the dressed weight by a factor of 1.33.

APPENDIX I:

- Table 1. Fishing period, number of fishing days, catch limit, and catch (000s of pounds) by regulatory area for the 1993 commercial Pacific halibut fishery.
- Table 2. Number of vessels and catch (000s of pounds) of Pacific halibut by vessel length class in the 1993 commercial fishery. Information shown for Area 2A does not include the treaty Indian commercial fishery.
- Table 3. Commercial landings in 1993 of Pacific halibut by port and country (000s of pounds).

APPENDIX II:

- Table 1. Fishing period limits (pounds, net weight) by vessel class used in 1993 for each regulatory area and fishing period.

APPENDIX III:

- Table 1. Catch by sport fishermen (000s of pounds) by area, 1988-1992.
- Table 2. 1993 catch allocations and estimates by subarea (pounds, net weight) within regulatory Area 2A.

APPENDIX I.

Table 1. Fishing period, number of fishing days, catch limit, and catch (000s of pounds) by regulatory area for the 1993 commercial Pacific halibut fishery.

| Area | Fishing Dates | No. of Days | Catch Limit (000's lbs) | Catch (000's lbs) |
|--------------|---------------|-------------------|-------------------------|---------------------|
| 2A | 3/01-7/19 | 81.5 | 136 ¹ | 138 |
| | 7/27 | 10 hrs | 225 | 366 ⁴ |
| 2B | 3/01-10/31 | 244 | 10,500 | 10,628 |
| 2C | 6/10-6/11 | 1 | 10,000 | 5,233 |
| | 9/08-9/10 | 2 | | 6,057 ⁴ |
| | | | | 11,290 ⁶ |
| 3A | 6/10-6/11 | 1 | 20,700 | 13,626 |
| | 9/08-9/09 | 1 | | 9,112 ⁴ |
| | | | | 22,738 |
| 3B | 6/10-6/11 | 1 | 6,500 | 5,259 |
| | 9/08-9/09 | 1 | | 2,596 ⁴ |
| | | | | 7,855 |
| 4A | 6/10-6/11 | 1 | 2,020 | 371 |
| | 8/11-8/12 | 1 | | 2,190 |
| | | | | 2,561 |
| 4B | 6/06-7/16 | 10.5 ⁷ | 2,300 | 206 |
| | 8/11-8/15 | 4 | | 1,190 |
| | 8/26-8/28 | 2 | | 566 ⁴ |
| | | | | 1,962 |
| 4C | 6/06-6/27 | 11 ² | 800 | 671 ⁵ |
| | 7/02-7/03 | 1 | | 160 ⁵ |
| | | | | 831 |
| 4D | 8/11-8/13 | 2 | 780 | 836 |
| 4D-N | 6/06-8/10 | 33 ² | 20 | < 1 |
| 4E(NW) | 6/06-9/18 | 70 ³ | 84 | 35 ⁵ |
| | 9/19-10/31 | 42 | | 2 ⁵ |
| | | | | 37 |
| 4E(SE) | 6/06-9/18 | 70 ³ | 36 | 22 ⁵ |
| | 9/19-10/31 | 42 | | 5 ⁵ |
| | | | | 27 |
| Total | | | 54,101 | 59,269 |

¹ Treaty Indian fishery.

² Alternating one day open and one day closed.

³ Alternating two days open and one day closed.

⁴ Fishing period limits by vessel class.

⁵ Single fishing period limit for all vessels.

⁶ Includes 21,000 pounds taken by Metlakatla Indians during additional fishing within reservation waters.

⁷ Alternating 12 hours open and 36 hours closed.

APPENDIX I.

Table 2. Number of vessels and catch (000s of pounds) of Pacific halibut by vessel length class in the 1993 commercial fishery. Information shown for Area 2A does not include the treaty Indian commercial fishery.

| Overall Vessel Length | Area 2A | | Area 2B | |
|-----------------------|----------------|--------------------|----------------|-------------------------|
| | No. of Vessels | Catch (000's lbs.) | No. of Vessels | Catch (000's lbs.) |
| Unk. Length | 2 | 2 | | |
| < 26 ft. | 65 | 27 | | |
| 26 to 30 ft. | 18 | 6 | | |
| 31 to 35 ft. | 19 | 11 | | *Data not yet available |
| 36 to 40 ft. | 48 | 42 | | |
| 41 to 45 ft. | 40 | 55 | | |
| 46 to 50 ft. | 24 | 54 | | |
| 51 to 55 ft. | 22 | 45 | | |
| 56 + ft. | 35 | 124 | | |
| Total | 273 | 366 | 355 | 10,628 |

| Overall Vessel Length | Area 2C | | Area 3A | |
|-----------------------|----------------|--------------------|----------------|--------------------|
| | No. of Vessels | Catch (000's lbs.) | No. of Vessels | Catch (000's lbs.) |
| Unk. Length | 10 | 43 | 14 | 118 |
| < 26 ft. | 295 | 342 | 146 | 126 |
| 26 to 30 ft. | 122 | 220 | 85 | 101 |
| 31 to 35 ft. | 205 | 739 | 202 | 903 |
| 36 to 40 ft. | 344 | 1,935 | 281 | 1,751 |
| 41 to 45 ft. | 220 | 2,330 | 210 | 2,516 |
| 46 to 50 ft. | 173 | 2,448 | 133 | 1,934 |
| 51 to 55 ft. | 73 | 968 | 91 | 1,901 |
| 56 + ft. | 135 | 2,265 | 367 | 13,388 |
| Total | 1,577 | 11,290 | 1,529 | 22,738 |

| Overall Vessel Length | Area 3B | | Area 4 | |
|-----------------------|----------------|--------------------|----------------|--------------------|
| | No. of Vessels | Catch (000's lbs.) | No. of Vessels | Catch (000's lbs.) |
| Unk. Length | 2 | 10 | 9 | 27 |
| < 26 ft. | 5 | 7 | 67 | 167 |
| 26 to 30 ft. | 1 | 1 | 19 | 149 |
| 31 to 35 ft. | 46 | 357 | 50 | 465 |
| 36 to 40 ft. | 66 | 518 | 13 | 126 |
| 41 to 45 ft. | 55 | 606 | 22 | 287 |
| 46 to 50 ft. | 58 | 690 | 14 | 333 |
| 51 to 55 ft. | 19 | 276 | 10 | 275 |
| 56 + ft. | 148 | 5,390 | 99 | 4,425 |
| Total | 400 | 7,855 | 303 | 6,254 |

APPENDIX I.

Table 3. Commercial landings in 1993 of Pacific halibut by port and country (000s of pounds).

| Ports | Canada | United States | Total |
|----------------------------------|---------------|---------------|---------------|
| California & Oregon | | 498 | 498 |
| Seattle | | 1,900 | 1,900 |
| Bellingham | 434 | 1,534 | 1,968 |
| Misc. Washington | | 1,221 | 1,221 |
| Vancouver | 3,166 | 142 | 3,308 |
| Port Hardy | 2,846 | | 2,846 |
| Misc. Southern B.C. | 965 | | 965 |
| Prince Rupert | 3,102 | 1,009 | 4,111 |
| Misc. Northern B.C. | 115 | | 115 |
| Ketchikan, Craig, & Metlakatla | | 2,322 | 2,322 |
| Wrangell | | 553 | 553 |
| Petersburg | | 3,528 | 3,528 |
| Juneau | | 558 | 558 |
| Sitka | | 2,990 | 2,990 |
| Hoonah, Excursion, & Pelican | | 2,646 | 2,646 |
| Misc. Southeast Alaska | | 114 | 114 |
| Cordova | | 1,039 | 1,039 |
| Seward | | 2,936 | 2,936 |
| Homer | | 5,667 | 5,667 |
| Kenai | | 1,073 | 1,073 |
| Kodiak | | 10,099 | 10,099 |
| Chignik, King Cove, & Sand Point | | 2,210 | 2,210 |
| Misc. Central Alaska | | 1,873 | 1,873 |
| Akutan & Dutch Harbor | | 4,012 | 4,012 |
| Misc. Bering Sea | | 717 | 717 |
| Total | 10,628 | 48,641 | 59,269 |

APPENDIX II.

Table 1. Fishing period limits (pounds, net weight) by vessel class used in 1993 for each regulatory area and fishing period.

| Vessel Class | | Regulatory Area and Fishing Period | | | |
|--------------|----------|------------------------------------|-----------------|--------------------|-----------------|
| Ltr | Len (ft) | 2A 7/27 | 2C 9/08-9/10 | 3A-3B 9/08-9/09 | 4B 8/26-8/28 |
| A | 0-25 | 600 | 1,700 | 900 | 1,300 |
| B | 26-30 | 700 | 2,600 | 1,300 | 1,400 |
| C | 31-35 | 1,100 | 4,600 | 4,000 | 6,600 |
| D | 36-40 | 2,800 | 6,900 | 5,200 | 7,700 |
| E | 41-45 | 3,000 | 11,100 | 8,400 | 9,400 |
| F | 46-50 | 3,600 | 15,300 | 11,800 | 11,400 |
| G | 51-55 | 4,000 | 15,300 | 17,400 | 16,900 |
| H | 56+ | 6,000 | 20,000 | 30,000 | 25,000 |

APPENDIX III.

Table 1. Harvest by sport fishermen (thousands of pounds) by area, 1988-1992.

| Area | 1988 | 1989 | 1990 | 1991 | 1992 ¹ |
|-------|-------|-------|-------|-------|-------------------|
| 2A | 249 | 327 | 197 | 158 | 250 |
| 2B | 504 | 635 | 762 | 584 | 714 |
| 2C | 1,076 | 1,559 | 1,330 | 1,654 | 1,668 |
| 3 | 3,264 | 3,005 | 3,638 | 4,236 | 3,899 |
| 4 | 36 | 24 | 40 | 74 | 40 |
| Total | 5,129 | 5,550 | 5,967 | 6,706 | 6,571 |

¹ Preliminary estimates

Table 2. 1993 Harvest allocations and estimates by sub-area within Regulatory Area 2A.

| Sub Area | Allocation | Estimate |
|-----------------------------------|------------|----------|
| Washington | | |
| Puget Sound ^a | 44,606 | 34,753 |
| North Coast ^b | 85,507 | 104,860 |
| South Coast ^c | 7,137 | 10,072 |
| Oregon | | |
| Central Oregon ^d | 2,564 | 5,191 |
| Southern Oregon ^e | 65,811 | 66,429 |
| Cent. and So. Oregon ^f | 2,564 | 569 |
| Cent. and So. Oregon | 14,530 | 22,298 |
| California | 2,281 | 2,281 |
| Total | 225,000 | 246,453 |

^a East of Bonilla-Tatoosh Line

^b Bonilla-Tatoosh Line to Queets River

^c Queets River to Cape Falcon

^d Cape Falcon to Nestucca Bay

^e South of Nestucca Bay

^f Restricted to waters inside the 30 fathom curve

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The Commission publishes three serial publications - Annual Reports, Scientific Reports, and Technical Reports - and also prepares and distributes regulation pamphlets and information bulletins. Items produced during 1993 by the Commission and staff are shown below. A list of all Commission publications is shown on the following pages. Commission materials are available upon request free of charge.

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TAGGED HALIBUT

The INTERNATIONAL PACIFIC HALIBUT COMMISSION attaches plastic tags to the cheek on the dark side of the halibut. Fishermen should return all tags, even those from halibut below legal size or those caught in trawls.



REWARD

\$5.00 will be paid for the return of each tag.

OR

A "Hat" will be paid for the return of each tag.

WHEN YOU CATCH A TAGGED HALIBUT:

1. Record tag numbers, date, location and depth in your log book.
2. Leave the tag on the fish.
3. Mark the fish with a ganglion around tail.

WHEN YOU LAND A TAGGED HALIBUT:

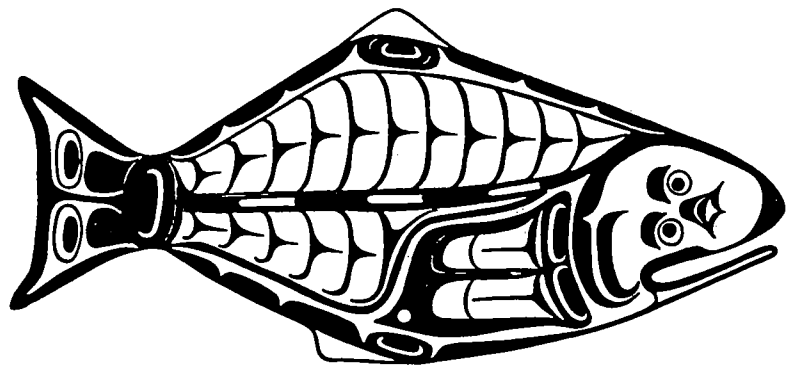
1. Report fish to a Commission Representative or Government officer
or
2. Forward tags to address below and enclose recovery information (see above), your name, address, boat name, gear, length of fish, and, if possible, earstones.

FINDER WILL BE ADVISED OF MIGRATION AND GROWTH OF THE FISH.

International Pacific Halibut Commission

P.O. Box 95009

Seattle, Washington 98145-2009



HALIBUT CREST — adapted from designs used by Tlingit, Tsimshian and Haida Indians.