# INTERNATIONAL PACIFIC HALIBUT COMMISSION

*Annual Report*
1994

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




Produced jointly by the IPHC staff
and
Krys Holmes, Winterholm Press
1995

**Cover:**
*The F/V Kristiana on charter with the International Pacific Halibut Commission in 1994. The vessel crew and IPHC staff were working on the annual grid survey in Area 3B.*

# 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.

*Al Mendoza from Unisea Seafoods in Dutch Harbor stands beside a 500-pound halibut. The **F/V Trask**, skippered by Charlie Adamonis, pulled this 99.5-inch fish from the waters around St. George Island in the Bering Sea. This fish is likely in its 30's and is most definitely a female.*

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.

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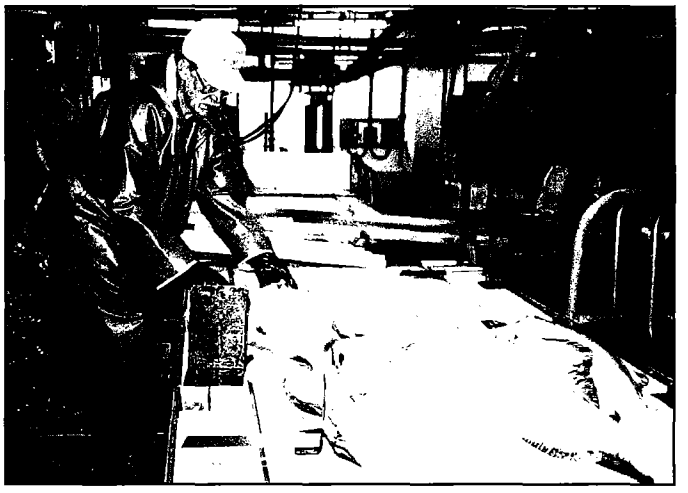
# ACTIVITIES OF THE COMMISSION 1994:
## THE DELICATE DANCE OF DECLINE

On this eastern margin of the Pacific, where the abyssal plain rises up to form the ridgebacked continent we call home, millions of Pacific halibut make their home along the continental slope. From the Mendocino Fracture Zone to the edge of the great Aleutian Basin, Hippoglossus stenolepis are one of the largest of the marine fishes and older than most: right-eyed flatfish first appeared in the Lower Eocene epoch, about 50 million years ago.

The world has changed a bit since the Lower Eocene - a few ice ages, some continental drifting, a planetary wobble or two - and the Pleuronectidae, the family of marine fishes that live on their sides in the Northern Hemisphere, have settled out into about one hundred different species, of which the Pacific halibut is among the most valuable. Human beings are the newcomers to this world and we still find changes in the world very curious.



This decade is its own epoch of change for those related to the halibut fisheries, and the Annual Meeting of the Commission in January focused on adapting to those changes in the best way possible. This year the halibut biomass continued its natural decline in abundance, and just when a host of questions push themselves to the forefront - questions about the interaction of marine species, about estimating survivability and abundance, about the DNA of halibut, and other clues to the enduring mysteries of halibut life - budget cuts on both the Canadian and the U.S. side of the border must inevitably temper our research work.

This year at the IPHC, our work focused on reducing bycatch mortalities; refining regulations to better adhere to our fishery management goals; working out conflicts between competing user groups; and providing research and informational support to the industry and other fishery management agencies to ensure the sustenance of the Pacific halibut resource.

## MEETING AT THE MARGIN

The shoreline where the sea lays seige on land can be one of the most turbulent places on Earth. It is along this shoreline, in the margin of the year, that the Commission holds its annual meeting with the industry to approve

the IPHC staff's agenda, to revise fishing regulations, and to discuss the impact of changes in fishery management programs.

Commission Chairman Steve Pennoyer presided over the 1994 meeting, held in Seattle, Washington. The Commission discussed a number of issues facing the industry today: an update on the Individual Fishing Quota (IFQ) program that begins off Alaska in 1995, catch sorting regulations aboard trawl vessels, estimates of Pacific halibut catches in Russian waters, the effects of increasing sport catches in some areas, and the mortality of halibut bycatch in other fisheries. At the annual meeting, the Commission set catch limits for 1994 for each of the harvest areas (harvest limits were set, as usual, at 30 percent of the exploitable biomass), and established fishery opening and closing dates.



## RULES ALONG THE WATERLINE: 1994 REGULATIONS

1) The Commission again adopted the catch sharing plan for Area 2A, off the U.S. West Coast, as requested by the Pacific Fishery Management Council. The catch sharing plan divides the harvest limit among commercial, sport and treaty Indian users. The Commission also resolved to study the complex resource and management issues in Area 2A for 1995.

2) The Commission voted to continue the experimental fishery in Area 4D-N, a sub-area within Area 4D created in 1993 to allow exploratory fishing around St. Lawrence Island in the Bering Sea.

3) Regulations were adopted that specified vessel clearance requirements for Area 4.

4) The Commission also explicitly banned the sale of undersized tagged halibut. Halibut below the size limit of 32 inches can be retained for personal use. In fact, the Commission encourages fishermen to bring in all tagged halibut regardless of size, season, or fishery.

## OTHER BUSINESS: BUDGETS, BIOMASS AND BYCATCH MEASURES

***Hot topics for 1994:***

*1) Deep budget cuts for the IPHC;*

*2) Bycatch reduction is ahead of schedule in Canada, behind in the U.S. North Pacific, and nonexistent along the U.S. West Coast;*

*3) Should Area 2A be subdivided to focus fishing effort where the fish are most concentrated?*

Budgets are lean everywhere, and the IPHC is learning, along with many other organizations, to survive on less. This year the Canadian government decreased their share of IPHC funding by nearly 5 percent - $33,500 in U.S. dollars - and gave notice that Canada's share of IPHC funding would not be above $800,000 for the next several years (matched by U.S. funds). However, the Commissioners authorized the carryover of an additional $315,000 of surplus 1994 funds to boost the 1995 budget. The Commissioners authorized the Director to transfer appropriations in an amount not exceeding an aggregate of $20,000 between categories within the budget, but not from Programs to Personnel.

Money talks, but bycatch walks away with disturbing numbers of Pacific halibut every year, and the Commission's annual meeting turned inevitably to the bycatch conundrum. In Canada, the bycatch reduction plan is slightly ahead of schedule. They aim to decrease bycatch by 50 percent and so far have adopted a number of measures to accomplish this. The U.S. continues to address the problem as well.

Area 2A was of particular concern this year for a number of reasons. A new regulation was proposed - and defeated - to divide Area 2A into two subareas to help assure that halibut within the area are harvested in proportion to their abundance. We know that 70 percent of the harvest comes from

the northern half of the area, where perhaps only 30 percent of the halibut biomass congregate, and only 30 percent of the harvest comes from the southern half, where estimates suggest that 70 percent of the halibut are found. Allocation and management issues are very complex in Area 2A, and the Commission decided to work with the Pacific Fishery Managment Council (as mentioned in the new regulations) to explore and evaluate management concerns, as well as wait for the results of the 1995 2A survey, in lieu of splitting Area 2A.

# DIRECTOR'S REPORT



Finally, we have a rational fishing system in place for the United States Pacific halibut fishery. It took many years of work by many dedicated people. To many professionals in the fisheries business it is hard to understand why it took so long. The system provides so many benefits to everyone involved one can only conclude that opposition comes from those that have not previously participated in the fishery or adhere to a different ideology.

The fishery has finally entered the free enterprise system and competition now occurs where it should, competing to produce the best possible product for the lowest cost and not the uncontrolled competition for the resource that produced the poorest of products. Our retailers have not had such a fine fresh product for sale for many years. The fishery is easier to manage and the data we get from fishermen has never been better.

There is of course still criticism of the system by people that have no quota shares or have less than they would like. There are now start up costs to enter the halibut fishery similar to beginning any new business. Fishermen can get into the halibut fishery by buying quota, just like farmers must buy or lease land and loggers must competitively bid for the privilege of cutting on public land or buy forest land to harvest trees. Some individuals have leveled criticism at the fishermen that have been given large quota shares, instead of criticism it should be acknowledged that the fishermen with large quotas earned those shares by hard work under a very poor and dangerous open access system. Some individuals have even gone so far as to suggest the International Pacific Halibut Commission has adopted larger catch limits than conservation principles would dictate because of the ITQ system. You can be assured this is not the case. The Commission only takes into account stock conditions and its conservation strategy when setting catch limits and does not modify its procedure regardless of the allocation scheme.

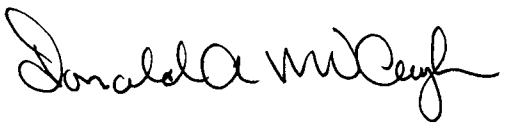
Unfortunately, criticism coming from this vocal minority often gets the attention of local politicians who then attempt to placate them by attacking the system legislatively. Politicians would be well advised to leave allocation considerations to the fishermen and professional managers that have expertise in the area. The critics of this system would do more for the fishery if they would concern themselves with the serious conservation problems which result in less than maximum catch limits. Their energy would be put to better use if they would attempt to convince politicians to turn their attention to the conservation problems

caused by bycatch and not interject themselves into allocative disputes between fishermen.

The experience from Canada is that the system works extremely well, fishermen are averaging at least a dollar per pound more under IFQs and the fishery is safer, more orderly, easier to manage, and the consumer is benefitting from fresh, high quality halibut for eight months of the year.



The Commission staff fully supports the ITQ systems and is thankful to those individuals of the North Pacific Fishery Management Council family that persevered to bring rational behavior back to the fishery.



Donald A. McCaughran
Director

# THE DIVINE INTOXICATION: FISHING FOR HALIBUT IN 1994



"Exultation is the going of an inland soul to sea," wrote poet Emily Dickinson. The first league out from land is where it begins, for most of us: The froth of conversation between wind and sea, the enlivening of a hull in the swell, the optimism of a thousand baited skates. What may be divine intoxication for some is just another day on the fishing grounds for another. For most of us, probably, it's a combination of both that draws us to the waters year after year to harvest meat from the deep.

The Pacific halibut resource feeds a number of different fisheries - commercial, recreational, traditional, ceremonial and subsistence. Our job at the Commission is to keep the total removals in balance with the other influences at work in the marine environment, and with this amazing biomass itself.

## MAPPING THE MUTABLE SEA

The Pacific continental shelf is much narrower than the Atlantic shelf - barely twenty miles wide between San Francisco and Juneau, widening out in the Gulf of Alaska between Kodiak and the Aleutian Trench. Along the edge of this shelf, turbulent waters and rocky, corrugated grounds create the world's best bed and breakfast for Pacific halibut.

Across the span of Pacific coast, the Commission has drawn lines dividing ten management areas, each with its own harvest limit, fishery schedule and regulations (see Figure 1). The 1994 regulatory areas were the same as in 1993, including the newly apportioned subarea 4D-N, which created a commercial halibut fishery off St. Lawrence Island. The halibut nursery ground in the Southeastern flats in the Bering Sea, excluding Bristol Bay, remain closed to all halibut fishing.

The regulatory areas are:

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.

## FEWER FISH IN THE SEA: THE 1994 COMMERCIAL FISHERY

In 1994, fishermen in all regions harvested 54,730,000 pounds of halibut, about 2.0 million pounds short of the catch limit of 56,755,250 pounds. Only in Areas 2A, 4A, 4C, 4D and 4E(SE) did actual catches exceed harvest limits, and there only slightly; in all other areas catches undershot the harvest limit for various reasons. Overall, catches of Pacific halibut have declined steadily since 1989, when nearly 67 million pounds were landed.

*In 1994, fishermen in all regions harvested 54,730,000 pounds of halibut, about 2.0 million pounds short of the catch limit of 56,755,250 pounds.*

There are fewer fish in the sea, it seems, and in U.S. waters there were fewer fishermen pursuing them. This year, 5,418 commercial halibut licenses were processed up and down the U.S. West Coast, 3 percent fewer than in 1993. In Alaska, 4,856 licenses were issued, down from 4,942 in 1993; there were 231 in Washington (down from 244); 285 in Oregon (down from 332) and 46 in California (down from 59). Canada's Pacific halibut fisheries are managed under an Individual Vessel Quota (IVQ) system, and 435 vessels received quota shares. This number has remained constant since the IVQ program began in 1991.

All we have here are numbers: catch statistics, dates, allocative details. Behind the numbers, though, drums the heartbeat of one of the oldest commercial fisheries we know; with all its changes and restrictions it is still absorbing, still inviting, still the vocation that beckons.

An overview of 1994 halibut fishing activities for each area follows.

**Area 2A**
**Catch limit: 550,000 pounds**
**Actual catch: 580,000 pounds**

The halibut resource off the coasts of California, Oregon and Washington feeds a multitude of people and supports several very different fisheries. Each year, the Pacific Fishery Management Council adopts a catch sharing plan that allocates Pacific halibut among commercial, sport, and traditional users. A recent Federal Court ruling upholding treaty-Indian fishing rights in Area 2A-1 required, among other measures, that the Council increase the treaty-Indian allocation from 25 to 35 percent of the total allowable catch. The remaining 65 percent was equally distributed between the non-treaty commercial and sport fisheries.

The total allowable catch for all user groups was 550,000 pounds. Within this total, the Washington treaty Indian fishery was allocated 192,500 pounds (176,500 pounds for the commercial fishery with 16,000 pounds reserved for ceremonial and subsistence fishing), and 178,750 pounds were allocated to the non-treaty commercial fisheries. An additional 178,750

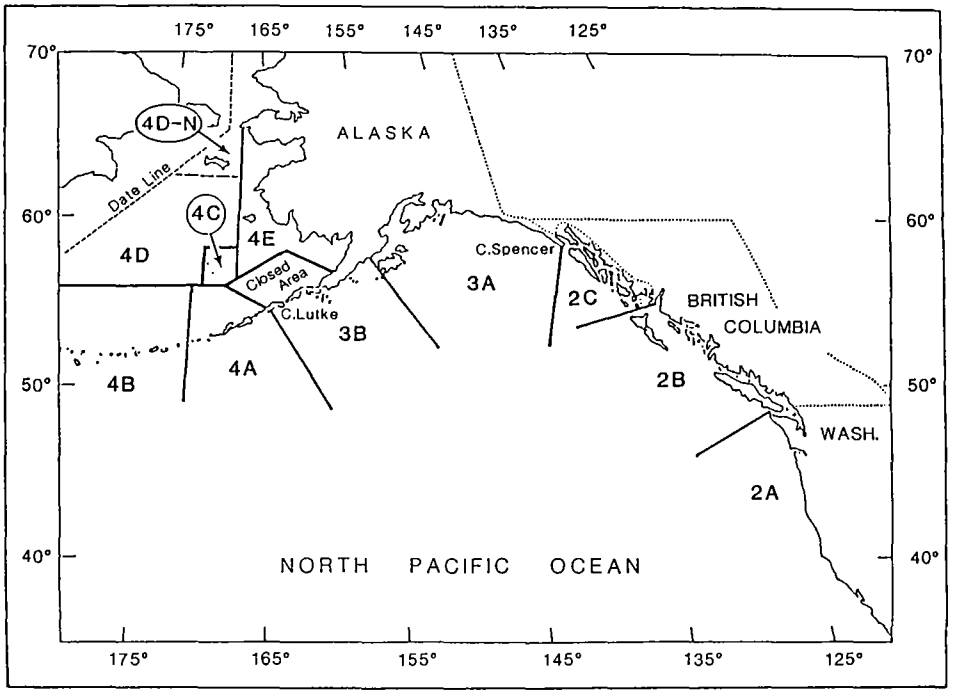


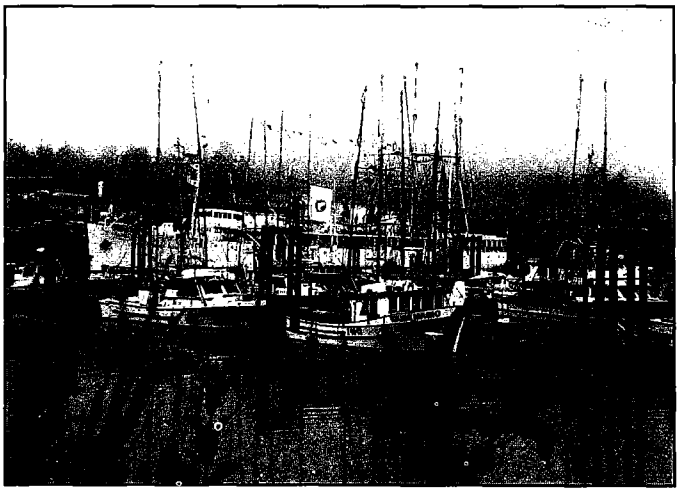

**Figure 1. IPHC regulatory areas in 1994.**

*A recent Federal Court ruling raised the treaty-Indian harvest allocation from 25 percent to 35 percent of the total allowable catch in Area 2A.*

pounds were allocated to the sport fisheries.

The Indian commercial fishery was scheduled to begin March 1, but a storm delayed the opening until 6 a.m. on March 5. Harvesters landed 49,000 pounds in that first opening, which ended at 6 p.m. March 8. A second fishing period ran from March 14 to March 18, yielding 51,000 pounds. A final 30-hour fishing period, with staggered openings for the different participating tribes, produced 88,000 pounds from March 25 to March 26. The total commercial landings for tribal fishermen, 188,000 pounds, exceeded the catch limit by 11,500 pounds.

Commercial fishermen took the non-treaty catch in three ten-hour periods on July 6, July 19 and August 3; each period was governed by fishing period limits, which restrict the allowable poundage according to vessel size. Harvesters landed 129,000 pounds on July 6, 28,000 on July 19 and 25,000 on August 3, for a total of 182,000 pounds - 3,250 pounds over the catch limit.



The sport fishery for all areas is discussed later in this report.

**Area 2B**
**Catch limit: 10,000,000 pounds**
**Actual catch: 9,911,000 pounds**

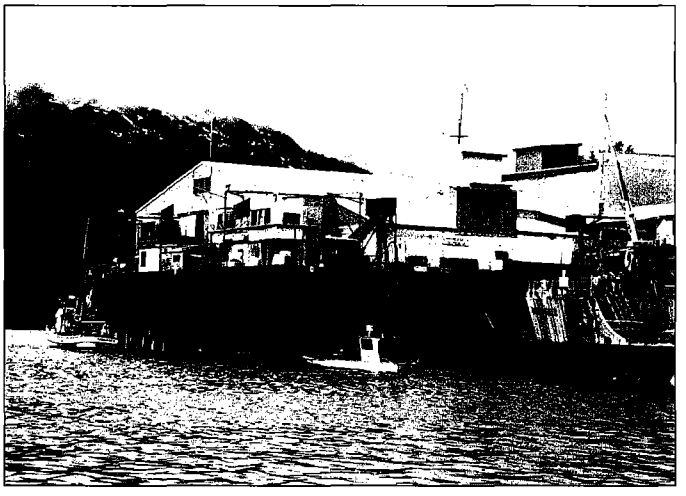
In this fourth year of the Individual Vessel Quota (IVQ) fishery for halibut in waters off British Columbia, harvesters could land their quota share any time between noon on March 1 and noon on November 15. As in 1993, each of the 435 "L" licensed vessels received their license quotas split into two equal shares. The shares could be transferred between "L" licensed vessels without regard to vessel size and without transferring the "L" license. Each vessel could hold and fish a maximum of four quota shares in 1994; therefore, since a number of vessels fished more than their original two quotas, there were fewer boats out on the waters this year.

Since 1993, IVQ fishermen have been allowed to carry over any amount of underharvest - up to 10 percent of the vessel's quota - to the following year's catch. Last year approximately 40,000 pounds of quota share went unharvested, so that amount was added to the 10 million pound catch limit, bringing the combined total catch limit to 10,040,000 pounds for 1994. The total removals of research and commercial catch was 9,911,000 pounds. About 125,000 of additional poundage will be distributed among the quota share holders who underharvested this year by being added to their 1995 shares.

*The total British Columbia catch was 129,000 pounds below the combined total catch limit, including the carryover from 1993. In 1995, about 125,000 pounds of additional poundage will be added to the shares of vessels that underharvested this year.*

**Area 2C**
**Catch limit: 11,000,000 pounds**
**Actual catch: 10,379,000 pounds**

The emerald waters of Southeast Alaska were the birthplace of the North Pacific commercial halibut fishery. In the first decades of this century, schooners and steamships loaded glacier ice into their holds to chill halibut catches for the long trip back to Vancouver or Seattle. Back then halibut were harvested by hand-lines that fishermen ran from individual dories; about twice a day they'd deliver their dory-full of halibut to the mother steamer. The fishery was open year-round before 1923, and the threat of bad weather beyond Cape Spencer - not to mention the good fishing in inside waters - kept most halibut vessels east of the Cape. It's a different fishery today, in these waters of the Southeast Alaska panhandle, with vastly different boats, gear and regulations. But the mystery of these waters endures and so, thankfully, do the fish.



The first 24-hour halibut opening in Area 2C this year yielded 4,822,000 pounds, taken on a fair June day. However, when the second opening was announced, a 48-hour period September 12 to 14, it was accompanied by a storm warning that kept most of Southeast Alaska's small boats safe at

harbor. Even though the storm never fully materialized, landings during that second opening were only 5,557,000 pounds, and the overall catch for the area undershot the limit by 621,000 pounds.

Within Area 2C, the Metlakatla Indians participate in a commercial fishery authorized by the U.S. Secretary of the Interior within the 3,000-foot Annette Islands Reserve boundaries. In thirteen 48-hour fishing periods between February 5 and September 4, a fleet ranging from one to 19 vessels harvested 54,294 pounds of halibut.



*In the modest Annette Island reserve fishery, the Metlakatla fleet harvested 54,294 pounds of halibut.*

**Areas 3A and 3B**
**Combined catch limit: 30,000,000 pounds**
**Combined actual catch: 28,704,000 pounds**

The Gulf of Alaska fills the open jaw between the North American mainland and the Aleutian archipelago and here, in these tumultuous waters where the North Pacific sloshes to its continental terminus, the halibut fishing is rich indeed. For management purposes, Areas 3A and 3B are assigned a combined catch limit as well as individual limits. Each area is managed within its own limits, but in case of an overrun in one area, both areas are closed when the combined limit is reached. This scheme helps us keep a more conservative watch on Gulf harvests.

In 1994, catch limits were 26,000,000 pounds in 3A and 4,000,000 pounds in 3B. The first 24-hour opening, which began June 6, was unrestricted in 3A but included fishing period limits in 3B to prevent overharvesting the relatively small catch limit. That first day yielded 18,159,000 pounds in 3A and 2,047,000 pounds in 3B. Fishing periods were imposed in both areas for the second opening, which began September 12 and closed 48 hours later, but those limits were quite liberal because we expected a number of boats to fish the unrestricted sablefish fishery - scheduled for the same time - instead of pursuing halibut. A fall storm on the second day of the September opening held harvests down significantly, and when the period ended vessels had delivered 6,685,000 pounds in 3A and 1,813,000 pounds in 3B, leaving the year's harvests just over a million pounds under the limit in the Eastern Gulf and 140,000 pounds short in the Western Gulf.

*In September, stormy weather in the Gulf of Alaska held deliveries down, and by the season's closure landings were just over a million pounds under the limit in the Eastern Gulf and 140,000 pounds short in the Western Gulf.*

**Area 4A**
**Catch limit: 1,800,000 pounds**
**Actual catch: 1,803,000 pounds**

The waters off the central Aleutian Chain were neatly managed in 1994; harvests came within 1 percent of the allowable take. The first fishing period of 24 hours opened at noon on June 6, and included fishing period limits to discourage Area 3B fishermen from slipping over into 4A and taking so much halibut that the August opening might be jeopardized. With limits imposed, the June catch was only 168,000 pounds. The area opened again on August 15 for only 12 hours, but with no period restrictions and the fleet landed 1,530,000 pounds on that day. The last opening, from September 12 to 14, yielded 105,000 pounds with fishing limits imposed, bringing the year's catch in 4A 3,000 pounds over the catch limit.

**Area 4B**
**Catch limit: 2,100,000 pounds**
**Actual catch: 2,017,000 pounds**

Just off the tip of the Aleutians, the Trench floor drops as deep as -7,679 meters - the deepest waters of the North Pacific. North of the islands, the Bering Sea floor drops into the flat, broad Aleutian Basin bowl, nearly 4,000 meters deep in places. Upwelling and the backwash of currents against the continental shelf bring a constant mixture of nutrients to these fertile waters.

The IPHC set the catch limit for Area 4B at 2,100,000 pounds, and managed openings so that 315,000 pounds (15 percent of the catch limit) could be harvested in June and July, before the major fishery began. The first 24-hour opening, June 6, produced 6,000 pounds; thirteen 12-hour openings that followed produced an additional 326,000 pounds. The major Area 4B fishery began August 15, a 96-hour opening in which harvesters landed 1,685,000 pounds. A final 48-hour fishing period opened September 12, accompanied by fishing period limits, to allow local fishermen a go at the remaining 83,000 pounds; however, no vessels participated in this final opening.

**Area 4C**
**Catch limit: 700,000 pounds**
**Actual catch: 715,000 pounds**

*Even with fishing period restrictions, fishermen in the rich waters around the Pribilov Islands landed plenty of halibut, exceeding the catch limit by 15,000 pounds.*

This smallest halibut area in the Bering Sea, around the twin jewels of the Pribilof Islands, are important fishing grounds for the high-seas halibut fleet and for the local Pribilof fleet. Allocation regulations by the North Pacific Fishery Management Council require we manage halibut fisheries here to give the small, local fleet a chance by scheduling a series of 24-hour fishing periods interspersed with 24-hour closed periods. The fishery opened with its first 24-hour fishing period June 3. All participating vessels were restricted to a 10,000-pound catch limit per fishing period. In 14 fishing periods between June 3-30, harvesters landed 681,000 pounds. A final opening on August 2-3 restricted vessels to 1,500 pounds each, and reaped a catch of 34,000 pounds - 15,000 pounds over the total catch limit.

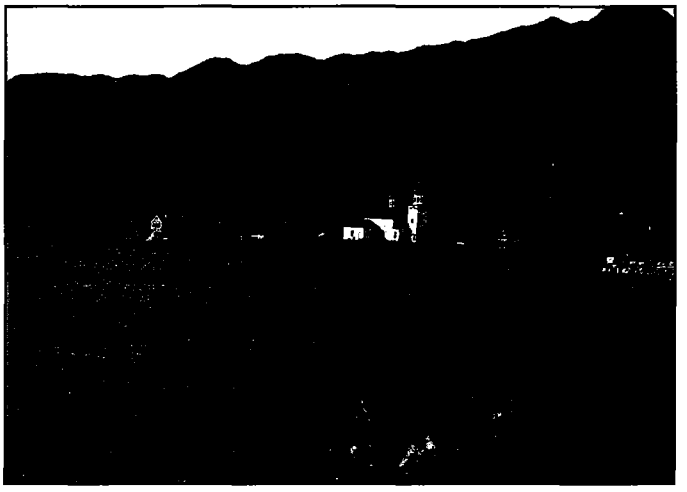
**Area 4D and Subarea 4D-N**
**Total catch limit: 700,000 pounds**
**Total actual catch: 711,000 pounds**

*Sparse halibut populations and tightly regulated fishing periods gear this fishery primarily to the small local fleets. This year, however, the catch limit was exceeded for the first time in several years.*

Subarea 4D-N was allotted a catch limit of 35,000 pounds in 1994, the second year of this program dividing Area 4D into two interrelated sections. We scheduled a series of 22 fishing periods between July 1 and August 13 in the waters north of St. Lawrence Island. Each 24-hour period was restricted by 1,000-pound fishing period limits. Vessels landed 18,000 pounds in this fishery, and the remaining 17,000 pounds reverted to the Area 4D total catch limit of 665,000 pounds.

The major 4D fishery opened August 15, a 30-hour unrestricted opening between 9 a.m. August 15 and 3 p.m. August 16. The final take was 693,000 pounds, 11,000 pounds over the area catch limit.

**Area 4E**
**Catch limit:**
**100,000 pounds**
**Actual catch:**
**120,000 pounds**



Area 4E skirts the western coastline of Alaska from Cape Prince of Wales to the Alaska Peninsula, including Nunivak island, and losing its southwestern corner to the closed area. These waters are rich in many species, but are home to a sparse halibut population, so the area is managed to encourage mostly local participation, again under the direction of the North Pacific Fishery Management Council. The fishery is designed so that 30 percent of the allowable catch - this year, 30,000 pounds - could be harvested in 4E-SE waters, southeast of Cape Newenham, the northern boundary of Bristol Bay; the bulk of the harvest, 70,000 pounds, was to come from waters north of Cape Newenham (4E-NW). May 2 opened the first in a series of 48-hour fishing periods interspersed with 24-hour closed periods. All vessels were limited to 6,000 pounds per fishing period.

Area 4E-SE closed on June 15, after 30 fishing days that reaped 58,000 pounds - nearly double the 30,000-pound target. Area 4E-NW was closed on July 24, after 56 fishing days that produced 62,000 pounds. The total area catch of 120,000 pounds topped the catch limit by 20,000 pounds - the first time the Area 4E catch limit has been exceeded for several years.

## THE SHADOW SUSPENDED IN GREEN GRACE: THE 1994 SPORT FISHERY

We carry a world of mystery inside us, and it is to learn more about that inner world that we are drawn. We long to drop a line into the silent deep and come up with something we can be sure of, and when even a bantam-weight halibut takes your line like a bus door closing on your tie, you know you have something you can be sure of.

Anglers apparently are not the only creatures who sport fish. On a sea voyage of 1877, a ship's captain reported watching a halibut pursue a cod through the upper surface of the water for a time, trying to kill the smaller fish by striking it with its tail. The skipper hove out a dory with a couple men who gaff-hooked the halibut. "The codfish was quite exhausted by the repeated blows, and did not try to escape after its enemy had been captured," the skipper's account reads. "The Halibut was so completely engaged in the pursuit of the codfish that it paid no attention to the dory and was quite easily captured."

None of our sport fishing regulations applies to halibut, but they do apply to anglers in pursuit of halibut for a number of purposes - for food, for recreation, for traditional and food use, and to support the growing charter-boat industry. This year, the sport fishing regulations remained the same for waters off British Columbia and Alaska. Life is more complicated

along the U.S. West Coast, however, and this Area 2A, saw a few regulatory changes.

The Pacific Fishery Management Council closed a popular fishing area west of Neah Bay, the northwest point of the Olympic Peninsula, to prevent fishermen from taking too many large halibut. The measure, which was requested by the state of Washington and the charter fishing industry, was designed to hold down the average weight of sport-caught halibut so the sport season could last longer.

As usual, halibut permits were required for sport charter boats coastwide if their skippers intended to pursue halibut.

## *Counting Our Blessings: Sport Catches are Hard to Monitor*

We dance a skip-step when we collect sport fishing harvest estimates across the West Coast. In Area 2A, data comes from the Oregon and Washington departments of Fisheries and Wildlife, and they are able to provide current data for this year. The 1994 sport catch statistics for Area 2B are still under review by Canada's Department of Fisheries and Oceans (DFO) and by the IPHC. The Alaska Department of Fish and Game gathers sport fishing data for all waters off Alaska - they conduct questionnaires by mail and do creel surveys - and their information lags behind by a year. So the information that follows covers 1994 sport catches for waters off Oregon and Washington; only a general snapshot of 1994 catches off British Columbia, and 1993 data for waters off Alaska.

## *Area 2A: Honing in on The Hot-Spots*

Sport fishermen of the U.S. Pacific Northwest caught approximately 186,339 pounds of halibut in 1994 - 7,589 pounds more than the catch limit of 178,750 pounds. Most of this overage came from the South Coast, where sport reelers caught nearly triple their limit in only two fishing days. This fishery, harvested mainly by the Westport, Washington, charter fleet, has shown a remarkable ability to target on small offshore halibut hot-spots. This year, halibut managers learned their lesson about evaluating catches on a daily basis in this area. The average weight in this area was 21.7 pounds, nearly the same as last season.

*Sport fishermen of the Pacific Northwest caught approximately 186,339 pounds of halibut in 1994 - 7,589 pounds more than the catch limit of 178,750 pounds.*

In the Strait of Juan de Fuca and Puget Sound, fishermen also exceeded their catch limit, but only by a small margin - barely 2,000 pounds. Here, the average weight decreased slightly from 23.0 pounds to 22.5 pounds. Further west, the fishery was closed just short of the 68,039 catch limit, and managers decided the catch was too close to the limit to warrant another fishing day. Here, the average weight climbed to 23.1 pounds, 3.1 pounds heavier than the average halibut caught in 1993. In this area, the fleet has

targeted on larger fish in the past few years, and may now be harvesting the last of the strong year classes of the 1980s.

From Cape Falcon, Oregon, to the California border, sport harvesters hit their catch limit almost right on target, just 81 pounds short of the 67,900-pound allocation. An early-season, all-depth fishery for 53,641 pounds actually reaped about 10,000 pounds more than that, so a planned all-depth fishery again in August was cancelled. However, an extended fishery in the zone shallower than 30 fathoms allowed managers to creep up on the catch quota, and gave bottomfish anglers a chance to keep their incidentally caught halibut. A fairly profitable sport fishery for albacore tuna in August and September also drained away some effort from the inshore halibut fishery.

*In Washington's North Coast sport fishery, the average weight of halibut was 23.1 pounds, 3.1 pounds heavier than the average halibut caught in 1993.*

California biologists do not collect data about halibut harvests separate from other sport fishing statistics. However, we do try to keep an eye on things off California's crenellated coastline, and from anecdotal information we're able to determine that about 1,813 pounds of halibut were harvested there last year.

## *British Columbia's Sport Catch: Estimating the Enthusiasm*

*From Cape Falcon, Oregon, from the California border, sport harvesters hit their catch limit almost right on target: just 81 pounds short of the 67,900-pound allocation.*

We are still reviewing information about recreational halibut catches from the waters off British Columbia. Canada's DFO now has discredited the Tidal Diary Program, a postal survey used between 1980 and 1992 to estimate the sport catch, as severely over-estimating the catch. The last Tidal Diary survey was conducted in 1992, and DFO stopped analyzing data from it after 1991. The Department this year used an ad hoc approach, relying on creel surveys, Record of Management Strategy reports, and information volunteered by fishing lodges and charter operators. Though participants did invest a great deal of effort into this approach, we don't feel extremely confident about the results, and the surveys themselves don't cover enough of the total fishing activity to provide sufficient data.

Until we can implement a comprehensive procedure for estimating British Columbia sport catches, we have decided to average out the sport catches from 1987 through 1992 as recorded in the Tidal Diary Program, and to estimate average weight by applying known statistics in neighboring regions. (Therefore, we've multiplied the number of fish caught in northern British Columbia waters by the average weight from Ketchikan, and the number of fish caught in southern B.C. waters by the average weight from Neah Bay.) Using this method, we estimate the total British Columbia sport catch to be about 657,000 pounds, judging by the six-year average catch between 1987 and 1992.

We acknowledge that we may be overestimating British Columbia sport catches as a result, but in keeping with the Commission's conservative management policy, we believe it's better to overestimate than to underestimate. The halibut sport fishery is becoming more popular in British Columbia, and though it hasn't reached the same intensity as in the U.S., we have reason to think it might. One clue, according to DFO biologists, is that salmon are diminishing in these waters due to higher predation by mackerel. As salmon returns get poorer, anglers are likely to redirect their effort toward more halibut, as they did in Area 2A in the late 1980s when salmon seasons were severely reduced.

In addition to the halibut caught by British Columbia anglers, a number of Washington charter boats caught 4,472 halibut off Swiftsure Bank, within Canadian waters, and landed them at Neah Bay, Washington. If the halibut off Swiftsure average about the same size as halibut off Washington's

North Coast, 23.1 pounds, we would estimate this Swiftsure harvest at about 103,303 pounds.

## *A Surge in Southeast*

In Alaska, we step back in time to 1993's sport fishery, when anglers caught about 1,811,000 pounds of halibut. Catches increased slightly - less than 10 percent - over 1992, but average halibut weight declined, from nearly 24 pounds to 21.3 pounds. The Southeast Alaska halibut harvest has remained stable for several years, but the fish themselves have traded real estate: since 1990, catches in inside waters (Juneau, Ketchikan, Petersburg/Wrangell and Haines/Skagway) have declined and catches along the outer coast (Sitka, Prince of Wales, Glacier Bay) have more than tripled. Meanwhile, angling effort everywhere has increased.

*Washington-based anglers harvested about 4,472 halibut off Swiftsure Bank in Canada, totalling about 103,303 pounds.*

*Southeast Alaska's 1993 sport catch was almost 10% higher than the previous year, but average weight dropped from nearly 24 pounds to 21.3 pounds.*

## *Pulses in the Populated Areas*

Halibut in the Gulf of Alaska and Prince William Sound have an interesting story to tell, and this year they continued their rhythmic narrative of odd leaps in abundance followed by a couple of years' stability. Over the past 15 years, sport catches in Area 3 show a pattern of holding steady for two to four years and then suddenly increasing. In 1993, sport catches of halibut in Area 3 jumped 35 percent over the previous year, reaching 5,265,000 pounds. Halibut in this area are among the smallest and the largest in the North Pacific; they average 15 pounds in Seward and 25 pounds in Homer.

On the Kenai Peninsula, we don't know if it's the halibut or the harvesters who are moving around more. Catches in Homer and the lower Cook Inlet have held steady or decreased, while catches near Deep Creek and the central Inlet are on the rise. Part of the reason for these higher catches off Deep Creek is that some Kenai River fishing guides have shifted their operations to the saltwater fisheries of the Inlet to avoid increasing king salmon restrictions on the Kenai River. The growing charter fleet in the central Inlet has attracted a lot of Anchorage anglers who previously had to drive the five hours to Homer to get their halibut.

## *Working the Far Western Waters*

*The 1993 sport catch of halibut in Area 3 jumped 35 percent over 1992, and averaged between 15 and 25 pounds.*

In 1995, the U.S. Navy will end what it calls the Morale, Welfare and Recreation Activity program on Adak Island, in the Aleutian Chain, which means there won't be as much sport fishing activity out in the far Aleutians. For the past few years, we have relied on the Navy Activity logbook and catch information for average weight estimates, which the Service has gener-

ously provided, as well as on postal surveys of anglers.

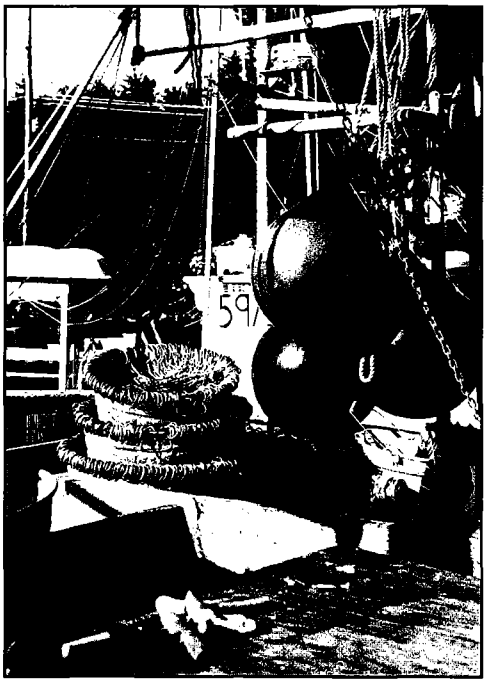
These records show extreme fluctuations in halibut catches in the Bering Sea and Aleutian Islands - caused, we think, by the extremely low number of anglers contacted for the postal surveys. The total 1993 recreational harvest in Area 4 was estimated at 72,000 pounds, nearly double the 1992 catch but just short of the 1991 catch. The average weight of halibut in this area is 20.3 pounds.



## REDEMPTION FROM OUR RECKLESSNESS: WASTE IN THE FISHERIES

All of nature is a concatenation of extravagant gestures. Nature herself is a wastrel; she overproduces, she revels in evolutionary decadence, she spends all she's got and counts on most of it slipping through the fingers of fate - else why would each female halibut carry thousands of eggs in a twenty-pound roe sac? But we humans only waste Nature's resources to our own peril.

A certain amount of waste shadows the commercial halibut fisheries. We monitor wastage levels as accurately as we can, and reduce the allowable catch to account for the estimated waste. Therefore, it benefits the industry, and some believe it shows more respect to the fish themselves, to reduce the amount of halibut that is profitlessly taken from the resource each year.



Waste comes to the commercial halibut fishery in two ways: by lost or abandoned gear left on the grounds with unretrieved halibut; or by the deaths of under-sized halibut that are thrown back too wounded to survive. Each year, we estimate how many halibut are killed by each kind of waste, and we also cast a backward glance to re-calculate waste from previous years using more current information. Tracking wastage not only helps biologists to better manage the resource, it also helps the entire halibut community assess its efforts to put this magnificent resource to the fullest possible use.

Each year, we collect information from logbooks, interviews and mail surveys, on the amount of gear hauled, and the amount lost or abandoned, in the halibut longline fishery. We estimate that in 1994, 1,481,000 pounds of halibut were killed by lost or abandoned longline gear; 79,000 pounds in Area 2B; 256,000 pounds in 2C, 1,002,000 pounds in 3A, 43,000 pounds in 3B, and 101,000 pounds in Area 4 (no data for Area 2A). The total waste in 1994 was higher than the 1993 wastage of less than 1 million pounds, yet far lower than the 2.2 million pounds lost in 1991.

*We estimate that 1,481,000 pounds of halibut were killed by lost or abandoned gear in 1994.*

Weather, management constraints and crowding on the grounds can all contribute to waste in the fishery. Sometimes several forces converge to

compound the waste problem. For example, the (estimated) waste in Area 3A jumped from 1.5 percent in 1993 to 4 percent in 1994. More skates than usual were lost in the June opening, we think because more vessels fished 3A in June to avoid trip limits imposed in Area 3B, so the 3A grounds were fairly crowded. The September opening brought bad weather, and even more skates were lost then. Mortalities from lost gear in Area 3A were estimated at 341,000 pounds (1.5 percent of the total catch of 22,735,000 pounds) in 1993, and 1,002,000 pounds (4 percent of the total catch of 25,050,000 pounds) in 1994.

*A number of converging influences kicked up the rate of waste from lost gear in Area 3A from 1.5 percent in 1993 to 4 percent in 1994.*

## *Back to the Watery Womb: Mortality of Young Halibut*

Halibut are hardy creatures, and even the youngsters can withstand injuries that would defeat a more delicate creature. Even so, a certain percentage of the under-sized (less than 32 inches long) halibut caught in the commercial longline fishery and tossed back into the sea die from the ordeal. The mortality rate depends on many things, most importantly on the speed and tenderness with which they're returned from the burning air to their own wet world. For U.S. waters, we estimate the mortality rate of discarded, sublegal halibut to be about the same as the bycatch mortality rate in the sablefish longline fishery - 25 percent - because of the similarities between the speed, gear and handling methods of the two fisheries, and in how non-targeted fish are handled. Therefore, we figure that 25 percent of the sublegals caught in the U.S. halibut fisheries are killed.

The Canadian halibut fishery is somewhat slower-paced under the Individual Vessel Quota system. Observations of the sablefish hook-and-line fishery in the Bering Sea/Aleutian Island area, where fishing is relatively slow and crew members can take the time to properly release non-target species, show that discard mortalities fall closer to 16 percent. This is the rate that we use to estimate losses of sublegal halibut in Canadian waters. In 1993, Canadian members of the IPHC Conference Board asked us to take a closer look at that number - they believe 16 percent is too high - but it remains our preferred estimate because it's still the most conservative observed mortality rate.

We estimate that 1,364,000 pounds of sublegal halibut were killed in all areas in 1994: 8,000 pounds in Area 2A; 222,000 pounds in Area 2B; 154,000 pounds in Area 2C; 814,000 pounds in Area 3A; 99,000 pounds in Area 3B; and 67,000 pounds in Area 4. This is about 100,000 pounds fewer than were killed in 1993.

*We estimate that 25 percent of the sublegal halibut that are discarded every year in our own halibut fishery die, and 16 percent in Canada. In 1994, 1,364,000 pounds of sublegal halibut were lost to discard mortality.*

In Area 2A, the treaty Indian catch is excluded from our calculations of discard mortality of sublegals, because all their halibut - even the sublegals - are retained and accounted for in their ceremonial and subsistence poundage.

## PERSONAL USE: THE UNRECORDED STORY



A portion of the annual harvest of Pacific halibut escapes accounting as either commercial or sport catch on its way to the dinnerplate, and this is the portion of the fishery we call "personal use." Personal-use halibut is the hardest to account for. It includes unlogged take-home fish from commercial halibut trips; halibut caught for food by rural Alaskans (a major portion of the personal use take); sanctioned Indian food fish in Canada; treaty Indian ceremonial and subsistence fish in Washington; illegally retained bycatch in other fisheries; and out-of-season longline-caught fish throughout the region.

It's difficult, for obvious reasons, to nail down hard data on personal-use harvests of halibut. Using information from a number of resources, we estimate the personal-use take at 616,000 pounds in Alaska, 300,000 pounds in Canada, and 16,000 pounds in Washington and Oregon.

*We don't even know how many halibut are taken as "personal use" harvest, but our best information tells us it's around 616,000 pounds in Alaska, 300,000 pounds in Canada, and 16,000 pounds in Washington and Oregon.*

### *In Alaska: Better Information Is on Its Way*

For Alaska, we're estimating the personal-use take at the same level as 1993: 108,000 pounds for Area 2C; 328,000 pounds for Area 3A; 59,000 pounds for 3B; and 121,000 pounds for Area 4 in general. Once the IFQ program for halibut begins in 1995, all take-home fish from commercial vessels will be included in the vessel's IFQ, so better estimates for that portion of the personal-use fishery should be available after that.

*Once the IFQ program for halibut begins in 1995, all take-home fish from commercial vessels will be included as part of the IFQ, giving us better estimates for that portion of the fishery in the future.*

### *In Canada: Port Monitor Data Helps*

Under the Canadian IVQ system, port monitors record all take-home fish and charge them against the vessel's quota. Beyond that, the primary source of unreported personal use catch is believed to be Indian food fish. In 1993, Canada's DFO estimated that users took about 300,000 pounds of undocumented fish for food; we think that figure remains about the same for 1994.

### *In Washington and Oregon: Do we Have all the Facts?*

We think there are two sources of personal-use halibut take in the U.S. Pacific Northwest. First, the treaty Indian fisheries are allowed to take 16,000 pounds of halibut for ceremonial and subsistence purposes, in addition to commercial and sport harvests. Please note that this harvest is a part of the Pacific Fisheries Management Council's allocation plan. This poundage also is included in the catch figures used in stock assessments, though it is not shown separately there.

State regulations require that all take-home halibut must be reported and shown on state fish tickets, and we believe this require-

ment diminishes the unreported catch significantly. However, we know that in 1994 there were some vessel operators who paid their crew members with part of the day's catch, and we have to assume that many of those fish were unreported. A new measure scheduled to begin in 1995, requiring all fishers to choose between the sport charter and commercial fisheries, may help us tighten our estimates for personal-use harvests.

# MEASURING MIRACLES: HALIBUT BIOMASS ASSESSMENT



They say most of the life in the ocean could pass easily through the wool of a sweater. The nannoplankton, it has been reported, could easily pass through the finest silk. But diatoms do not slip past the copepods, and the copepods cannot escape the tiny fish, and the smaller fish are eaten by the larger ones, and by and by we find ourselves counting the millions of millions of halibut in the sea. We continually assess the abundance of Pacific halibut stocks not just to predict the future of our fisheries, not just to attend to our tasks of stewardship, but also to gain a view into the mystery of marine life in the North Pacific.

To estimate the stock abundance of Pacific halibut, we gather information about all aspects of the fishery and develop three important different kinds of data: catch-at-age statistics, size-at-age statistics, and catch per unit of effort. The total catch was tallied from fish tickets provided by each fish processing plant that handles halibut. Catch per unit of effort (CPUE) data was developed from 3,000 logbooks that covered 70 to 80 percent of the 55 million pounds that were landed commercially this year. The logbooks were updated using information from the 7,000 licenses issued this year.

In addition, we interviewed the halibut themselves, taking length and weight measurements of a good sampling of halibut at ports coastwide, and retrieving their otoliths (ear bones), which reveal information about age, weight and some of the life experiences each halibut has had along the way. In addition, 270 tags were collected from 29 different ports, and these help us monitor mortality and migration. From all this information, we determine the exploitable biomass, which is the amount of the halibut biomass we believe is available for harvest.

The next step is to determine the constant exploitation yield, or CEY, which our conservative approach convinces us should be set at thirty percent of the exploitable biomass. In other words, we believe that slightly less than one-third of the exploitable biomass should be made available for removal from the population in any given year. Once the CEY is set, we determine the total amount of halibut that will be removed by sport catches, personal use harvests and mortality from waste and bycatch. These removals accounted for, the commercial fishery gets the rest.

For 1995, we proposed that the CEY rate be applied to the estimated biomass for the start of the upcoming year (1995) rather than to the estimated biomass for the year just ending (1994), as has been done in the past. We believe this forward-looking method would better help us respond to changing trends in the biomass, and would make us better stewards of this valuable resource.

*This year, we proposed that the CEY rate be applied to the upcoming year's biomass estimate, rather than the estimate for the year just past.*

We estimated the total exploitable biomass of Pacific halibut at 282.6 million pounds at the beginning of 1994, and 242.1 million pounds at the start of the 1995 season. After an overall decline in biomass of 18 percent between 1993 and 1994, the biomass declined 14 percent further between 1994 and 1995. This is a fairly rapid decline, compared to the 5 percent to 15 percent we have seen in previous years.

Figure 2 shows the trends in exploitable biomass and recruitment for the Pacific halibut stocks. In one year, we have seen the exploitable biomass decrease 20 percent in Area 2A, 13 percent in Area 2B, 12 percent in Area

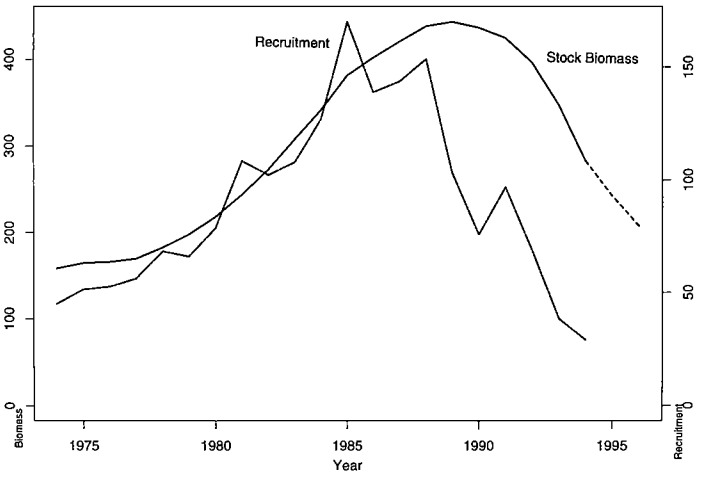



**Figure 2. Coastwide biomass and recruitment in millions of pounds for the years 1974 through 1994.**

*The total exploitable biomass of Pacific halibut was estimated at 282.6 million pounds at the beginning of 1994, and 242.1 million pounds at the start of the 1995 season.*

2C, 23 percent in Area 3A, 27 percent in Area 3B, and 9 percent in Area 4.

Recruitment of 8-year-old halibut continues to drop off coastwide. Once again, this year's recruitment represents the lowest we have seen in nearly two decades. This continuing low recruitment tells us that stocks will continue to decline about 10 percent to 15 percent per year for the next several years - a trend that has emerged in all of our assessments, despite the evidence of relatively high CPUE we have seen in recent years.

Sometimes we get mixed signals from a fishery, and the degree of inconsistency suggests to us the degree of caution we should exercise in setting catch quotas. For example, we drafted two trial stock assessments in 1993, one counting the increases in CPUE observed in the fishery, and the second discounting that CPUE data. In Area 2B in particular, we wanted to find out why the CPUE has increased since implementation of the IVQ program, even though stock trends and catch-at-age data indicate that several strong year-classes are disappearing and recruitment of young fish is poor.

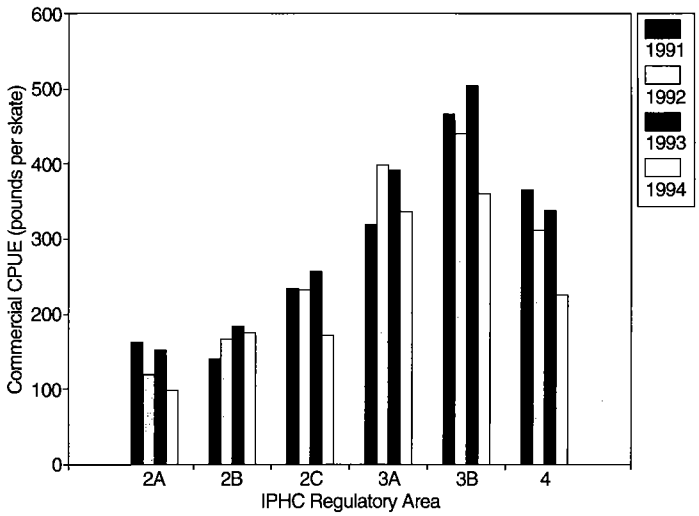
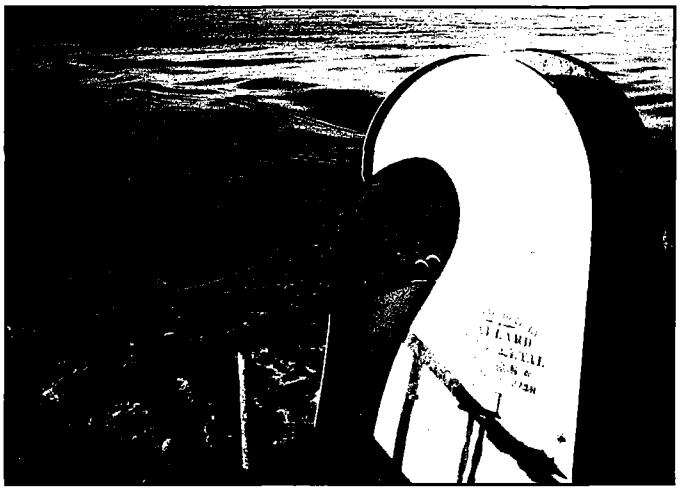



**Figure 3. Commercial CPUE (pounds/skate) for IPHC regulatory areas, 1991 - 1994.**



*Though CPUE levels are 20 percent higher in Area 2B than historic averages, the inconsistent data tell us to be careful with our biomass estimates.*

We saw exactly the same trend in Area 2B this year: CPUE in the post-IVQ fishery is 20 percent higher than the long-term average, even though age composition data show a decline in stock abundance. If we reduce these CPUE values by 20 percent, our estimate of the exploitable biomass is reduced by the same amount, and the resulting harvest quota would be reduced by one-third. Doing this kind of exercise alerts us: We need to exercise caution in Area 2B. Figure 3 shows the CPUE for the last 4 years for the IPHC regulatory areas.

In Area 3A, halibut stocks appear to be dropping dramatically. The decline is partly due to continued poor recruitment, and partly to a declining weight-at-age of the fish that are caught in the commercial fishery. The average weight of an 11-year-old halibut has dropped in half since the late 1970s (a time of historically high weights-at-age). Halibut throughout the Gulf of Alaska show the same decline in average weight. If this trend continues, we can expect to see the exploitable biomass figures continue to shrink in the years to come, even if the number of fish were to remain constant.

## DANCING TO THE MUSIC GONE BY

"All things Almighty Time disquiets," said Sophocles. Each year, as we estimate the current year's stock levels, we also go back to re-figure the stock levels for previous years using our updated information and methods. Some things do change over the years, and as our knowledge about what has happened in recent years clarifies - as we gain more insight into changes in bycatch levels and waste, gather more sport catch data, and add new year-class information to the abundance estimates - we can paint a clearer picture of the life and abundance of Pacific halibut than our previous years' data alone could allow.

*Each year, as we estimate the current year's stock levels, we also go back to re-figure the stock levels for previous years. Sometimes this new information can compel us to raise the allowable catch, even in areas where stock abundance is declining.*

In a few cases, this new information has compelled us to raise the allowable catch, even in areas where stock abundance is declining, because earlier stock estimates we now know were too conservative. In fact, adjustments like this have happened several times in the past few years in different halibut areas. Fishery scientists looking at other species have run into the same problem, and we're working together to seek a solution. As the biomass continues its natural trend of decline, however, don't expect our estimates to continue to adjust upward.

*In light of overall declines in halibut stocks, we must take the conservative approach in setting constant exploitation yields.*

## ADJUSTING FOR BYCATCH LOSSES

Bycatch costs the halibut biomass in two important ways: Most immediately, bycatch mortality removes fish from the population. It also prevents

those fish from spawning and adding to the future biomass. Most halibut caught as bycatch, especially in the trawl fisheries, are younger, under-sized fish that would contribute to the biomass in body size and reproductive fecundity in the future if they were left alone. We account for both kinds of losses, and each year we reduce the commercial catch quota to compensate for bycatch removals. The adjustments are made in each area in proportion to the estimated exploitable biomass in that area.

## WALKING THE NEIGHBORHOOD

We have gained some new information recently that helps us set harvest quota recommendations specific to sub-areas in the Bering Sea, a move that we think will help us manage that important area more carefully. Using historical fishing grounds as a measure of area and catch per unit of effort as a measure of fish density, we have been able to partition an area's total halibut abundance into separate abundance estimates for each subarea, and set separate exploitation rates for each subarea. The Bering Sea/Aleutian Islands region includes six sub-areas: 4A, 4B, 4C, 4D-S, 4D-N and 4E. By looking at the historical fishing patterns and average CPUE data gathered over the last five years, we can estimate what percentage of the Bering Sea biomass congregates in each sub-area. Allocation and other management considerations are important to the Commission in setting catch lmits for subareas in the Bering Sea, but the staff bases its recommendations for CEY on its best estimate of biomass in each area.

## AND TIME CAN DO SO MUCH

The poet Emily Dickinson said "Each age is a lens," and IPHC biologists know this to be true. Each year, we press our lenses to the otoliths of halibut caught in the commercial fishery to record the ages of thousands of fish in each area. Keeping track of the ages of fish harvested is another way of watching the health and plenitude of the halibut population. We know, for example, that the average age of halibut coastwide has increased steadily in the last five years to 12.7 in 1994, more than a year older than the average age of 11.6 in 1990.

*The average age of the coastwide halibut biomass was 12.7 years in 1994, more than a full year older than in 1990.*

The average age of samples from Areas 2A, 2B and 3A increased in 1994, while the average age of samples from Areas 3B and 4 decreased slightly. The 1983 year-class (11-year-olds) were the most numerous of the ages represented in this year's commercial catch, and comprised 15.3 percent. The next most abundant were the 1984 year-class (10-year-olds), com-

prising 12.6 percent, and the 1982 year-class (12-year-olds), comprising 12.5 percent of the catch.

Otoliths are the delicate, cone-shaped bones, translucent as fine china, embedded in the inner ear of fish and other vertebrates. They help fish balance and align themselves in the water, but they're also memos to fish scientists as well; each year of life lays down a ring or annuli around the fish's otolith, and we can count these rings like the rings of a felled tree to judge the fish's age at death. And just as the rings of a stump describe the weather and nutrient patterns of that tree's life, the thickness, pattern and other markings on an otolith tell the life story of an individual halibut. To learn as much as we can, we usually scan the otolith under a microscope and count the annuli. In some cases, when the otolith is too thick or too opaque or its edges are too jagged to get a good reading, we perform what's called a break-and-burn reading, which gives us an even more accurate assessment of the fish's age. In 1994, we collected 13,328 otoliths from all areas, and used 12,756 of them to compile our age data.

*We gathered 13,328 otoliths from all regulatory areas in 1994, and used 12,756 of them to collect information about the age of the halibut biomass.*

# LIFE INTERTWINED: THE BYCATCH TANGLE TIGHTENS

*We estimate that 16 million pounds of halibut were lost to bycatch in 1994.*

No man is an island, and neither is a halibut. The community that halibut live in include a host of other species, mostly groundfish like pollock, cod and sablefish, and these are the commercial fisheries in which halibut bycatch is most likely to occur. Regulations require that all bycatch-caught halibut be returned to the sea as quickly and gently as possible, but even so a great number of them die. We estimate that halibut bycatch mortality reached 16 million pounds in 1994.

Our bycatch information comes from a number of sources. The National Marine Fisheries Service (NMFS) oversees an observer program aboard a good percentage of groundfish vessels in waters off Alaska, and the observers chart bycatch pretty carefully. In Canadian waters, the Department of Fisheries and Oceans conducts a limited observer program over a portion of the groundfish fishery. We also use data from large-scale observer programs in the early 1970s and 1980s off Canada. There is no observer program off the coasts of Washington and Oregon, so bycatch data among trawl and longline vessels are estimated using commercial fishery logbook information and results from gear experiments.

We extrapolate bycatch mortality information in the crab pot and shrimp trawl fisheries from bycatch rates observed on research surveys, because in-season data are not available from those fisheries. And this year, we began estimating halibut bycatch data in several small state-managed fisheries in Alaska's waters. These include hook-and-line fisheries for sablefish in the inside waters of Southeast Alaska and in Prince William Sound, and scallop fisheries across the Gulf of Alaska and the Bering Sea. Here, fishery logbook interviews and research survey data give us information from the sablefish fisheries, and observer data provided by the Alaska Department of Fish & Game give us information about the scallop fisheries.

*This year, for the first time, we began estimating bycatch from small state-managed fisheries in Alaska waters. They included sablefish fisheries in inside waters and scallop fisheries in the Gulf and the Bering Sea.*

## CATCH AND CONSEQUENCES: MEASURING DISCARD MORTALITY

We not only estimate bycatch rates, we also assess discard mortality rates - that is, we determine what percentage of incidentally caught halibut die after they're returned to the water. Observers document the number of halibut brought on board in other fisheries, and they also use a common scale to assess each halibut's viability, or the likelihood that it will survive. Discard mortality rates vary according to the fishery, the gear used, and the area.

In Area 2A, the domestic groundfish trawl and shrimp trawl fisheries are assumed to have a 50 percent mortality rate, whereas bycatch mortalities in the unobserved hook-and-line sablefish fishery is estimated at 25 percent. The midwater whiting fishery, in which huge volumes of fish are caught in each tow, is assigned a 75 percent mortality rate.

In Area 2B, we estimate a 40 percent discard mortality rate for the Canadian trawl fisheries - the same rate we used last year. The near-shore scallop fisheries are assigned a 50 percent mortality rate.

Groundfish fisheries in U.S. waters off Alaska are assigned the following bycatch mortality rates, calculated from observer data:

**Area 2C, 3A and 3B hook and line fisheries:**

Sablefish: 14% for observed boats, 17% for unobserved
Other targets: 11.5% for observed boats, 14% for unobserved

**Area 2C, 3A and 3B trawl fisheries:**



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

**Area 4 hook and line fisheries:**

All targets: 12.5% for observed boats, 15% for unobserved

**Area 4 trawl fisheries:**

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, 3B and 4 groundfish pot fisheries:**

All targets: 5%

## BYCATCH MORTALITY BY AREA

### *Gulf of Alaska*

Bycatch mortality of halibut in Area 2 was estimated at 2.47 million pounds in 1994, a 17 percent decline from 1993. Slightly more than half of the bycatch mortality occurs in the trawl fishery operating off Canada. Bycatch mortality in this fishery declined from 1993, largely due to lower summer landings of Pacific cod, rockfish and flatfish.

We recently lowered our estimates of bycatch mortality for the groundfish and shrimp trawl fisheries in Area 2A, from 700,000 pounds to 650,000 pounds. Results from research at the University of Washington and at the Oregon Department of Fish and Wildlife may help us refine our estimates by early 1995.

In Area 2C, bycatch mortality occurs primarily in the longline

*We recently lowered our estimates of bycatch mortality for the groundfish and shrimp trawl fisheries in Area 2A to 650,000 pounds.*

fisheries for rockfish and sablefish, and in the small scallop fishery. Fishermen in this region - primarily participants in the federal sablefish fishery - cut their bycatch in 1994 to the lowest rate in many years.

Overall bycatch mortalities decreased 3 percent in 1994 from the year before. Though trawl fisheries showed higher bycatch levels, that increase was offset by decreases in bycatch by longline fisheries.

Throughout Area 3, the hook and line and trawl fisheries for groundfish are by far the largest fisheries, and that is where most of the bycatch occurs. Here, harvesters in these fisheries are given a bycatch cap, and the National Marine Fisheries Service closes the target fishery once the bycatch cap is reached. The trawl fisheries in this area exceeded the bycatch mortality limit by 10 percent this year, primarily because the rapidly changing fleet size made it difficult to project an accurate closure date. The trawl fisheries targeting Pacific cod, rex sole and deep-water flatfish (primarily Dover sole) saw the highest mortality rates, followed closely by the shallow water flatfish fishery for rock and yellowfin soles.

The sablefish longline fishery in the Gulf was managed quite differently this year than previously. Until this year, NMFS would track bycatch as it occurred and try to predict when the fishery would have to be shut down. But the closure almost always came too late, after the bycatch limit was already substantially exceeded. In 1994, they set a 10-day limit for the fishery before the season started, based on bycatch rates from earlier years. It worked: halibut bycatch was reduced significantly in that fishery. But some fishermen sat out one day, noting that they could get around observer coverage requirements by fishing fewer than 10 days. As a result, observer coverage was much lower than in earlier years, especially in Southeast Alaska, where not one single vessel carried an observer. Unfortunately, this means our bycatch estimates for this fishery may not be as accurate.

*This year, NMFS set a 10-day limit for the sablefish fishery before the season started, based on bycatch rates from earlier years. As a result, halibut bycatch was reduced significantly.*

Other fisheries tallied up bycatch as well. The Pacific cod fleet, operating from January to March, took the remainder of the hook-and-line bycatch of halibut. Groundfish pots targeting almost exclusively on Pacific cod grew in popularity in 1994, and were responsible for 7,000 pounds of bycatch mortality - almost twice their 1993 level. Observer data collected aboard scallop trawl (dredge) operations shows only a minimal amount of halibut bycatch. Similarly, only a small amount of halibut bycatch was attributed to the in-state longline fishery for sablefish in Prince William Sound. Around Kodiak Island, the winter Tanner crab fishery takes about 300,000 pounds of halibut each year.

## *Bering Sea/Aleutian Islands*

More than half of the total 1994 bycatch mortality along the entire Pacific coast happens in Area 4, most of it in the domestic trawl fishery. Trawlers out here target the panoply of species: pollock, cod, rock sole, yellowfin sole and other flatfish species. Longliners focus mostly on cod, and sometimes on sablefish along the Aleutian Island chain. Pot fisheries for cod are pretty small.

*More than half of the total 1994 bycatch mortality along the entire Pacific coast happens in Area 4, most of it in the domestic trawl fishery.*

Bycatch mortality increased 21 percent this year in Area 4, totalling 8.4 million pounds. Bycatches increased in the trawl fisheries, but they almost doubled in the longline fisheries. Ironically, longliners' high bycatch occurred because the trawl fishery for cod hit the bycatch limit and was closed in May. The remaining cod quota was transferred to the longliners, who continued fishing until mid-October when the catch limit and the bycatch limit were both hit almost simultaneously.

Trawlers logged their highest bycatch rates while targeting rock sole

and turbot. They exceeded bycatch caps for both fisheries - in the case of turbot, by 2.7 times the limit. As in the Gulf of Alaska, the small-scale scallop fishery accounted for only a small amount of mortality. The king and Tanner crab fleets in the southeast Bering Sea, and king crab vessels in the Aleutian Islands, took roughly 300,000 pounds of bycatch mortality in 1994.

## BEYOND THE SWELL: BYCATCH MANAGEMENT PLANNING

Bycatch is a many-headed monster and it takes many hands to manage it. In the waters of the North Pacific, the hands that join across the water to manage bycatch issues come from the North Pacific Fishery Management Council (NPFMC) in Alaska, the Department of Fisheries and Oceans (DFO) in Canada, and the Pacific Fishery Management Council (PFMC) along the U.S. West Coast. Both fishery management councils rely on the National Marine Fisheries Service to implement and monitor their bycatch management programs. Throughout the range of the Pacific halibut, the IPHC takes responsibility for managing and conserving the halibut resource, and as part of those responsibilities we have requested that the councils in the U.S. and DFO in Canada take strong measures to reduce halibut bycatch mortality in the other fisheries.

In 1991, the IPHC recommended to the fishery management community a set of bycatch reduction guidelines with a stated goal of "restriction of halibut bycatch in groundfish fisheries to levels that would allow each nation to reasonably harvest its groundfish resources while minimizing halibut bycatch mortality." We at the IPHC have determined that a good target bycatch mortality level would be the rate achieved in the foreign and joint-venture fisheries of the 1980s: an average 9 million pounds per year, with a minimum level of 7 million pounds.

Bycatch management is but one aspect of an overall fishery management plan, and these management plans aren't drafted or implemented overnight. In the U.S. council system, both in the Pacific and the North Pacific, bycatch management measures are outlined in groundfish fishery management plans. It takes at least a year and a half to amend one of these plans, longer if a proposed amendment arouses controversy. In Canada, DFO develops its bycatch management measures in consultation with industry boards and working groups - a less structured, more flexible system than in the U.S. DFO can amend management plans in less than a year, and can alter some aspects of the program, such as a particular bycatch measure, in mid-season.

*The IPHC's target bycatch mortality rate is 7 million to 9 million pounds per year, the level that foreign and joint-venture operations achieved in the 1980s.*

## *Sixteen Million Pounds and Counting: Current Bycatch Management Plans*

Up and down the coast, fishery management agencies are responding to the call to help reduce halibut bycatch in the groundfish fisheries. In waters off Washington and Oregon, there is no observer program and no bycatch reduction program in place right now. Off Alaska, however, the North Pacific Council has imposed halibut bycatch caps on nearly all fisheries; has stepped up its observer coverage; has defined the industry standard for bycatch in the pelagic trawl pollock fishery; has proposed a vessel incentive program to assign responsibility for reducing bycatch to each vessel owner; and has mandated careful release procedures for the longline groundfish fisheries.

In 1995, the Individual Fishing Quota (IFQ) program for sablefish and halibut will begin in waters off Alaska. Fishermen will be able to fish over a longer season (eight months) rather than the few weeks they previously could fish for sablefish, or the few days they could race for the halibut. The new program will help cut halibut bycatch by allowing sablefish fishermen with halibut IFQ to retain halibut up to the level of their IFQ. Because their season will have more flexibility, fishermen can stay out of a heavy halibut area once they have used up their halibut IFQ. Halibut longliners also will be able to fish at a more careful pace, and so will have time to release their under-sized catch gently, hopefully increasing the survival rate.

The North Pacific Council has proposed to exempt the sablefish fishery in the Gulf of Alaska and Bering Sea/Aleutian Islands areas from the 1995 halibut bycatch limits. This would reduce the overall bycatch cap in the Gulf by about 450 metric tons round weight (750,000 pounds net weight). The Council would re-evaluate such exemptions every year.

*The North Pacific Fishery Management Council has proposed exempting sablefish longliners in waters off Alaska from the 1995 halibut bycatch limits. This would reduce the overall bycatch caps significantly.*

License limitation came to Canada's groundfish, halibut and sablefish fisheries in 1977. IVQ programs followed for the sablefish fishery in 1990 and for halibut in 1991. That year Canada began its observer program in the groundfish trawl fisheries, requiring vessels to carry an observer whenever the DFO requests. Observers focused on Hecate Strait in 1991-1992 and on the west coast of Vancouver Island in 1993-1994. Their data helped us get a grip on actual bycatch mortalities and also on the condition of released halibut, allowing us to revise our estimates of bycatch mortality of trawl-caught halibut from 50 percent to 40 percent.

The Canadian industry reduced its overall halibut bycatch mortality by 21 percent in 1994, largely because of lower discard mortality rates. Part of those reductions are due to quota reductions on Pacific cod, trip limit restrictions in sole fisheries, aggregate species management for rockfishes and limitations on total fishing effort. Canada also is enhancing its observer program and increasing observer placement; has imposed directed management measures for Pacific cod and rock sole (both high-bycatch fisheries); is developing alternative techniques for estimating bycatch; is revising its mortality rate schedule for trawl-caught halibut; is studying blood chemistry of trawl-caught halibut to quantify the condition factor of by-caught fish (i.e., the halibut's chances for survival); and is implementing industry-government initiatives to develop gear and handling practices to reduce halibut encounters and mortalities.

*The Canadian industry reduced its halibut bycatch mortalities by 21 percent in 1994.*

## *Leaning Into the Wind: Future Bycatch Measures*

Canada has developed a bycatch reduction plan aimed at reducing mortalities to 1 million pounds by 1997. As a first step, DFO will impose

bycatch caps in 1995 that will progress from the highest-bycatch fisheries to the lowest. For 1995, a bycatch mortality cap of 560,000 pounds will be imposed on the Hecate Strait trawl fishery. Bycatch caps for the west coast of Vancouver Island will be added in 1996, and for the rest of Area 2B in 1997. Additional reduction measures will be introduced, as necessary, to reach the 1 million-pound target.

*Canada has developed a bycatch reduction plan aimed at reducing mortalities to 1 million pounds by 1997.*

Up in the North Pacific, the NPFMC has embarked on an ambitious plan to reorganize its entire fishery management program to impose some order on the chaos ignited by an overcapitalized groundfish industry. The Council has begun the difficult task of developing what it calls the Comprehensive Rationalization Plan, and for the past couple of years has been considering two options as the most reasonable approaches for the future of the groundfish and crab fisheries off Alaska: an overall individual transferable quota system and a license limitation program. This year, the Council chose to emphasize license limitation and put the IFQ option aside; their decision concomitantly delays any consideration of an IFQ program for prohibited species, including halibut.

We do not expect any serious measures toward reducing bycatch in the North Pacific until the NPFMC chooses its course toward a more rational management program for the entire groundfish species complex. As 1995 dawns, the NPFMC has begun evaluating a program called Harvest Priority that would reward fishermen who adhere to bycatch reduction standards by giving them a separate allocation of their target species. This program is basically consistent with the IPHC's goals of bycatch reduction through individual responsibility, but it may fail in its legal practicalities. The due process requirements probably would mean that a fisherman charged with exceeding bycatch standards could nevertheless enjoy a year or two of fishing in the "reward" allocation fishery while he or she appeals the charge in court.

*We do not expect any serious measures toward reducing bycatch off Alaska until the NPFMC chooses its course toward comprehensive groundfish management.*

Another new proposal that the NPFMC will address in 1995 would require on-deck sorting of bycatch from factory trawlers and catcher vessels that now dump to stern tanks for sorting below decks. Such a requirement might be imposed on all applicable trawl vessels, or only those in fisheries with the greatest chance of bycatch reduction. Support for the deck-sorting measure is widespread, for practical reasons: the more halibut survive the bycatch experience, the more groundfish harvesters can fish before hitting the bycatch cap. There are disadvantages, though. Groundfish observers would have to give up other work to monitor deck-sorting, may face safety hazards on deck during sorting, and may after all that turn in data from on-deck sorting that wouldn't fit into the existing, rather complex, database. Also, the deck-sorting program doesn't meld well with the vessel incentive program and doesn't follow the program's sampling protocol. And when observers are not present, it would be difficult to enforce the sorting requirement at all.

*In 1995 the NPFMC will address a proposal requiring trawlers and catcher-boats to sort their bycatch on deck rather than dumping to stern tanks.*

# MAGNIFICENT OBSESSIONS: SCIENTIFIC INVESTIGATIONS

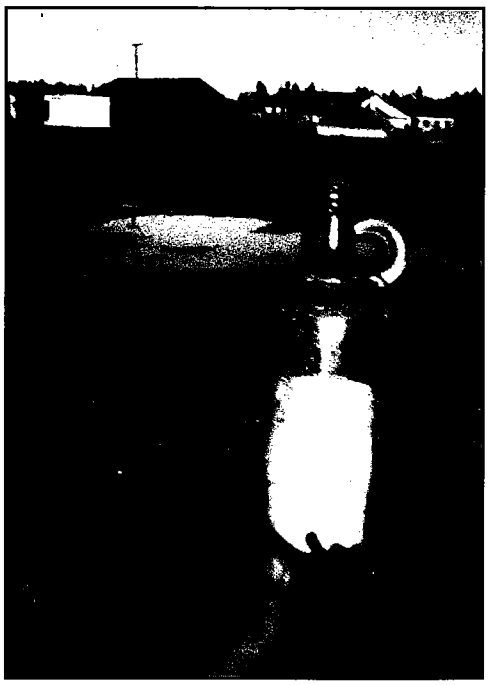


"Water is really as opaque as a stone wall," wrote naturalist John Crompton in 1957. "The only difference is it has to be thicker than a stone wall before it can shut out light." Seawater, for example, has to be about 50 fathoms deep before no light can penetrate. Into that darkness the IPHC peers every year pursuing a deeper understanding of the nature of Pacific halibut, its habits and habitat. Since 1923 we have been conducting scientific investigations into the oceanography, biology, life cycle, survivability and behavior of halibut and the company they keep.

***TIME IN A BOTTLE***

*In September 1994, a bottle was found by National Weather Service employee, Jack Endicott, on a beach near Yakutat, Alaska. The bottle (shown in the photograph) had a message inside which asked that the finder report where and when they had found the bottle to the International Fisheries Commission, 2727 Montlake Blvd., Seattle, WA, USA, No. 3665. A 25 cent reward was offered if the information was reported by March 31, 1935.*

*The IPHC (formerly named the International Fisheries Commission) conducted a number of drift bottle experiments in the early 1930s to investigate ocean currents in the Gulf of Alaska. Bottle No. 3665 was released on March 7, 1933, at station 58:12 N Latitude 136:47 W Longitude. After 61 years, the bottle was reported to be in excellent condition.*



This year, our investigations focused in four major areas: Several tagging studies will give us new information about halibut movement and survivability. Longline grid surveys and trawl surveys tell us volumes about the population down there and what it is doing these days. We conducted a small study to update our information about average head weight relative to body weight, an issue of immediate importance to the industry. And we continued our study of halibut parasitology, which has revealed some geographic patterns in halibut parasites that may help us identify different halibut stocks.

## LETTING GO AND LIVING THROUGH IT: LONGLINE SURVIVABILITY STUDY

The 77-foot U.S. F/V Rebecca B pulled out of Kodiak harbor July 3 for a 25-day charter on the Albatross Bank area east of the island to study the survivability of halibut released from cod and sablefish longline gear. For the study we caught halibut on autoline-style and circle hooks fixed to conventional skate-bottom gear, and then removed the fish by one of four methods: careful release by shaking; hook straightening; gangion cutting; and automated release with a hook stripper. The first three methods are legal ways to release a halibut. The hook stripper is not, but we know some fishermen use them and it was important to gather information about the consequences of careless release.

After we removed each fish we measured its length, noted the hook location, evaluated its injury and assigned the condition factor used by on-board NMFS observers in assessing each halibut's chances of survival. A few of the halibut were held in live tanks on board the vessel so we could watch their short-term survival rate. Most of them were tagged and released. Over the next two or three years we'll use the tag recovery information to glean some idea of how halibut survive these different release methods.

*We caught halibut on cod and sablefish longline gear and released them by a variety of methods to learn how release methods affect halibut survivability.*

We hoped to learn from this experiment some important details about halibut survivability on the longline grounds: 1) how different release methods affect halibut mortality; 2) how accurate the NMFS observers' "condition factor" evaluations are in predicting halibut survivability, and how to correlate hook removal method with condition factor; and 3) whether or not holding halibut on board for three days or longer will help us document post-release survivability. We also hoped to produce a video documenting our early observations and showing the consequences of different release methods.

We made 60 gear sets, fishing a total of 744 skates of 150 hooks each. This included 313 skates (24 sets) with the autoline-style hooks, 409 skates (33 sets) with small circle hooks and 33 skates (three sets) with large (16/0 #3) circle hooks. We landed 14,452 halibut, 8,026 of them legal-sized and 6,426 sub-legals. We designed the experiment so that the fish were evenly distributed between the three careful release treatments, with about twice as many released with the hook stripper as any of the other treatments. In all, 3,706 fish went through the hook stripper, 1,654 were released by shaking, 1,703 by hook straightening and 2,233 by gangion cutting. We tagged 9,296 fish (3,716 from the autoline hooks, 5,350 from the small circle hooks and 230 from the large circle hooks) and released all the fish except for those headed for the on-board holding tank.

## *Tender on the Inside, Tough on the Outside*

Most of the halibut were hooked in the left or right jaw, whether they were caught on autoline or conventional hooks, and regardless of size. (During a 1993 pilot study, we had noticed differences by gear and size.) Generally, about 80 percent were hooked in the left jaw, and 18 to 20 percent were hooked in the right jaw or eye. We noticed that circle hooks hooked a greater proportion of halibut in the eye (5.8 percent, compared to 2.1 percent overall).

*Gangion cutting seems to be the release method that causes the least injury to the fish.*

In the hook removal department, the results were predictable: the hook stripper did the most damage of all the treatment methods. There were marked differences between the three careful release methods as well; cutting the gangion seemed to produce the least serious injuries (Also, the injuries were less severe for larger fish, and for those removed from the lighter autoline gear).

Overall, the fish in best condition were those removed by gangion cutting. Our figures show that 91.7 percent of halibut caught on circle hooks and 86.8 percent caught on autoline hook styles were in excellent condition after removal by this method, and showed great signs of surviving. Next best were halibut released by careful shaking; a few more of these showed up in poor condition. More than one-third of the fish removed by hook straightening were in poor condition, but we suspect this reflects on some constraints in our procedures more than the method itself. The fish that fared the worst were those that endured the hook stripper; more than three-quarters of those caught on circle hooks, and two-thirds of those caught on autoline hooks, were in poor condition and one-tenth of all of them were dead or nearly so.

## *The Holding Tank Experiment*

Thirty-six halibut ranging in size from 56 to 90 centimeters were held in four large aluminum tanks in about 30 inches of water. The tanks were fitted with plywood covers and received a constant flow of fresh seawater throughout their stay on board. For this part of the experiment we chose 15 fish with torn face wounds (six with hooks still in the mouth as the result of gangion cutting), three cheek and jaw wounds and 18 with torn cheeks. We put eight to ten fish in each tank on July 6, mixing the more severely injured fish with those more mildly wounded or without wounds.

We only lost one halibut when it managed to jump out of the tank. But by July 16, heavy weather made it hard to keep the tanks stable and the fish contained, so we terminated the experiment and released the fish. At that time, all 35 of the remaining fish looked healthy and stress-free and no fish showed any damage other than the original hook removal injuries. All six fish that had been tanked with hooks still in their mouths had shed their hooks by the time they were released.

*We held 36 halibut in four large aluminum tanks in about 30 inches of water. Only one fish was lost when it jumped out of the tank.*

## *Postcards from the Grounds*

We have already received 127 tags from halibut that participated either in this 1994 experiment or the 1993 pilot study. Though that's less than one percent so far (we expect an eventual recovery rate of about ten percent of the fish released in excellent condition), it's enough that we can make a few generalizations.

We have had the highest tag recovery rates, 6.4 percent, from uninjured fish, to no one's surprise. The next highest group is fish with split jaw (2.9 percent) and torn lip (2.0 percent); fish with injuries to the cheek only,

jaw only, torn cheek and torn jaw have shown recovery rates between 1 and 2 percent. Tags from only about 0.4 percent of fish with torn cheek and jaw have shown up; no recoveries have been made from fish released with eye, torn face, torn snout or jig injuries. The following shows the criteria used to place the fish in "excellent", "poor", or "dead" categories, which is the same criteria used by observers to assess halibut viability.



**HOOK & LINE**

Excellent: No sign of stress

1. Hook injuries are minor (limited to the hook entrance/exit hole, torn lip) and located in the jaw or cheek.
2. Bleeding, if present, is minor and limited to jaw area.
3. No penetration of the body by sand fleas (check eyes, fins, anus).
4. Muscle tone or physical activity is strong.
5. Gills are deep red.

Poor: Alive but showing signs of stress

1. Hook injuries may be severe: broken jaw; punctured eye.
2. Vital organs are not injured.
3. Bleeding may be moderate but not from gills.
4. No penetration of the body by sand fleas (check eyes, fins, anus).
5. Muscle tone or physical movement may be weak or intermittent; little, if any, response to stimuli.
6. Gills are red.

Dead: No sign of life or, if alive, likely to die from severe injuries

1. Vital organs may be damaged: torn gills; gaff wound to head or body; jig injury to viscera; side of face torn loose or missing jaw.
2. Sand fleas have penetrated the body (they usually attack the eyes first, but also fins and anus).
3. Severe bleeding may occur, especially from the gills.
4. No sign of muscle tone; physical activity absent or limited to fin ripples or twitches.
5. Gills may be red, pink, or white.

The observers' "condition factor" assessment is a kind of on-board triage. So far we have received tags from 1.4 percent of fish released in "excellent" condition, 0.6 percent of fish released in "poor" condition, and no tags from fish that were "dead."

*No one was surprised that we recovered far more tags from the uninjured halibut than from fish wounded upon release from the hook.*

## THE BRIGHT INCALCULABLE SEA: 1994 SETLINE GRID SURVEYS

Bright and incalculable this Pacific Ocean may be; its 63,800,000 square miles of saltwater and biology and converted sunlight offer up wonder more than anything else. Yet calculate we must, being mathematical beings given to measure things and given also a propensity to not steward well what we cannot measure.

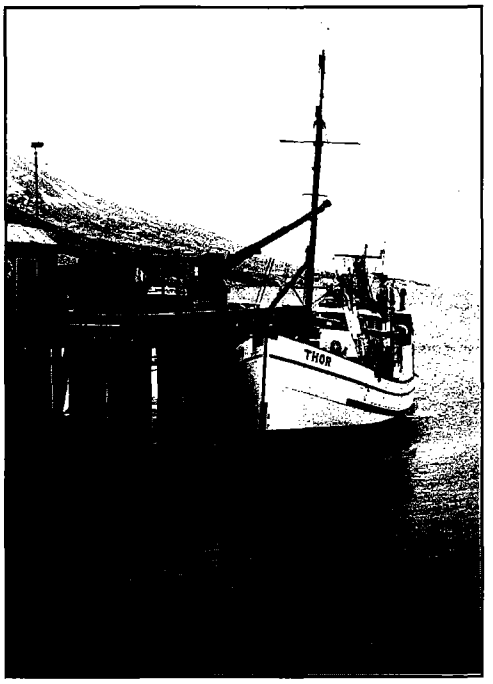
Setline grid surveys tell us much about the halibut biomass, its distribution and behavior, and about how the stocks are doing. They provide data on catch per unit of effort, the size, age and sex composition of the local halibut population, and the species composition of the catch. From this information we learn about growth and distribution of the halibut resource, the relative abundance of other species, the sexual maturity of the fish themselves, and the rate of bait attacks on gear. We also will use information

about halibut distribution to interpret the effects of the fleet's changing fishing practices after the IFQ program begins in sablefish and halibut fisheries off Alaska.

We have been conducting setline grid surveys in the Pacific Ocean since 1963, not every year and not in every area, and over the years we've altered our methods and redesigned the grid patterns to get the most information in the shortest travel time. Grid surveys were halted in 1986 to give us time to evaluate and redesign the system to improve spacing and efficiency, and were reinstated in 1993 with a new design. Survey stations were placed 12 to 13 nautical miles apart and as many of the historical grid stations as possible were covered so the new harvest results could be compared with those of previous surveys.



*Setline grid surveys help us chart the distribution of the halibut population and learn more about their age, size, sex composition and CPUE.*




We chartered two vessels for the 1994 setline grid survey. The F/V Thor departed from Kodiak on June 19 for a forty-day, four-trip charter to survey a grid pattern east of Kodiak Island in the Gulf of Alaska (Area 3A). The Thor fished 1500-foot conventional longline gear with 18-foot spacing and #3 circle hooks baited with frozen chum salmon. In 30 fishing days we set 714 skates of gear along 115 stations and harvested 169,827 pounds of halibut, which we sold on the market at US $2.15 per pound to recoup the costs of the charter. We also sold 4,202 pounds of sablefish at US $2.01 per pound.

To survey Area 3B, we chartered the F/V Kristiana, which left Seward on June 24. The Kristiana fishes 1800-foot conventional longline gear with 18-foot spacing and #3 circle hooks, also baited with frozen chums. With only a few of the fishing days lost to mechanical problems, we set 463 skates of gear at 91 stations over a period of 23 fishing days. We began fishing strings of six skates at each station, but the long days of working from 5:00 a.m. to midnight began to wear, and the strings were shortened to five skates each. During the charter we landed 115,485 pounds of halibut, which were sold at US $2.21 per pound, and an additional 2,143 pounds of sablefish were sold at US $1.72 per pound.

## *A Few Comparisons*

During the two 1994 charters, we landed an average of 319 pounds of halibut per skate. This is only 7.1 pounds per skate less than the 1993 survey achieved. We don't consider this 2.3 percent decrease in catch per unit of effort to be significant

Noting that the CPUE for Area 3A was lower in 1994 than the year before, we wondered if the figures might be affected by the addition of a number of stations to the survey. We added several along the continental shelf and at the eastern edge of the survey area to help determine the full

range of the halibut's summer habitat. Yet even if we discount these additional stations, the CPUE still decreased by the same amount.

Since 1994 was the first Area 3B survey in recent years, there was no previous CPUE data with which to compare results. However, we did find that the CPUE, at 276.07 pounds per skate, was lower than in the commercial fishery. We expect CPUE in our surveys to be lower than in the fishery because we fish areas where we do not necessarily expect high densities of halibut.

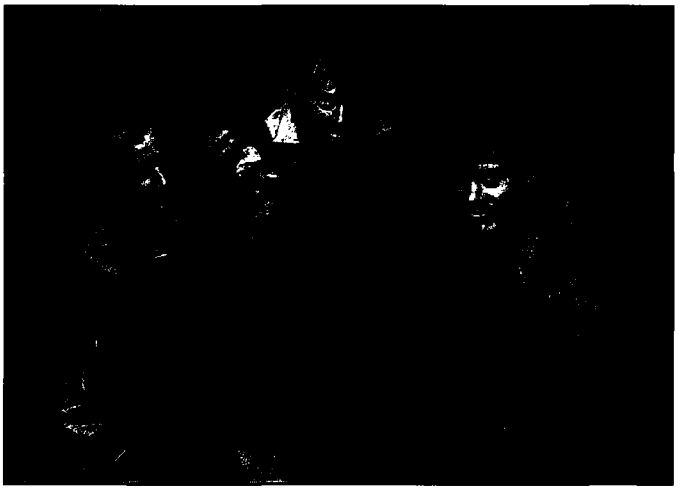


*Is CPUE decreasing? We logged an average of 319 pounds of halibut per skate - but that's only 7.1 pounds less than the 1993.*

## *Seeking Balance in Area 2A-1*

"Imagination reveals itself in the balance of discordant qualities," said Samuel Taylor Coleridge. There's some discord out on the halibut grounds in Area 2A, and we hope with better information we can bring some balance to the discord. Over the years most of the Area 2A halibut catches have come from waters north of Grays Harbor. Yet National Marine Fisheries Service trawl surveys tell us that 70 percent of the halibut biomass live south of Grays Harbor. This year, the Commission declined to divide Area 2 into two sub-areas, but discord remains over the distribution of catch vs. the distribution of fish.

*Evidence shows that only 30 percent of the Area 2A halibut live north of Grays Harbor, where 70 percent of the fishing activity occurs. So we proposed a survey to find out for sure.*



The IPHC staff has proposed a longline survey of all of Area 2B and 2A in 1995 to gain more understanding of halibut distribution along the continental coast. In 1994, we began a test survey in the northern part of 2A, between Grays Harbor and Cape Flattery, to see if the grid pattern we follow in the Alaska surveys can be used here. We fished along east-west transects spaced 10.4 nautical miles apart, mostly staying 2 nautical miles offshore and fishing in depths of 100 fathoms or less.

We chartered the F/V Coolidge out of Seattle, a 62-foot longliner that's fished a number of seasons off the U.S. West Coast and Alaska. We departed Seattle June 21, ran to the southernmost transect just above Grays Harbor, and fished northward up the coast to Cape Flattery between June 23 and 29, making three sets per day at grid stations and one set chosen by the skipper in waters he thought would yield good catches. The Coolidge worked conventional halibut gear: large circle hooks, spaced every 18 feet, baited with frozen chum salmon. Skates were 250 fathoms (five lines) rather than 300 fathoms, and a string of six skates was fished at each station (except for one of the skipper's fishing spots, where we fished only four skates.)

In seven fishing days we landed 807 halibut, most of them at the skipper's stations. Our catches were very lean at all grid stations in depths below about 80 fathoms. More than three-quarters of the halibut we caught were taken at three stations near the continental shelf, in depths of 80 to 100 fathoms, in the northwest corner of the survey area. Throughout the survey,

we caught one legal-sized fish for every two skates fished at grid stations, which is about 13 pounds per skate - far below the commercial average of 100-150 pounds per skate. When we fished at the spots the skipper preferred, which were at or near the edge, our catch rates averaged 250 pounds per skate, well above the fleet average. The size of fish out here, and thus the ratio of legal-sized fish in the catches, was also higher than at the grid stations.

We have concluded that a standard grid survey probably would not give us the information we need, but that we'd do better to conduct a random stratified survey with sampling stations more concentrated in the areas we know to be rich halibut habitat - at the continental shelf edge, for example.

*A random stratified survey that allowed us to target more on the areas we know are rich in halibut would give us better information about the biomass and habits of halibut from California to Alaska.*

## A LOOK TO THE FUTURE: THE BERING SEA TRAWL SURVEY

The Bering Sea is known as the Sesame Street for Pacific halibut, the romper room for juveniles. Every year the National Marine Fisheries Service (NMFS) conducts a systematic trawl survey of a standard area along the eastern Bering Sea shelf north to about 61°N, an area that includes the young halibut's summer playground. (Every third year NMFS includes the northern shelf and the slope in their survey.)

The trawl survey follows a 20 nautical-mile grid and plumbs depths from 30 to 200 fathoms. Since 1981, the survey vessel has used Eastern flatfish trawl gear (without rollers) with a 25-meter headrope and a 34-meter footrope; this is a little larger than the gear used before 1981.

*The Bering Sea halibut biomass is about twice the size it was in the 1980s, but there is no evidence of any strong year-class since 1987.*

In some years, we get a glimpse of a particularly strong year-class of halibut that show up as two-year-olds (about 20 centimeters) in our survey. For example, the 1977 year-class stood out in the 1979 survey, when they were two years old, and they remained a strong year-class overall for the next two or three years.

The 1987 year-class made a strong showing in 1989, and the following year this group of youngsters appeared on our graphs as an enormous spike, head and shoulders above the spike that the 1977 year-class had made in 1980. From 1989 through 1994, this 1987 year-class has remained strong, and continues to surpass the 1977 year class at comparable ages. By now our 1987 youngsters have reached 60 centimeters or more, and should begin to show up in the commercial longline fisheries in 1995. Their recruitment into the fishery may be delayed, as sometimes happens, if the sheer numbers of their year-class caused the individual fish to grow more slowly.

No other strong year-classes have appeared as two-year-olds in the trawl survey since the 1987 class. We have seen fair numbers of fish of every size out there in the Bering Sea, all the way down to 40 centimeters, but we also know that halibut vary significantly in size at any given age, so it's very possible that most of the fish we see up there are from the 1987 year-class.

*There were fair numbers of halibut of all sizes in the nursery grounds of the Bering Sea in 1994, but we know that halibut vary significantly in size at age, so it's possible these are all from the 1987 year-class.*

## GIVING CREDIT WHERE CREDIT IS DUE: THE HEAD WEIGHT CONTROVERSY

A good head on one's shoulders is a boon to any vertebrate, a fact of life common to fish and fish scientists. This year we studied the weight of halibut heads relative to overall body size at a few plants in Alaska and British Columbia to get a more accurate reading of average head weight. Head weight has been a contentious topic over the years - much more so in the early days of the fishery, when halibut were sold iced, head-on. In those

days, Seattle fish dealers customarily deducted 14 percent of the overall delivery weight for the heads. Over the years, a few studies convinced processors to lower their deduction to 10 percent.

Head weight has again become controversial because some British Columbia buyers now prefer buying head-on fish to sell in the fresh markets, and fishermen believe the 10 percent deduction is too high. Also, in the quota system fisheries in Alaska and British Columbia, individual quotas are allocated by net weight (head-off, dressed), so fishermen there want to be very sure the head weight deduction is not higher than necessary.



Our goal at the start of the season was to collect head-weight data on 1,000 halibut in each regulatory area. Samplers in selected plants coastwide were instructed to measure the heads of 45 fish in each of three size categories: 80-100 centimeters, 101-120 centimeters, and larger than 120 centimeters. We wanted to collect fork length, gross weight before washing (to measure slime weight), head weight and net weight after heading and washing.

*Try finding a scale that can weigh a one-pound head and a 200-pound halibut with equal accuracy, and a plant willing to put up with the disruption during a 24-hour opening.*

In practice, finding a plant that could accommodate our disruptions in the rush of unloading after a 24-hour opening proved difficult. To begin with, it was hard to find a plant with scales that could weigh small one-pound heads and 200-pound halibut with equal accuracy. Carting fish around for repeated weighings also would have disrupted processing and risked mixing up fish from different boats. In the end, we weighed fish at only four plants in Alaska (one of those was after the IPHC charter trip in July) and two plants in British Columbia. The work went slowly, and sample sizes were fairly small.

We measured 398 halibut, and calculated an average weight of 9 percent of gross body weight. The head weight was about 1 percent less for large fish than for small fish. Relative head weight was also smaller in Canadian plants (8 percent) than in Alaska plants (10 percent). Head weight varied quite a bit, from 5 percent to 15 percent of gross weight. Some of this variation may be related to differences among plant operations; four of the six processors had average head weights between 9 percent and 11 percent of gross weight, heads at another plant averaged 12 percent, and at one they averaged only 7 percent. Researchers charting head weight in the past have seen an equal variety of results.

*The average halibut is about 9 percent head weight, with heads about 1 percent larger in big fish than in small fish.*

## THE UNIVERSE WITHIN: PARASITE STUDIES

Perhaps you can judge a halibut by the company it keeps, or at least you can tell a lot about it by the parasites it hosts. In the Pacific Ocean, many halibut keep company with a multifarious community of freeloaders that do the fish little harm but like an indiscreet houseguest may reveal some of their

secrets. We have supported a graduate student at the University of Alberta who has been studying parasite patterns in halibut for a few years to see if the geographical distribution of the parasites can help us differentiate between different halibut stocks.

He has examined 380 halibut to date, 350 in the late juvenile/early adult stage and 30 juveniles that just recently settled into their bottomfish life from their, shallow-water stage. For each individual, he charts the area the fish came from and the kinds of parasites present in the tissue and gastrointestinal tract. To date, he has been able to map the presence of approximately twenty different species of gastrointestinal parasites across fourteen localities from California to the Bering Sea.

*Some parasites have clear differences in geographical distribution, giving us clues into the patterns of halibut distribution.*

Many of the parasite species show some limit to their geographical distribution. One group of three parasites, for example, occurs in the Bering Sea and western Aleutian area; one group of seven inhabits the real estate in the Gulf of Alaska. Five kinds of parasites are primarily found in more southern climes. One group of parasites, including *Tubulovesicula lindbergi* - a traveller's eponym if ever there was one - spans the whole region, showing up either in all areas or in such discontinuous areas that no pattern of distribution is apparent.

From the life cycles of the parasites, we've learned that many of the late juvenile/early adult halibut become hosts by eating other fish that have the developmental stages of the parasite. This indicates a halibut's diet at this stage of life is comprised primarily of other kinds of fish. The parasites inhabiting the younger, just-settled juveniles, however, often come from invertebrates. This teaches us that a halibut's diet changes significantly as it matures.

It's surprising how much can be learned from the parasites that studies of the halibut themselves could never reveal. As this intriguing study continues, we'll try to equalize the number of samples from each of the 14 coastwide localities. We also hope to complete our examinations of the newly-settled larvae, to incorporate tissue and other non-intestinal parasites into our analysis, and to delve into some of the deeper questions that these results have unearthed.

## HOPING TO HEAR FROM YOU: TAGGING STUDIES

A halibut tag is a memo from the briny deep to our study lab. Halibut tags bring us a multitude of information, some of it specific to the project in which the fish was tagged and some more general. The ongoing tagging programs in the North Pacific are a crucial part of our halibut research, and so are the hundreds of participants who aid our tagging studies.

In 1994, more than 10,000 tagged halibut were released as part of four different projects, and as these tags return to us in the years to come they will teach us numerous lessons about halibut migration, survivability and distribution, and they will reveal something about our own fishing and management practices as well.

*This year more than 10,000 tagged halibut were released and 276 tags were recovered from 29 ports in the U.S. and Canada.*

Most of the 1994 tagged halibut were released as part of the second phase of the longline mortality project on board the *F/V Rebecca B* (See "Letting Go and Living Through it: Longline survivability study" in this report). The Homer halibut derby used 46 lock-on tags as part of their annual event, and those tags are returned to us when the fish are caught, along with information about date and location of catch. Glacier Bay National Park this year continued their study of home range in Pacific halibut, and have released 947 tags. We also began a sport fishery tagging program in British

Columbia and Alaska, in which more than 80 charter companies purchased a total of 4,576 dart tags for their catch and release program. We have release information for 500 of those fish.

This year, we recovered 276 tags from 29 different ports in the U.S. and Canada. Most of the tags were recovered in the same area in which the fish was originally tagged, though a few of them were recovered just north or south of the area where they were released. We noticed some remarkable movement among fish tagged in Area 2A, however. Fully 63 percent of the Washington and Oregon tags that were recovered this year came from Canadian waters, and showed up between February and April. These tags were recovered from the north end of Vancouver Island up to Dixon Entrance. One tag was recovered in February off the Queen Charlotte Islands by a trawler; the rest were recovered with longline or troll gear during the halibut fishery. We think the tagged halibut must have moved south out of Canadian waters by April. Most of the halibut fishing activity in British Columbia occurs in April and May and drops off in June, increasing again in the fall after the salmon fishery ends. So if the halibut were present, they would most likely be retrieved in May, the most active halibut fishing month, but no tags were retrieved after April, and the only tags recovered in the summer came from waters off Washington and Oregon.



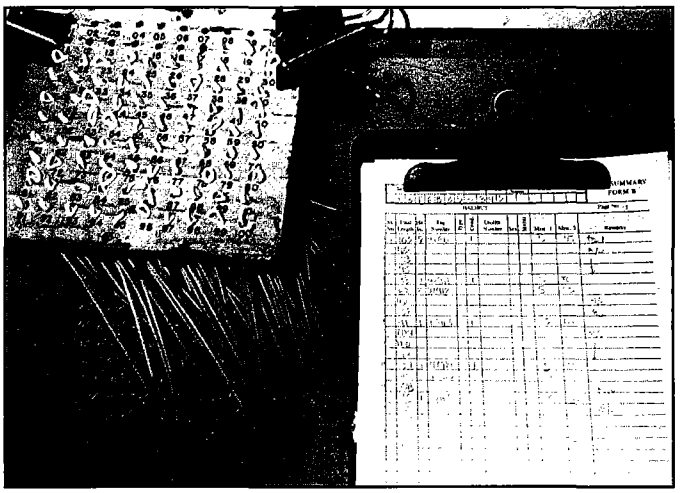
Five tagged fish travelled remarkable distances over the years between tagging and harvest. One fish tagged in 1985 off Unalaska Island, along the Aleutian Chain, was recovered this year, nine years later, off Cape Flattery. The 46-centimeter fish had travelled 1,917 miles. Another fish had moved 1,377 miles from Unalaska to Dixon Entrance over the same period of time. Three halibut travelled 900 miles between tagging and retrieval. Some of these fish show strong growth rates, varying from 5.1 centimeters per year to 8.4 centimeters per year.

Fish are tagged in a number of our projects, and so far the projects are showing recovery rates varying from 1 to 50 percent. The 1988 Sitka Spot experiment in Dixon Entrance and the 1989 Central Oregon study continue to show the highest rates, probably because these are very popular fishing grounds. The Central Gulf of Alaska historically shows recovery rates around 10 percent - also a popular area, but there is a larger population of halibut out there and far less fishing effort per nautical mile. The 1993 and 1994 releases off Chirikof Island and Albatross Bank are part of the longline mortality study, and we hope to recover hundreds of tags from that study over the next four years.

*One fish tagged in 1985 off Unalaska Island was recovered this year off Cape Flattery, a journey of 1,917 miles.*

## *Thanks to the Skippers: Sport Tagging*

We conducted a pilot sport tagging program in 1993 in which we learned that sport charter boat operators were willing and able to participate in a tagging program that would help expand our



pool of tagged halibut over a large geographic area. We were enthusiastic about being able to track the movements of fish released over an extended time period. Harvesters in quota-system fisheries in Canada and the U.S. are pushing for extended seasons to market their catch. We hoped that tag releases from the sport fishery may shed some light on the home range and seasonal movements to and from spawning grounds, particularly among halibut caught early or late in the season.

In 1994 we began a full-scale tagging program in the sport fishery. We posted letters to licensed sport charter boat operators all along the coast offering tagging kits and instructions. Each kit included tags, an applicator needle, a form to record release information about the fish, and a certificate and pin for the skippers to give the client who caught the fish. We also offered skippers a tagging pennant to fly from their mast on the days they tagged halibut. We encouraged skippers to keep in touch with their clients so when we recover their tag we can pass on the information we've learned about that halibut since the day it was tagged.

The charter operators were very cooperative, and even paid for all their supplies: US $0.60 per tag, including the certificate and pin, $3 for the needle and $15 for the pennant. Tags were designed in two different sizes, a larger stainless steel tag that could be applied over the side of the vessel for halibut too big to bring on board, and a smaller tag with a plastic barbed head for the more manageable halibut. Skippers could either mount the application needle into a broom handle or use a commercial tagging pole. All tags were to be inserted in the nape or just behind the head of the fish to reduce downgrading of processed fish. To minimize injury to small fish, we discouraged tagging of halibut under ten pounds.

## *We Hope to Hear More*

We were amazed at the number of skippers who volunteered to participate in the tagging program. Our initial order of 2,000 plastic darts, 1,500 stainless steel tags and 50 pennants quickly disappeared. We filled as many orders as we could, back-ordered the rest, and sent letters to skippers apologizing for the delay. By late spring we caught up with orders, however, and in the end we supplied nearly 4,600 tags to 89 skippers, three of whom had to reorder supplies.

*We were amazed at the number of charter-boat skippers who volunteered to participate, and our initial order of 2,000 plastic darts and 1,500 stainless tags quickly disappeared.*

We have received sport-tag release information from 21 participants, or 24 percent of the skippers who volunteered. Three other participants notified us that they didn't release any tagged fish this year. Three skippers released tags in more than one regulatory area.

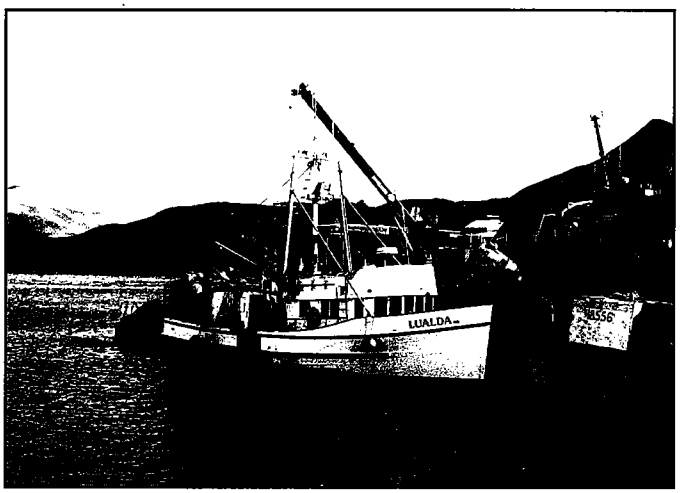
Our first tag recovery came from a group of halibut tagged in the 1993 pilot program near Hippa Island in northern British Columbia. A commercial operator delivered the tagged fish to port in Prince Rupert, British Columbia. A fish buyer later pointed out that the tag was improperly positioned and had caused injuries to the fish; as a result, we will evaluate further use of the stainless steel tags. In all, 31 tags were recovered in 1994, 15 of them recovered on longline gear, 14 on sport gear, and two were caught in trawl gear.

*The sport tagging program depends on cooperation from all the participants, and we hope to receive more release information before the next sport fishing season begins.*

We were pleased that so many people in the sport fishery enthusiastically embraced the tagging program, though by year's end there were still thousands of tags unaccounted for. We have contacted skippers asking for release information, and hope to receive more responses before spring. In the meantime, we will continue to provide those charter operators who did send in tag release information with recovery data so they can tell their clients the rest of the story about the halibut they tagged.

"Land and sea cannot be regarded as separate and unrelated," John

Crompton wrote. "Most of the land we live on has been formed under the sea and given to us only on temporary loan. And if the sea has a great influence on the land, so does the land have an influence on the sea...." Indeed it does, and those of us who live our lives on the margin between the miracle of air-fed land and the mystery of the sea do not easily forget our responsibility to both. Our work at the Commission is a blend of at-sea projects on onshore policy making. As the entire fishing community faces its future of the unknown and the unpredictable, we do best to remember that no system in nature is separate and unrelated; we all participate in this life, and all of it is temporarily on loan.



# APPENDICES

The tables in Appendix I provide season and catch information for the 1994 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 1994 commercial fishing season, and Appendix III shows the 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 1994 commercial Pacific halibut fishery.

Table 2. Number of vessels and catch (000s of pounds) of Pacific halibut by vessel length class in the 1994 commercial fishery. Information shown for Area 2A does not include the treaty Indian commercial fishery.

Table 3. Commercial landings in 1994 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 1994 for each regulatory area and fishing period.

## APPENDIX III:

Table 1. Catch by sport fishers (000s of pounds) by area, 1989-1993.

Table 2. 1994 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 1994 commercial Pacific halibut fishery.**

| Area | Fishing Period | No. of Days | Catch Limit | Catch |
|---|---|---|---|---|
| 2A | 3/05 - 3/26 | 8.75 | 176.5[1] | 188 |
| | 7/06 | 10 hrs | 178.75 | 129[2] |
| | 7/19 | 10 hrs | | 28[2] |
| | 8/03 | 10 hrs | | 25[2] |
| | | | | 182 |
| 2B | 3/01 - 11/15 | 259 | 10,000[3] | 9,911 |
| 2C | 6/06 - 6/07 | 1 | 11,000 | 4,822 |
| | 9/12 - 9/14 | 2 | | 5,557 |
| | | | | 10,379[4] |
| 3A | 6/06 - 6/07 | 1 | 26,000 | 18,159 |
| | 9/12 - 9/14 | 2 | | 6,685[2] |
| | | | | 24,844 |
| 3B | 6/06 - 6/07 | 1 | 4,000 | 2,047[2] |
| | 9/12 - 9/14 | 2 | | 1,813[2] |
| | | | | 3,860 |
| 4A | 6/06 - 6/07 | 1 | 1,800 | 168[2] |
| | 8/15 | .5 | | 1,530 |
| | 9/12 - 9/14 | 2 | | 105[2] |
| | | | | 1,803 |
| 4B | 6/06 - 6/07 | 1 | 2,100 | 6[6] |
| | 6/15 - 7/09 | 6.5[5] | | 326[6] |
| | 8/15 - 8/19 | 4 | | 1,685 |
| | 9/12 - 9/14 | 2 | | 0[2] |
| | | | | 2,017 |
| 4C | 6/03 - 6/30 | 14[7] | 700 | 681[6] |
| | 8/02 - 8/03 | 1 | | 34[6] |
| | | | | 715 |
| 4D | 8/15 - 8/16 | 1.25 | 665 | 693 |
| 4D-N | 7/01 - 8/13 | 22[7] | 35 | 18[6] |
| 4E(NW) | 5/02 - 7/24 | 56[8] | 70 | 62[6] |
| 4E(SE) | 5/02 - 6/15 | 30[8] | 30 | 58[6] |
| **TOTAL** | | | **56,755.25** | **54,730** |

[1] Treaty Indian fishery
[2] Fishing period limits by vessel class
[3] An additional 40,000 pounds available as carryover from 1993
[4] Includes 54,000 pounds taken by Metlakatla Indians during additional fishing within reservation waters
[5] 12-hour opening, every second day
[6] Single fishing period limit for all vessels
[7] Alternating one day open and one day closed
[8] Alternating two days open and one day closed

## APPENDIX I.

**Table 2. Number of vessels and catch (000s of pounds) of Pacific halibut by vessel length class in the 1994 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 | 7 | <1 | | |
| < 26 ft. | 41 | 12 | | |
| 26 to 30 ft. | 12 | 3 | | |
| 31 to 35 ft. | 20 | 5 | *Data not yet available | |
| 36 to 40 ft. | 48 | 30 | | |
| 41 to 45 ft. | 43 | 38 | | |
| 46 to 50 ft. | 30 | 24 | | |
| 51 to 55 ft. | 15 | 16 | | |
| 56 + ft. | 36 | 54 | | |
| **Total** | **252** | **182** | **319** | **9,911** |

| Overall Vessel Length | Area 2C | | Area 3A | |
|---|---|---|---|---|
| | No. of Vessels | Catch (000's lbs.) | No. of Vessels | Catch (000's lbs.) |
| Unk. Length | 12 | 24 | 15 | 82 |
| < 26 ft. | 226 | 248 | 152 | 143 |
| 26 to 30 ft. | 92 | 209 | 76 | 105 |
| 31 to 35 ft. | 175 | 598 | 222 | 1,135 |
| 36 to 40 ft. | 326 | 1,680 | 298 | 1,848 |
| 41 to 45 ft. | 246 | 2,134 | 247 | 2,756 |
| 46 to 50 ft. | 176 | 2,194 | 150 | 2,146 |
| 51 to 55 ft. | 76 | 897 | 105 | 1,944 |
| 56 + ft. | 155 | 2,395 | 451 | 14,685 |
| **Total** | **1,484** | **10,379** | **1,716** | **24,844** |

| Overall Vessel Length | Area 3B | | Area 4 | |
|---|---|---|---|---|
| | No. of Vessels | Catch (000's lbs.) | No. of Vessels | Catch (000's lbs.) |
| Unk. Length | 1 | 9 | 22 | 45 |
| < 26 ft. | 4 | 3 | 93 | 170 |
| 26 to 30 ft. | 1 | <1 | 26 | 110 |
| 31 to 35 ft. | 26 | 97 | 66 | 491 |
| 36 to 40 ft. | 54 | 236 | 12 | 62 |
| 41 to 45 ft. | 53 | 312 | 20 | 164 |
| 46 to 50 ft. | 58 | 497 | 16 | 304 |
| 51 to 55 ft. | 22 | 268 | 13 | 313 |
| 56 + ft. | 101 | 2,438 | 117 | 3,707 |
| **Total** | **320** | **3,860** | **385** | **5,366** |

# APPENDIX I.

**Table 3. Commercial landings in 1994 of Pacific halibut by port and country (000s of pounds).**

| Ports | Canada | United States | Total |
|---|---|---|---|
| California & Oregon | | 403 | 403 |
| Seattle | | 1,301 | 1,301 |
| Bellingham | 96 | 2,133 | 2,229 |
| Misc. Washington | | 933 | 933 |
| Vancouver | 2,251 | 84 | 2,335 |
| Port Hardy | 2,878 | | 2,878 |
| Misc. Southern B.C. | 822 | 11 | 833 |
| Prince Rupert | 3,728 | 1,075 | 4,803 |
| Misc. Northern B.C. | 136 | 135 | 271 |
| Ketchikan, Craig, & Metlakatla | | 1,461 | 1,461 |
| Wrangell | | 580 | 580 |
| Petersburg, Kake | | 2,547 | 2,547 |
| Juneau | | 281 | 281 |
| Sitka | | 2,800 | 2,800 |
| Hoonah, Excursion, & Pelican | | 2,570 | 2,570 |
| Misc. Southeast Alaska | | 77 | 77 |
| Cordova | | 1,226 | 1,226 |
| Seward | | 3,896 | 3,896 |
| Homer | | 5,242 | 5,242 |
| Kenai | | 859 | 859 |
| Kodiak | | 9,103 | 9,103 |
| Chignik, King Cove, & Sand Point | | 2,653 | 2,653 |
| Misc. Central Alaska | | 2,072 | 2,072 |
| Akutan & Dutch Harbor | | 2,855 | 2,855 |
| Misc. Bering Sea | | 522 | 522 |
| | **9,911** | **44,819** | **54,730** |

## APPENDIX II.

**Table 1. Fishing period limits for 1994.**

| Vessel Class | | Regulatory Area and Fishing Period | | | |
|---|---|---|---|---|---|
| | | 2A | | 3B-4A | 3A-3B 4A-4B |
| Ltr | Len (ft) | 7/06 | 7/19;8/03 | 6/06-07 | 9/12-14 |
| A | 0-25 | 170 | 200 | 900 | 600 |
| B | 26-30 | 210 | 200 | 1,300 | 900 |
| C | 31-35 | 335 | 200 | 4,000 | 2,700 |
| D | 36-40 | 925 | 350 | 5,200 | 3,500 |
| E | 41-45 | 995 | 375 | 8,400 | 5,600 |
| F | 46-50 | 1,190 | 450 | 11,800 | 7,900 |
| G | 51-55 | 1,330 | 500 | 17,400 | 11,600 |
| H | 56+ | 2,000 | 750 | 30,000 | 20,000 |

## APPENDIX III.

**Table 1. Catch by sport fishers (000s of pounds) by area, 1989-1993.**

| Area | 1989 | 1990 | 1991 | 1992 | 1993[1] |
|---|---|---|---|---|---|
| 2A | 327 | 197 | 158 | 250 | 246 |
| 2B | 635 | 762 | 584 | 579 | 657 |
| 2C | 1,559 | 1,330 | 1,654 | 1,668 | 1,811 |
| 3 | 3,005 | 3,638 | 4,236 | 3,899 | 5,265 |
| 4 | 24 | 40 | 74 | 40 | 72 |
| **Total** | **5,550** | **5,967** | **6,706** | **6,436** | **8,051** |

[1] Preliminary Estimates

**Table 2. 1994 catch allocations and estimates by sub-area within Regulatory Area 2A.**

| Sub-Area | Allocation | Catch Estimate |
|---|---|---|
| Washington | | |
| Puget Sound | 35,328 | 37,260 |
| North Coast | 68,039 | 65,298 |
| South Coast | 5,670 | 14,149 |
| Oregon | | |
| All depths[1] | 53,641 | 63,013 |
| < 30 fathoms | 14,259 | 4,806 |
| California | 1,813 | 1,813 |
| **Total** | **178,750** | **186,339** |

[1] August fishery was canceled and remaining catch limit was allocated to < 30-fathom fishery.

# PUBLICATIONS



The IPHC publishes three serial publications - Annual Reports, Scientific Reports, and Technical Reports - and also prepares and distributes regulation pamphlets and information bulletins. Items produced during 1994 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.

## CALENDAR YEAR 1994

International Pacific Halibut Commission. 1994. Annual Report 1993: 56 p.

_____1994. Pacific halibut fishery regulations 1994: 13 p.

Kaimmer, S. M. 1994. Halibut injury and mortality associated with manual and automated removal from setline hooks. Fisheries Research 20: 165-179.

Pelletier, D. and A. M. Parma. 1994. Spatial distribution of Pacific halibut (hippoglossus stenolepis): An application of geostatistics to longline survey data. Can. J. Fish. Aquat. Sci., Vol. 51:1506-1518.

Sullivan, P. J. and D. A. McCaughran. 1994. Pacific halibut stock assessment: Changing strategies for changing times. Proceedings of the World Fisheries Congress, Theme 5, Assessment Methodologies and Management. Oxford and IBH Publishing Co.

Sullivan, P. J., R. J. Trumble, and S. A. Adlerstein. 1994. Pacific halibut bycatch in the groundfish fisheries: Effects on and management implications for the halibut fishery. Int. Pac. Halibut Comm. Sci. Report No. 78: 28 p.

# COMMISSION PUBLICATIONS 1930-1994

## REPORTS

1. Report of the International Fisheries Commission appointed under the Northern Pacific Halibut Treaty. John Pease Babcock, William A. Found, Miller Freeman, and Henry 0 'Malley. 31 p. (1931). [Out of print]
2. Life history of the Pacific halibut (13 Marking experiments. William F. Thompson and William C. Herrington. 137 p. (1930).
3. Determination of the chlorinity of ocean waters. Thomas G. Thompson and Richard Van Cleve. 14 p. [1930).
4. Hydrographic sections and calculated currents in the Gulf of Alaska, 1927 and 1928. George F. McEwen, Thomas G. Thompson, and Richard Van Cleve. 36 p. [1930).
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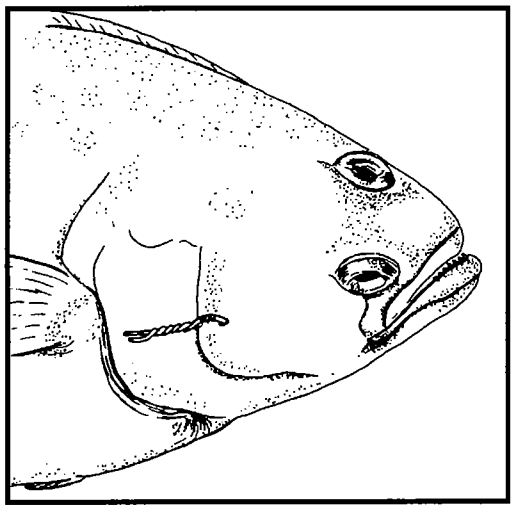
# TAGGED HALIBUT

The INTERNATIONAL PACIFIC HALIBUT COMMISSION attaches plastic-coated wire tags to the cheek on the dark side of the halibut, as in the diagram below. Fishermen should retain all tagged halibut, regardless of gear type used, time of year caught, or size of the halibut.



## REWARD

$5.00 or a baseball cap with tag reward logo will be paid for the return of each tag.

The IPHC also pays a reward for the return of Halibut Sport Tags:

1. A plastic-tipped dart tag inserted into the back just below the dorsal fin.
2. A metal-tipped tag inserted into the flesh behind the head.

**WHEN YOU CATCH A TAGGED HALIBUT:**

1. Record tag numbers, date, location and depth .
2. Leave the tag on the fish until landed.
3. If possible, mark the fish with a gangion or flagging tape around the 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, fish length, and, if possible, the ear bones. Tags should be completely removed from the fish. Plastic-tipped and metal-tipped tags may need to be cut out of the fish.

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

**International Pacific Halibut Commission**
**P.O. Box 95009**
**Seattle, WA 98145-2009**
**Phone: (206) 634-1838**