FIELD SERVICES BRANCH

1984 Review

FISHERIES AND OCEANS
PACIFIC REGION

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Field Services Branch

1984 Review

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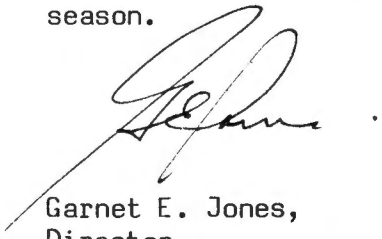
Director's Report

The highlight of the 1984 year for Field Services Branch and fisheries management in Pacific Region was the successful negotiation of the United States/Canada Pacific Salmon Fishing Treaty. Negotiations were successfully completed late in the calendar year, with the treaty itself being ratified in 1985. The appointment of commissioners and members of the various fishing panels will be concluded in 1985. Staff from the International Pacific Salmon Fisheries Commission will also be integrated into the Department of Fisheries and Oceans during the 1985 calendar year.

The announcement by the Liberal government for restructuring of the Pacific fishery created considerable controversy amongst the various user groups. With the election of a Conservative majority later in the year, most of these recommendations were subsequently dropped.

I would like to pay tribute to Donald D. Wilson, former director of Field Services Branch, who left us in October to assume duties as regional marketing advisor. Don served both Field Services Branch and the fishing industry most capably during his term as director of Field Services Branch.

As director of Field Services Branch, I plan to take a very active role in fisheries management in Pacific Region. In this regard, I look forward to meeting with members of the fishing industry and other user groups to discuss items of mutual concern. I wish you well in the 1985 fishing season.



Garnet E. Jones,
Director,
Field Services Branch.

Fraser River, Northern B.C. and Yukon

The Fraser River, Northern B.C. and Yukon Division encompasses the entire Fraser River watershed, all the salmon-bearing stream watersheds known as the transboundary rivers (originating in northwestern B.C. and terminating in U.S. waters in Alaska) with some minor watersheds in southwestern B.C. (i.e. Pepin Creek and Bertrand Creek watershed); the Okanagan River in south-central B.C. and all of Yukon, where the Department is responsible for managing freshwater species as well as anadromous fish. The entire geographic area under the Division's management is in excess of 1.3 million square kilometres.

The Division's headquarters are located in New Westminster, and encompass three management areas - District 1, (Upper Fraser River Watershed) and District 2 (Lower Fraser River Watershed) and District 10 (Yukon and Northern B.C.); a Management Biology Unit, a Habitat Management Unit, a Fish Inspection Unit, a Native Affairs Unit and a Special Enforcement Unit.

Fishery officers again concentrated on the protection of early Fraser River chinook and enforced a special closure in the Indian food fishery for the protection of a weak return of early Stuart sockeye.

A major tagging program, conducted jointly with Alaskan biologists, provided information on the magnitude of salmon stocks and their spawning distribution in the Canadian section of the Taku River. The Taku is one of several transboundary rivers which originate in Canada and flow through Alaska before discharging into the ocean. Under the new Pacific Salmon Treaty, fisheries in these rivers will be cooperatively managed by the two countries. Other studies on the Stikine River, another transboundary stream, added to existing information on stock abundance and distribution and resulted in further advances in techniques for separating comigrating sockeye stocks.

Chinook escapements to the Fraser River continued to improve, with the 1984 escapement of 79,000 being well above the recent (1979-83) average of 61,000. Increased escapements were noted in many areas of the upper Fraser. Reductions in fisheries for chinook along the north coast and a late start to the Fraser River commercial gillnet fishery are considered to be at least partially responsible for this improved escapement.

The chum salmon escapement to the Fraser River also improved. The estimated spawning ground escapement of 625,000 was the second highest on record; a direct result of the new management approach developed jointly by the Chum Advisory Committee and DFO. In this approach, harvesting when run size is low, such as occurred in 1984, is limited to test fishing and Indian food fishing.

In 1984, the Division filled two new positions--a Native extension officer and an enforcement coordinator. The Native extension officer plays a major role in developing Native Indian co-management plans and implementation strategies through consultation with band and tribal groups. The enforcement coordinator is responsible for an accelerated program designed to detect and take action against violations under the Fisheries Act. The primary emphasis of this program will be to reduce the impact on the resource of illegal activities such as poaching and fish trafficking and, secondly to take direct enforcement action against companies and individuals who are threatening or destroying fish habitat

due to their activities.

Contact: Fred Fraser,
Area Manager,
Fraser River, Northern B.C.
and Yukon Division.

Kamloops District

The Kamloops District comprises 220,000 km^2 of the upper Fraser River watershed, with varying terrain ranging from mountains to plateaus. There are no tidal waters within the district. The southern boundary extends from North Bend to the U.S.A./Canada border at Osoyoos; the northern boundary is the Driftwood River; the western boundary extends from Burns Lake to North Bend; and the eastern boundary is east of Tête Juane Cache to near Revelstoke. The district office is located at Kamloops, while subdistrict offices are located at Prince George, Quesnel, Williams Lake, Lillooet, Clearwater and Salmon Arm.

The principal functions within the district are habitat protection, management of the Indian food fishery and the enforcement of the regulations covering these matters.

Commercial Salmon Fishery

No commercial fisheries are undertaken within the District.

Sport Fishery

The B.C. Fishery (General) Regulations prohibit the taking of sockeye, pink or chum salmon from nontidal waters of the province throughout the year. Since all waters within the District are nontidal, a sport fishery exists only for chinook and coho salmon. The B.C. Sport Fishing Regulations permit the taking of chinook and coho over 30 cm from nontidal waters, but chinook and coho over 50 cm cannot be taken from the Fraser River watershed. Estimates of total catches would be 400 jack chinook and 600 coho.

The fishery occurs on the North Thompson, South Thompson and Thompson Rivers as well as the Fraser River near Lillooet. Due to the high mortality of hooked and released chinook at the mouth of the Bridge River and the retention of chinook over 50 cm by local anglers, Bridge River was closed to all angling from the highway bridge to the confluence with the Fraser River from July 9 to September 15. The Shuswap River was also closed August 22 - October 31 for the same reasons.

Table 1

KAMLOOPS DISTRICT

1984 Sport Fish Catch*

Species	Nontidal
Sockeye	Closed
Coho	600
Pink	Closed
Chum	Closed
Chinook	400
Steelhead	NA[1]

* Estimates only.
1 Not available.

Indian Food Fishery

Approximately 60 Indian bands situated throughout the District participated in the fishery. Indian bands, situated along the Fraser River at Lytton and Lillooet claimed aboriginal rights of fishing locations on the Fraser River. Indians from other areas wishing to fish here required a letter of permission from the Indian band claiming aboriginal rights.

Members of various Indian bands and Department representatives met several times to discuss such topics as closures, stock strengths, management objectives and permits.

An 18 - 20 day closure of the Indian food fishery in the Fraser River, Nechako River and Stuart Lake system

was in effect in July to provide conservation for early Stuart Lake system sockeye. The closure was well observed. The 1984 sockeye escapement to the Stuart Lake system was 45,000 while the brood year was 17,000.

The total catch in the District for all species was 148,558. Sockeye catches of 144,398 represented 97 percent of all salmon caught. The 1984 sockeye catch was 20 percent smaller than the 1983 catch, but 41 percent larger than the 1980 catch of 102,261.

Table 2

KAMLOOPS DISTRICT

1984 Indian Food Fish Catch

Species	Catch
Sockeye	144,398
Coho	795
Pink	--[1]
Chum	--[2]
Chinook	3,365
Steelhead	--[3]

[1] Off-year for pinks.
[2] Do not frequent the district.
[3] Not available.

Salmon Escapements

In 1984, there were considerable increases in spawning escapements compared to the 1980 brood year.

Total sockeye escapement increased 29 percent, chinook increased 51 percent and coho increased 130 percent.

1984 was an off-year for pink salmon in the Fraser River system.

In each of the subdistricts, sockeye escapements showed an increase over the 1980 brood year. In Prince George, escapement was 115,335 compared to 93,240 enumerated in the brood year; in Williams Lake escapement was 600,077 compared to 507,100; in Lillooet, 2,600 compared to 1,000; in Clearwater, 30,562 compared to 14,030 and in Salmon Arm, 65,420 compared to 16,203. Particularly noteworthy was the early sockeye escapement to the Stuart system: 45,000 compared to the brood year of 17,000.

All subdistricts except Prince George, which had a six percent decline, showed significant increases in chinook escapement. Escapement in

Table 3

KAMLOOPS DISTRICT

1984 Salmon Escapements

Species	Escapements	1980 Brood Year
Sockeye	813,994	631,573
Coho	63,144	41,778
Pink	21,211	9,225
Chinook	--[1]	--[1]

[1] Off-year for pinks.

Table 4

KAMLOOPS DISTRICT

1984 Major Sockeye Escapements

River	1984	1980 (Brood Year)
Adams	4,200	2,600
Bowron	10,500	2,900
Chilko (& Lake)	581,000	387,000
Early Stuart	45,000	17,000
Fennell Creek	11,000	8,400
Gates	29,000	25,000
Horsefly	6,200	3,200
Momich	5,900	3,300
Nadina (Lower)	7,100	3,100
Raft	19,100	5,400
Seymour	17,200	8,400
Stellako	72,000	61,000
Upper Adams	3,500	560
Total	811,700	527,860

Prince George was 7,650 compared to 8,130 enumerated in the 1980 brood year; in Williams lake, 18,663 compared to 9,150; in Lillooet, 7,130 compared to 6,300; in Clearwater, 14,861 compared to 9,288 and in Salmon Arm, 14,840 compared to 8,910.

Enforcement

During the year, 117 charges were laid varying from illegal possession of fish to the depositing of a deleterious substance by a Prince George forest company.

District staff again participated in RCMP roadblocks at Roger's Pass, Falkland and Cache Creek, and several charges were laid. The RCMP expressed their appreciation for this Department's participation.

The appointment of fishery officers as deputy conservation officers has increased their enforcement effectiveness.

Habitat

Protection of habitat is the prime responsibility of field staff, who devote up to 80 percent of their working hours to habitat matters.

Within the District are over 100 wood-processing manufacturers, six pulp mills, hundreds of placer mine operations, as well as agriculture and urban development. Wood harvesting operations can be regarded as the major environmental concern.

The workload of the District habitat biologist has increased substantially as a result of involvement in the review and assessment of several major projects including CN twin-tracking, the Coquihalla--Coldwater Highway; and proposed log handling operations on Quesnel Lake.

During the year, 2555 habitat referrals were received and processed. A large percentage of these referrals were forestry related. Large cut blocks were harvested throughout the District because the wood was infested with spruce bark beetle. Early in 1984, as many as 700 - 800 truckloads of wood a day were removed from the Bowron River area. Considerable blowdown which occurred in the Nadina Valley will also require extensive logging.

A sodium cyanide spill occurred at the Stellako River bridge crossing. Waste Management Branch and Environmental Protection Service investigated the incident and may take further action.

A motor vehicle accident which occurred near Canoe resulted in the explosion of a propane truck and the derailment of 15 railway coal cars. A small amount of coal entered Shuswap Lake, but there was no environmental damage to the lake system.

In order to provide protection for rearing juvenile salmon in Quesnel Lake, the log dewatering site originally proposed for Plato Island was changed to Beach Point. Log handling operations on Quesnel Lake will be monitored in 1985.

Table 5

KAMLOOPS DISTRICT

1984 Habitat Protection Referrals

Type	Number
Water Licences	779
Forestry	728
Navigable Waters Protection Act	18
Land Use Applications	17
Urban Development	16
Ocean Dumping & Dredging	0
Pollution Control Board:	
Pesticides	141
Waste Management	50
Highway Development	29
Placer Mining	662
Other	319
Total	2,819

Salmonid Enhancement

Public Involvement (volunteer) projects have increased from 19 to 33 due to participation by schools. There is a growing demand for the "Salmonids in Classroom" educator's package, as many teachers find it and the in-classroom incubator to be a valuable educational tool. Students are increasingly aware of salmonids and salmonid habitat. This year, 116,000 chinook eggs were taken at two projects and 54,000 coho eggs were taken at five projects.

Contact: Grant Scott,
District Supervisor,
Kamloops.

New Westminster District

The New Westminster District office administers fisheries-related activities in the eastern Gulf of Georgia, Howe Sound, Greater Vancouver, Burrard Inlet, Indian Arm and the Lower Mainland areas. The District includes the Fraser River watershed west of Boston Bar, the Squamish River watershed and the combined watersheds of the Harrison, Lillooet and Birkenhead Rivers. In addition to substantial commercial salmon, crab, shrimp and prawn fisheries, the District has one of the largest sport fishing fleets found on the coast, with sport fishing activity greatest in Howe Sound and the Strait of Georgia. The District includes the largest Indian food fishery of the Region (approximately one-third of total catches within the Region). Approximately two-thirds of the total population of the province is located within the boundaries of the District, with the result that there are major and chronic habitat encroachment problems in addition to substantial illegal poaching and sales of fish. Management and enforcement of

Table 6

NEW WESTMINSTER DISTRICT

1984 Commercial Salmon Catch and Escapements

Species	Gillnet	Seine	Troll	Total	Escapement
Statistical Area 28 (Howe Sound-Burrard Inlet)					
Sockeye	0	0	0	0	50
Coho	0	0	0	0	47,454
Pink	0	0	0	0	0
Chum	0	0	0	0	170,805
Chinook	0	0	0	0	5,294
Steelhead	0	0	0	0	0
Total	0	0	0	0	223,603
Statistical Area 29 (Fraser River)					
Sockeye	815,164	0	68,543	883,707	165,109
Coho	9,139	0	1,372	10,511	65,706
Pink	599	0	94	693	0
Chum	2,041	0	45	2,086	532,238
Chinook	27,674	0	1,613	29,287	16,378
Steelhead	371	0	0	371	2,878
Total	854,988	0	71,667	926,655	782,309

the various fisheries and the protection of habitat constitute the major functions in the District.

Commercial Salmon Fishery

The commercial salmon fishery on the Fraser River and District waters of the Gulf of Georgia (Area 29) opened in July, after an extensive closure to all fisheries to protect the early Stuart sockeye run, under the control of the International Pacific Salmon Fisheries Commission.

The total Fraser sockeye return was almost double the predicted return and even exceeded the 1983 run which was a record dating back to 1904. This was primarily the result of the record Chilko production of more than four million fish.

Sport Fishery

While the sport fishery did not change significantly in 1984, it still presented problems for fishery managers. Heavy pressure on the salmon fishery continues in Howe Sound, Burrard Inlet, the Gulf of Georgia and the Fraser River bars. The Capilano River supports an intensive sport fishery for returning coho and chinook. Production of coho salmon in the Capilano facility has been increased to maximum in anticipation of the additional pressure Expo 86 will place on the sport fishery. A year-round shellfish fishery is held in Boundary Bay, Burrard Inlet and Indian Arm for Dungeness and red rock crabs. Eulachon and sturgeon fisheries take place in the Fraser River during spring and summer. The smelt fishery is growing in terms of effort and catch each year. Actual statistics are not available for the sport fishery for 1984.

Table 7

NEW WESTMINSTER DISTRICT

1984 Sport Fish Catch*

* See Table 37--Georgia Strait Creel Survey--in South Coast, Management Biology.

Indian Food Fishery

The number of Indian food fish licences issued in the District was 820 two-band licences, compared to 761 in 1983, 879 in 1982 and 739 in 1981. This fishery harvested 333,773 pieces, most of which were sockeye salmon. While this catch is below the 1982 level, it is considerably above the nine-year average of 220,000 pieces.

The chinook catch increased to 20,000 pieces from the 1983 catch of 13,000. It remains substantially below the record catch of 30,600 pieces taken in 1982 and is greater than the nine-year average catch of 15,400 chinook salmon.

A total river closure was implemented this year for protection of the early Stuart sockeye stock. The success of obtaining 45,000 sockeye on the spawning grounds is partially due to the cooperation of Indian fishermen who observed the closure.

Table 8

NEW WESTMINSTER DISTRICT

1984 Indian Food Fish Catch

Species	Catch
Sockeye	214,436
Coho	70,417
Pink	25
Chum	21,589
Chinook	20,561
Steelhead	6,745

Salmon Escapements

Chum salmon escapement to the lower Fraser exceeded 530,000 spawners this year. However, this is well below optimum requirements. Chinook returned in quantities similar to brood-year escapement while sockeye returned at

less than brood-year levels of 21,100 to 65,700 spawners.

Returns to the Squamish system overall were less than brood year with the exception of coho which increased slightly. The numbers of coho returning to Capilano and Seymour Rivers is encouraging.

Severe flooding occurred throughout the District during January, and in the Squamish-Pemberton areas during October, causing damage to spawn depositions.

Table 9

NEW WESTMINSTER DISTRICT

1984 Herring Spawn Deposition

(standard square metres x 1,000)

Area	1984	1983	1982
29	3.11	--	--
Total	3.11	--	--

Other Fisheries

The New Westminster District continues to support an active crab, shrimp and prawn fishery as well as small commercial and sport fisheries for eulachon and smelt. In addition, reduced fishing times for salmon and halibut has resulted in fishermen diversifying into other fisheries such as octopus, crayfish, zooplankton and sturgeon. A small trawl fleet operates in the Gulf of Georgia supplying the fresh fish market in Vancouver and Steveston areas.

Enforcement

Enforcement continues to be a high priority in the District. As prices paid for fish products increase, poaching and selling illegally caught fish becomes more lucrative. In 1984, 468 persons were charged for a total of 573 offences in the district. Seizures for fisheries offences included: 505 nets; 3 boats; 1,600 salmon; 2,722 kilograms of sea urchins; 2,700 crabs; 2.7 t of clams and various amounts of other fish, fish products and fishing gear. District staff recorded approximately 1,600 incident reports in 1984 which dealt with illegal activities.

Habitat

Pollution and loss of viable fish habitat continue to be major problems in the New Westminster District. Two-thirds of the population of British Columbia live and work in the Lower Mainland, with the result that growth and expansion of urban and industrial development continues at a rapid pace. Habitat specialists are working to respond to the heavy workload. Habitat development and particularly encroachment of the Fraser River foreshore and estuary are priorities. One thousand and fifty-seven referrals were processed in 1984, compared to 1,261 in 1983 and 1,470 in 1982.

Table 10

NEW WESTMINSTER DISTRICT

1984 Habitat Protection Referrals

Type	Number
Water Licences	127
Forestry	151
Navigable Waters Protection Act	68
Land Use Applications	92
Urban Development	288
Ocean Dumping & Dredging	90
Pollution Control Board:	43
Pesticides	68
Waste Management	43
Highway Development	34
Placer Mining	7
Other	46
Total	1,057

Salmonid Enhancement

Permanent enhancement facilities now operating in the District are located at Capilano, Birkenhead, Chilliwack,

Inch Creek, Chehalis and Tenderfoot. These hatcheries, already producing significant amounts of salmon, have placed a major priority on coho production in anticipation of the demand generated by visitors to Expo 86. Several community development and public involvement projects operated by fish and game clubs, schools, community clubs and individuals are incubating coho and chum salmon eggs on small systems throughout the Lower Mainland.

Significant returns to the Vedder River and the Brunette River from SEP facilities produced a much-awaited sport fishery on chinook and coho salmon respectively.

Public reaction and support of the Salmon Enhancement Program has been overwhelming.

Contact: Don Aurel,
District Supervisor,
New Westminster.

Chinook salmon carcass sampling on the Takhini River.

Whitehorse District

The Whitehorse District office is responsible for supervising all river and lake systems in Yukon and northern B.C. It is the largest district in the Pacific Region, covering 751,100 square kilometres.

Management of the commercial, domestic and sport fisheries is the major concern. Habitat protection revolves around mining and proposed hydro dams. A major responsibility (not shared by any other district in the Region) is the management of all freshwater species and management of domestic fishing by non-Natives. In addition, the District participates in joint U.S./Canada management activities for transboundary river systems. Pipeline proposals, Indian food fishing, mining, road construction, logging, seismic operations, and developments in many fields of the Beaufort Sea are some of the activities in Yukon and northern B.C.

Commercial Salmon Fishery

This year's chinook run was later than usual with the first catches on July 6 and the peak passing Dawson City about July 20. The Yukon River fishery was slow starting because fishermen were unhappy with prices offered by a processing plant, resulting in lost chinook sales to the plant.

Of the 45 licences available for commercial salmon fishing on the Yukon River, 40 were sold and 34 were fished. Twenty-four fishermen reported catches exceeding 340 kilograms. Three processing plants purchased fish.

The eddy set net was the predominant fishing method. The use of fishwheels increased in popularity, with six used.

The two-thirds of the chinook catch not sold to the three plants, was sold fresh or smoked. Fresh chinook sold for $3.85 per kilogram; smoked sides $9 and up per kilogram and smoked strips for $22 and up per kilogram. Fresh fish was also sold in Inuvik. In addition to domestic markets, fish was sold to the United States, Germany, France and Japan. The total salmon value to fishermen was estimated at $244,000.

With the breakdown of international negotiations in June 1983, few restrictions were imposed on the 1984 Canadian-Taku salmon catch. Consequently, and coupled with an excellent return, a record number of sockeye were harvested by Canadian fishermen. The Department decided not to become involved in processor subsidies this year, but processing and transporting went very smoothly on the river.

The third week in July was the peak week for sockeye catches with over 5,600 pieces taken. The total to date, up to and including the second week of July, was 14,425. The coho run was average while the chum run was very poor compared with 1979, 1980 and 1981 escapement. Judging from commercial catches, spawning surveys and fishwheel catches, the 1984 pink run was below average.

Marketing of sockeye, coho, and chinook went very smoothly in 1984. it was not economical to market remaining species because of high transportation costs.

No commercial fishery for salmon occurred on the Stikine River this year due to expected low returns of sockeye and coho salmon.

Sport Fishery

Catches resulting from the rainbow trout lake stocking program carried out in the spring of 1982 continue to be very good. One to two kilogram (2.2 to 4.4 pounds) trout are harvested from the stocked lakes. Additional stocking of rainbow fry was carried out in 1984 as a supplement to the 1982 program; growth of these fry is still quite limited. Most of these lakes are now at maximum carrying capacity. Public reaction to the program has been

Table 11

WHITEHORSE DISTRICT

1984 Commercial Salmon Catch and Escapements

Species	Gillnet	Escapement[1]
Taku River Area		
Sockeye	27,242	29,000
Coho	5,357	NA[2]
Pink	6,964	70,000
Chum	2,462	5,500
Chinook	294	4,100
Steelhead	367	NA[2]
Total	42,686	108,600
Stikine River Area[3]		
Yukon River Area		
Sockeye[4]	0	0
Coho[4]	0	0
Pink[4]	0	0
Chum	22,982	60,000
Chinook	9,885	30,000
Steelhead[4]	0	0
Total	32,867	90,000

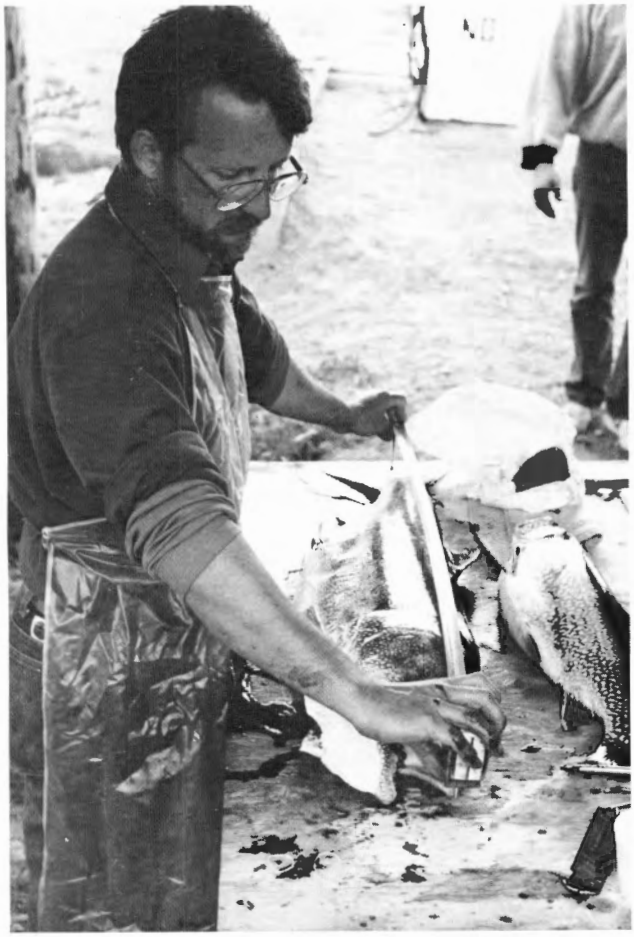
1 Escapement figures are best estimates.
2 Not available.
3 No commercial fisheries this year due to low escapements. Escapement data not available.
4 Species not in this area.

Table 12

WHITEHORSE DISTRICT

1984 Sport Fish Catch*

* No data taken this year due to funding restraints.



Fisheries personnel check statistics of catch at the Tagish weigh-in station during the Kiwanis Derby.

excellent and these types of projects will continue to be in high demand by all users. The program is also an excellent means of shifting effort away from the more heavily fished areas.

Sports fishing pressure on indigenous species is mainly directed at lake trout and, to a lesser extent, arctic grayling and northern pike. Fishing derbies were held at Mayo, Ethel, Frenchman, Little Salmon and Kluane Lake in addition to the annual Yukon-wide Kiwanis Derby, with the largest lake trout caught in Tagish lake and weighing 12.5 (27.5 lbs) kilograms.

Fishing for salmon at Dalton Post was restricted to weekends only (open 6 a.m. Saturday to noon Tuesday). Significant sport fishing began at Dalton Post the last week in June, but there was relatively no success until the second week in July. The chinook run began June 6, the earliest in nine years of weir operation, and 90 percent of the run was through the weir by July 26. Sport fishing for chinook was permitted, but sockeye had to be released prior to August 18 to conserve seriously depleted early sockeye run. Due to the poor sockeye return, the entire sport fishery in the area was closed September 21 to October 15. Sport fishing pressure in the Blanchard (Yukon portion only) and Takhanni Rivers was limited. There was not the usual return of chinook to these systems.

In addition to Dalton Post, salmon sport fishing concentrated at Tatchun Creek and the Teslin River area in Yukon.

There was an above-average return of chinook salmon to the Tahltan River system in northern B.C.: approximately 250 chinook were harvested. Tahltan Indian Band bylaws on the reserve section of the Tahltan River have curtailed sport fishing activity in this area. The largest sport catch is now harvested in an area of the Tahltan River known locally as the "cannery"; located approximately six and one half kilometres upstream of the confluence of the Stikine/Tahltan Rivers.

Another major salmon sport fishery, located on the Nakina River has a catch estimate of less than 100 chinook (similar to 1983). Access to this area is by helicopter only and is expensive and difficult to patrol.

The question of commercial sport lodge operations in Yukon remains outstanding, as regulations have been in Ottawa for over a year.

Indian Food Fishery

Data compiled on the Indian food fishery was notably improved this year. Natives were hired from each community through the FREDY (job

creation) program to gather harvest statistics from the twelve Yukon Indian Bands. In addition, the historic Indian food fish catch information is to be consolidated from DFO records. This will be the first year of fairly good data on the freshwater fishery.

Because of continuing concern for early sockeye, fishing times for traps at Klukshu were reduced to one day each week from June until August 18. The fishing times were then increased to match gaffing times (three days a week).

Sixty-three licences were issued to Native members of the Association of United Tahltans for food fishing privileges on the Stikine River. Food fishing was allowed seven days a week and was done using boom nets.

Table 13

WHITEHORSE DISTRICT

1984 Indian Food Fish Catch

Species	Catch
Sockeye	7,977
Coho	516
Pink	62
Chum	5,815
Chinook	6,293
Steelhead	NA*

* Not available.

Salmon Escapements

Chinook escapements to the Yukon River were low but coverage was minimal because of lack of funds. The count at the Whitehorse fishway was 1,042, higher than the past two years, however, chinook escapements were low. The chinook escapement is estimated at 30,000, about average, but far below optimum.

Chum escapements to the mainstem Yukon were below average, the Fishing Branch area fair, while the Kluane system was up. The total chum escapement is estimated at 60,000. Again, well below optimum levels. The Taku River sockeye run was stronger than expected, while showings of coho, pinks and chinook were average. The chum run was a disappointment, very poor compared to brood years.

The Alsek area escapements of sockeye and chinook were very poor. Despite a reduction in the early Alaskan fishing times, nonretention by sport fishermen, and Native trap restrictions, the early sockeye run produced an escapement less than 2,000.

Aerial surveys made possible with funds from the international salmon program were done in the Stikine River watershed. Although poor weather conditions and high turbidity limit the effectiveness of such surveys, the 1984 surveys were more successful than others. The Tahltan Lake weir had a count of 32,777 sockeye, a result of extremely limited fishing on both sides of the border.

Enforcement

District staff initiated 15 prosecutions with 14 convictions in 1984. The coverage of the sport fishery was more extensive this year, along with extensive surveillance of suspected trouble areas. The general public was receptive to the increased enforcement program.

Habitat

Placer mining, proposed Beaufort Sea development and highway construction were the major habitat issues in Yukon.

The "Report of the Yukon Placer Mining Guidelines Public Review Committee" was released early in 1984.

For the first time, application for a water licence was required by all miners using in excess of 227,000 litres per day. The first 63 applications went through the public hearings process. The remaining applications

Construction of the huge culverts on the Rose River crossing was a major habitat concern in Yukon.

were responded to by written interventions.

King Point in the Beaufort Sea appears to be the main focus for port development. This area is part of the Cope land claim settlement but the referral process through this organization is not finalized.

The gypsum deposits in the upper Stonehouse Creek area are being developed by the Haines Gypsum Company. A road was constructed into the claims along hardrock mineral claims, requiring no approval or consultation from environmental agencies. Test pits were dug with proposed sample marketing of gypsum beginning in 1985.

Major highway construction was undertaken on the Haines Road from under the Shakwak project and on the Alaska Highway. Completion of the Rose River culverts reopened the South Canol Road. The Dempster Highway was upgraded from Km 80 to 102 and preliminary work was done on Km 67 - 80 of the Klondike Highway. On the Stikine River, Hal-Pak Forest Products cooperated in its 1984 logging program. Approximately 70 log booms were floated down the Stikine River to Wrangell, Alaska. The high cost of travel to this location presents a serious obstacle to monitoring this activity.

Fish stocking in Hidden Lake.

Table 14

WHITEHORSE DISTRICT

1984 Habitat Protection Referrals

Type	Number
Water Licences	312
Forestry	13
Navigable Waters Protection Act	5
Land Use Applications	108
Urban Development	-
Ocean Dumping & Dredging	-
Pollution Control Board:	
Pesticides	-
Waste Management	2
Highway Development	52
Placer Mining	301*
Total	477

* Most placer applications are also water licences.

A new hardrock gold mine located on Mt. Skukum, south of Whitehorse in the Wheaton Valley is scheduled to come on-line in 1985 and is projected to be active for 10 - 15 years. It has some of the richest gold-bearing ore in western Canada. As many as 100 workers are expected to be employed at the mine during peak production. Several other mine prospects along the B.C./Yukon border may come on-line should metal prices increase and demand become stable.

Salmon Enhancement

The first hatchery in Yukon came on-stream in 1984 at the Whitehorse rapids. Only 140,000 eggs were taken on a trial basis. The hatchery was built by the Northern Canada Power Commission (NCPC) as a compensation facility for smolts being ground up in the existing turbines. The operational costs are being questioned by NCPC and are yet to be resolved.

Public Information

Whitehorse took part in the DFO awareness program in 1984. For this event, information sheets were produced on the freshwater species of Yukon and used as part of a display at the local mall. Staff talked to local clubs, schools and organizations. Public awareness has improved and further awareness programs are recommended for 1985.

Contact: Gordon Zealand,
District Supervisor,
Whitehorse.

Southern Inspection District

The staff of the Fraser River, Northern B.C. and Yukon Inspection office are responsible for monitoring the processing of 66,000 tonnes of fish handled through 94 registered plants, 30 of which are also registered to handle bivalves.

Canning

The Vancouver area has seven of the fourteen major B.C. salmon canneries where indepth cannery surveys are performed regularly during the operating season. In addition, over 80 percent of B.C. canned salmon and most of the U.S. canned salmon imports are labelled and screened for defective cans through five warehouses in this area. Inspectors routinely verify the effectiveness of the screening lines and require reprocessing or hand culling of cans where potential problems have been identified.

Certification

After inspection of fish samples and approval of processing techniques, export certificates are issued to comply with export regulations for sockeye and pink salmon and roe-on-kelp and to meet the requirements of buyers and importing countries (e.g. France, Belgium, Italy, Greece).

There were 1,790 certificates prepared for 15.5 million kg ($110 million worth) of fish. This figure includes fish inspected in other districts and certified through the Vancouver office. Each lot may represent several sublots, requiring an estimated 4,500 sublot examinations.

Many certificates are prepared by industry, with Inspection staff continuing to sign and validate each one. All DFO preparation and completion of fresh and frozen certificates are done in the field office. Certificates continue to be seasonally concentrated, with 54 percent issued between August and October, but the program remains time-consuming throughout the entire year.

Sampling

The field office regularly samples commercial productions of fillets, crab, shrimp, prepared products and clams for submission to the Regional Laboratory for testing for faecal contamination, total bacterial count, staphylococcus, mercury and PSP. On

several occasions, the need for improved sanitary handling was identified and plant operations were suspended pending upgrading. Field officers destroyed unacceptable products, and concentrated on finding the cause of contamination to prevent further problems.

Plant Surveys and Inspections

Plant surveys are carried out annually and inspections are done routinely, as part of an ongoing audit of plant construction and operations. Ninety-four plants were registered during 1984, and proposals for several more are currently under review. New plants require a thorough review of all plans before construction begins, inspections during construction and a final survey before approval for registration is given.

Plant operations are rated and where necessary, schedules for correction are arranged. Good plants rate "A", some "D" plants were closed pending cleanup.

Herring

The 1984 food herring season ran smoothly, with vessel quotas eliminating the "gold rush" fishery of a few years ago. Roe herring ran well also, due to a reduced quota and more careful processing by industry. Inspection strives to maintain at least minimum processing standards, especially in the few plants attempting to increase competitiveness by using substandard processing. Bacteriological samples were routinely taken, but only a small quantity was detained because of contamination.

Legal Activities

The Inspection Branch has increased enforcement activities in situations where individuals or companies are involved in flagrant violations. This involved eight plant registration suspensions and nine charges for violations. The number of chronic violators has decreased, indicating that our program has been effective.

New Initiatives

Under new regulations, smoked salmon can once again be sold, under permit, to Australia. Permits are issued only after Inspection provides written notification that Australian requirements are being met.

Quality control programs are typical in many plants. Inspection officers work on prevention rather than treatment by having plants control processing; for example, with regard to cold storage records, proper hygiene, and day coding.

Planning has become an integral part of Inspection. Priorities are set, surveys and inspections are better defined, and individual work plans for inspectors improve management of time and resources.

Certificates continue to increase in importance. Accountability for accuracy has increased in 1984, with the Department declining to issue certificates for products not submitted for inspection, for lots where descriptions have changed, or where processing has not been adequate.

Contact: Dale Paterson,
District Inspection
Supervisor,
Vancouver.

Management Biology

The Management Biology Unit analyses data and conducts field programs which provide a biological basis for the management of fisheries. Some programs are in-season, such as test fishing; while others are concerned with long-term management, such as salmon spawning enumeration.

Fraser River Salmon Fry Enumeration

In 1984, the enumeration of downstream migrant juvenile salmon in the Fraser River at Mission indicated an above average count of chum fry. This

fry production resulted from below average spawning in 1983 of 426,000 adults and the output from various chum hatcheries.

The chum fry count aids in predicting the magnitude of adult returns. While the fry output from the Fraser River is one of the best predictors of chum returns, further analysis of the data is required to assess its usefulness in predicting returns of adult chinook salmon to the Fraser River.

Chum Test Fishing and Total Return

The in-season abundance of chum salmon in the Fraser River is estimated annually by using commercial gillnet boats under charter. Two boats operate daily from early October until mid-December on the Fraser River, one at Cottonwood Drift near Tilbury Island and the other just upstream from the Albion ferry dock. In 1984, the test fisheries indicated higher than expected returns of chum to the Fraser River, particularly the middle and late timing runs. The final estimate of the run was 565,000; 60,000 or 9.2 percent less than the spawning grounds estimate of 625,000.

The total return of Fraser River chum (including catch in all areas plus spawning escapement) was approximately 680,000; 243,000 or 36 percent lower than the pre-season estimate of 437,000.

Chinook Test Fishery

The test fishery to assess the abundance of chinook entering the Fraser River operated for the fifth consecutive year. Test fishing is conducted by a gillnet vessel under charter which fished three days per week from April to October near Albion. Two drifts were made each fishing day during low tide.

Catches were low (between zero and five chinook per day) during April, and did not increase in early May as expected from previous years' data. Although catches began to increase in late May, the 1984 cumulative index by early June was the lowest on record and below average until late June. Catches in June, July and August were the highest on record, and by the end of August the cumulative index was 20 percent above average.

Catches of Harrison chinook were above average in September, and catches in early October were higher than usual. The incidental chinook catches during chum test fishing were the highest on record. It would appear that the Harrison run was well above average, but late, and that many fish moved upriver in the middle of October following the usual end of chinook test fishing.

Crab Soft Shell Monitoring

The crab soft shell monitoring program, initiated in 1981, was completed in 1984. The objective of the program was to identify when the majority of the Dungeness crabs in the Fraser River area have soft shells and then close the fishery during this period.

Soft shell crabs generally have poorer meat quality and a lower meat recovery rate than hard crabs. The expected result of the program was to produce a higher quality product at a higher price.

The 1984 program began March 28 and continued until June 19. Crabs were sampled for size, sex and hardness of shell.

The incidence of soft shell was already high at 39 percent on March 28, remaining just under 50 percent until the last week of May. By the first of June, the incidence of soft shell had dropped to 16 percent on Sturgeon Bank and 30 percent on Roberts Bank, dropping below four percent in both areas by June 19.

Boundary Bay was sampled only on June 5, showing a 48 percent incidence of soft shell.

The 1984 closure extended from May 1 to July 15. It appears that this closure was approximately two weeks late (both beginning and ending) according to the samples obtained for 1984.

Fraser River Sport Fishery Assessment

The sport fisheries of the lower Fraser River mainstem (downstream from Hope), the Harrison River and the Vedder-Chilliwack River were assessed during the fall of 1984 to determine the annual catch by species and annual angler effort in each of the three fisheries. Additional information was collected in order to permit an economic analysis of the fisheries by the Regional Planning and Economics Branch. Manpower for the 1984 assessment was supplied through the FREDY job creation program, and the study was conducted in cooperation with an environmental consultant retained by the provincial Fish and Wildlife Branch.

The study, which used a roving creel methodology, employed seven surveyors during the period September through December. Anglers were approached during their fishing trip in order to determine the duration of their trip, and species composition and incidence of marks in the catch, as well as information related to the economic component of the survey. Anglers were also enumerated through ground, water and aerial surveys in order to generate estimates of daily effort.

Approximately 5,000 interviews were conducted during the survey. These data are currently under analysis by DPA Consultants in order to generate estimates of catch and effort, and to provide recommendations for a cost effective study design for further studies.

Klukshu River Enumeration Weir

A salmon counting weir on the Klukshu River (Alsek River system) was operated for the ninth consecutive year. The chinook count of 1,672 was below the 1976 - 83 average of 2,700. This decline was disappointing in view of a two-week delay in start up of the U.S. fishery in Dry Bay, which reduced the catch in that fishery to only 60 chinook. The sockeye count of 12,727 was below the 20,500 average, although the early segment of the run showed an increase. The coho count was 1,402 but because the weir is removed each year before the run is complete, comparative annual counts are of little value.

Sport catches in the Klukshu and nearby streams in 1984 were estimated at 500 chinook, 300 sockeye and 100 coho, while Indian food fishery catches included 200 chinook and 2,400 sockeye.

Taku River Salmon Tagging and Spawning Enumeration

A joint Canada-United States salmon tagging program was conducted on the Taku River to gather information on population sizes, harvest rates, migratory timing and behavior and to identify spawning locations. Two types of tags (spaghetti and radio) were used. Salmon were captured by four fishwheels located on Canyon Island on the Alaskan section of the river.

Spaghetti tags were applied to 2,025 sockeye, 1,085 pink, 814 coho, 309 chum and 138 chinook. Some of the tagged fish were recaptured in the Canadian commercial fishery and used for computing population estimates and harvest rates. Because the migratory period for chinook, coho and chum extended outside the tagging period and pinks were taken, only the sockeye estimate is reliable. An estimated 106,000 sockeye entered the Canadian side of the river where 27,000 or 25 percent were taken in the commercial fishery leaving 79,000 for escapement. Population estimates were 56,000 for coho, 100,000 for chum, and 143,000 for pink. No estimate for chinook could be computed.

Radio transmitters were inserted in the stomachs of 93 sockeye and 17 coho. Fish movements were monitored every two to four days by a receiver

located in a small fixed wing aircraft. Of the 93 tagged sockeye, 38 moved downstream, were recaptured in the commercial fishery or were lost. The remaining 55 were tracked throughout the Taku drainage with the majority being found in side sloughs and channels of the mainstem of the Taku River.

The Inklin River, a major tributary, received the second largest number of tagged adults. Only five radio-tagged fish entered the Nakina River.

Information from the tagging programs was supplemented by aerial escapement surveys, by a sockeye counting weir at Little Trapper Lake and by a chinook carcass recovery weir on the Nakina River. The sockeye weir was situated on Kowatua Creek approximately 50 m downstream from Little Trapper Lake. Seventeen percent (13,084 sockeye) of the estimated total Taku River sockeye escapement, passed through the weir. Of these, 120 bore spaghetti tags applied at Canyon Island. Sockeye took 18 to 52 days to travel the 166 kilometres from Canyon Island.

The Nakina River carcass weir, previously operated by the Alaska Department of Fish and Game, was operated for the first time by DFO in 1984. A total of 1,153 chinook carcasses were observed at the weir between July 30 and August 26. Twenty-six contained coded-wire tags which provide information on catch distribution and exploitation rates of chinook.

During tagging, in the fishery and at the counting weirs, the salmon were examined for size, age and sex.

Yukon Aquaculture Program--Pothole Lake Stocking

In June, 50,000 rainbow trout fry (one gram average weight) were planted in nine pothole lakes in southern Yukon Territory. The fry were purchased from Sun Valley Trout Farm in Mission B.C. with funds provided by the Salmonid Enhancement Program. The acquaculture program has been operating sporadically since the early 1970s (more regularly in the 80s), with strong public support from local residents and tourists. The objective of the program is to provide high yield, year-round fishing opportunities close to population centers and to take some of the pressure off vulnerable, indigenous lake trout stocks.

Success of the program is a direct result of rapid growth rates, accessibility and good catchability of the fish. Preliminary results from follow-up assessment work currently being conducted has indicated growth up to 215 g (7.6 oz.) (June - January) for fish planted in 1984 and rainbows of 2.6 kg (5.7 lbs.) (planted June 1982 - January 1985). One angler caught a 6.4 kg (14.1 lbs.) rainbow in November 1983 which had been planted in the spring of 1980.

Tahltan Lake Adult Sockeye Enumeration

The enumeration and sampling of age, size and sex of adult sockeye has been carried out at Tahltan Lake (Stikine River headwaters) since 1959. A total of 32,777 adult sockeye migrated into Tahltan Lake in 1984. Fifty percent of the run had passed by July 26; 90 percent by August 3. The average return, over the years from 1959 to 1984, is 19,149. However, the run has increased with the recent five-year average of 28,820; being more than three times the average of the 1959 to 1963 period. Preliminary analysis suggests an optimum escapement of 35,000 to 40,000 sockeye.

This return came from brood year counts of 10,200 in 1979 and 11,000 in 1980. The dramatic increase in 1984 can be attributed to the curtailment of fishing activity in both Canadian and Alaskan commercial gillnet fisheries in 1984 (Canadian Stikine fishery was closed for the season).

A total of 2,160 fish were sampled for age, size and sex. Preliminary results showed a sex ratio of 1.0:0.8 (male/female); 72 percent age 5, 25

percent age 4, two percent age 6, and one percent age 3.

Whitehorse Fishway and Hatchery

This was the 26th consecutive year of operation at the Whitehorse fishway since its construction in 1959. The fishway was built to allow adult chinook salmon and other indigenous non-salmon species to pass around the Whitehorse hydro dam on the Yukon River. Annual counts have ranged from a low of 121 in 1976 to 1,555 chinook in 1981 with a 1959 - 83 average of 713. The 1984 count conducted under a Summer Canada Works program, showed 1,042 chinook using the fishway.

Approximately 9,500 people visited the fishway's public viewing chambers this year; down 23 percent from 1983. This trend generally reflects the recent overall decline in the tourist industry in the Yukon.

This year, 41 female and 23 male chinook were removed from the fishway to supply the new Whitehorse Rapids hatchery with approximately 150,000 eggs (25 percent of the hatchery capacity). The hatchery was not stocked to capacity since this was the first year of production and it was uncertain whether trouble-free operation would be guaranteed. This facility was constructed by the Northern Canada Power Commission as mitigation for estimated effects of the dam and new turbine installed in 1983 and 1984 (fry and smolt mortality especially). Fertility and other incubation tests are being performed on a small subsample of eggs incubating at the Pacific Biological Station in Nanaimo.

The fry will be reared until April, coded-wire tagged, and then released into Michie Creek (a natal stream located 100 km upstream of the dam). The fry will then undergo the normal one-year rearing phase before descending (past the dam) to the Bering Sea as smolts.

Stock Separation Studies--Stikine Sockeye

A number of stock separation techniques, such as analysis of scale pattern variables, egg diameters, electrophoresis and parasitism have been employed over the last two-three years to determine the contribution of Tahltan stocks to the Stikine sockeye production.

This year, two DFO employees assisted in the operation of a sonar salmon counting program on the lower Stikine in Alaska. The program was part of the joint Canada/U.S. research program conducted on transboundary rivers. Utilizing two Bendix side-scanners, 134,186 fish were counted during June, July and August. Test-netting showed that of this number, an estimated 83,121 sockeye passed the sonar site. A program of using scales, egg diameters and brains was conducted in conjunction with the sonar project to obtain sockeye stock separation data.

Tissue samples for electrophoretic analysis were taken from spawning stocks in a joint project of the Northwest Salmon Enhancement Society and DFO-Habitat division.

Preliminary results of the egg diameter and parasite separation techniques suggested approximately 40 percent of the sockeye were bound for Tahltan Lake. Scale analysis indicated about 45 percent contribution of Tahltan sockeye. Results of the electrophoretic sampling have yet to be determined. The closeness of these estimates indicates that in future, total escapement could be estimated using the Tahltan weir count and the lower river stock separation results. For example, the 1984 Tahltan count of 32,777 indicates a total Canadian run estimate of 72,800 - 81,900, comparatively close to the sonar count of 83,121. Use of the sonar count appears to be a valuable method for monitoring run sizes in-season.

Yukon Non-Salmon Resource Monitoring

This year, four angling derbies in Yukon territory lakes were monitored. Catches from six lakes were sampled for age, size, sex, stomach contents, state of maturity and fecundity. Lake trout amounted to 75 percent of the catch. The largest lake trout from Tagish Lake was recorded at 15.6 kg (34.4 lb.), although the average was considerably smaller, at 1.7 kilograms (3.7 lb.). Fifty-six percent of the lake trout were mature and the average fecundity was 2,670 eggs. Approximately 50 percent were female.

The commercial lake fisheries on Teslin and Atlin lakes were sampled throughout late winter and summer. Information regarding species composition and size, sex and age of lake trout and humpback whitefish is currently being analysed.

Yukon River Commercial Salmon Sampling Program

A commercial fishery has been targetting on Yukon River chinook and chum salmon in the Dawson City area since the turn of the century. Recently catches have been increasing as a result of the operation of a processing plant in Dawson City. The 1980 - 84 average commercial catches were 9,900 chinook and 16,300 chum. In 1984, 9,885 chinook and 22,932 chum were taken in the Canadian commercial fishery.

An ongoing sampling program, operating in the Dawson commercial fishery since the mid-1970s was continued in 1984 as part of a Summer Canada Student Program. Analysis of the age, size and sex data is underway.

Contact: Robin Harrison,
Senior Management Biologist,
New Westminster.

Habitat Management

Land Use

The Land Use section is responsible for the protection of fish and fish habitat against any land-based development such as linear facilities, logging, urban expansion, gravel removal and flood control and placer mining that may threaten the resource.

In 1984, projects such as CNR twin tracking and the Annacis Highway again dominated due to the magnitude of the proposals, the potential harm to the resource that could result, and the political implications of actions taken by DFO. Added to these projects was the announcement that the Hope to Merritt (Coquihalla) highway would be completed by 1986, a feat that would require approximately ten years of work to be completed in two seasons. This highly accelerated program presented unprecedented problems for the Land Use section and innovative measures were taken to address them.

A summary of these and other programs is outlined below.

a) Coquihalla Highway

This project involves extension of the existing Highway 401 from Vancouver through to Kamloops. It requires construction of a new four-lane highway from Hope to Kamloops via Merritt. It will be 115 km long and parallels both the Coquihalla and Coldwater Rivers for much of this distance. The Coquihalla is a world-renowned steelhead river and supports good runs of pink and coho salmon which utilize areas below the actual sites of highway encroachment. The Coldwater River supports important runs of chinook and coho salmon as well as a population of steelhead trout which will be directly affected by the project.

Highway construction will result in

numerous crossings, diversions and encroachments of these major rivers and their tributaries and requires an intensive program of design review and approval, construction supervision and post-construction monitoring on a scale never before experienced by DFO. The project was divided into 16 segments to facilitate design and construction (9 design contracts were awarded to private firms), all of which were undertaken simultaneously, creating a complex problem of coordination. Added to this was the sudden decision to construct the highway on such a massive and accelerated scale which did not permit DFO to plan or assign resources to the project. In order to overcome this, area staff have negotiated with the Ministry of Transportation and Highways (MOTH) who will provide necessary funds for specialized consultants to work directly for DFO coordinating environmental design and approvals. The major task of addressing environmental design began in July, two months after work had commenced.

Engineering and environmental design on all segments was almost completed by December 1984 and construction had progressed on most to the point that much of the required instream work was finished under acceptable conditions. Unprecedented measures were implemented to ensure no damage to fish or fish habitat occurred during construction. Biophysical studies were undertaken to determine the best means of mitigating or compensating for habitat losses to ensure a "no net loss" of productive capacity. In spite of the magnitude and accelerated scale of the project, work in 1984 was completed with no significant impact upon salmon resources and 1985 should see the finalization of all instream works. Monitoring studies will continue for a period of three years following construction to evaluate the effectiveness of mitigative and compensative facilities and determine appropriate corrective measures, if necessary, to ensure that the no net loss objective has been met.

b) CNR Twin Tracking

The project involves construction of a second track from the Alberta border to Vancouver alongside the existing track. Major salmon rivers such as the Fraser, Thompson, North Thompson and Albreda are parallelled by the track, and spawning, rearing and migration can be affected by river encroachments and stream crossings. To address these issues, Habitat staff are represented on the Technical Work Group consisting of technical experts from CNR, their environmental consultants, MOE and DOE who meet to develop study programs and environmental design for the project.

In 1984, environmental design reports were completed for sections of track around Blue River (Mile 123.4, Albreda Sub. to Mile 8.5, Clearwater Sub.) adjacent to the North Thompson River and Basque (Mile 59.8 to Mile 67.8, Ashcroft Sub.) adjacent to the Thompson River and most of the work completed on the former. Additional rearing habitat for coho salmon was constructed to compensate for similar habitat lost due to encroachment of fills for the second track. Other tasks included inspecting many miles of CNR track to evaluate potential conflicts and identifying necessary study sites in preparation for future environmental design. Area staff attended two Environmental Assessment Review Panel (EARP) hearings on twin tracking and a workshop commissioned by EARP to discuss linear development conflicts in the Fraser/Thompson corridor.

c) Annacis Highway Project

Area staff continued to review and monitor the construction of a new highway from Boundary Bay to Richmond including two major bridges across Annieville and Annacis Channels on the Fraser River. Construction was completed on the "sand islands" which protect each bridge pier on the Annieville Channel Bridge and produce a significant constriction to the channel. Hydraulic measurements and radiotelemetry studies were undertaken to

assess the impact on fish migration and compare results with those provided through earlier model studies. Marsh habitat will be created in an area of Patrick Island which was purchased by MOTH for that purpose. This new habitat will compensate for losses which were incurred when some foreshore areas were filled.

d) B.C. Placer Mining

There was an increase in placer mining activities over 1983. Of 645 notice of works on placer leases received in the Cariboo-Omenica mining district, 245 were bonded, 99 were small operations and the remainder were hand operations. Placer mining operational committees have been established in the Cariboo-Omenica operating from Quesnel, the Vancouver Island Lower Mainland committee operating from Burnaby and the Northwestern B.C. and Queen Charlotte Committee operating from Smithers. This should make the administration of the placer mining referral system more efficient and more productive from a fisheries management point of view.

e) Urban Development

The urban development section is responsible for minimizing the impact of extensive land development on adjacent streams. In 1984, there was a slight decrease in urban development; however, it continued to be a major habitat involvement. Most work comes through a referral system and although some guidelines and some stream coding have taken place, problems are still reviewed on site-specific basis. By providing input into the early stage of planning, the Department has the opportunity to achieve habitat protection through local government. By negotiating streamside green strip preservation, water quality and quantity requirements into the development plans, resource conflicts can be prevented.

Water Use

The Water Use section is responsible for the technical assessment of activities relating to water diversion for hydro, municipal, and industrial use, foreshore development in riverine, estuarine and marine environment and dredging for both maintenance and development purposes.

During the 1984/85 fiscal year, the Unit conducted minimum flow studies to determine the impact of the Coquitlam diversion proposed by the Greater Vancouver Water District. The proposal involves diverting Or Creek and Hixon Creek into the Coquitlam reservoir. Further data collecting and interpretation will be required to complete the assessment.

A minimum flow study was also conducted on the Alouette River to determine flow formulas for spawning, incubation and rearing. A technical report was produced and negotiations with B.C. Hydro will be conducted to establish a flow regime for the river.

Several development proposals involving alteration of river and intertidal foreshore areas were reviewed and assessed by the Unit. Where mitigation to reduce the environmental impact was not considered feasible, compensation involving habitat creation was sought.

A foreshore inventory program was conducted to update the Fraser River inventory maps. The inventory consisted of mapping marsh, mudflat and intertidal areas, as well as identifying potential restoration areas. In conjunction with the inventory, marsh transplanting was conducted on several of the identified restoration sites and the success of the transplants will be monitored this year. As well, wood debris and logs were removed by clean-up crews in Tilbury and Wood Island Sloughs as partial restoration for the areas. Further restoration projects are planned for both sloughs.

Dredging continues to be a high profile activity on the lower Fraser River. In 1984, the largest dredging

operation involving 2,000,000 cubic metres of sand was undertaken for the approach to the Annacis crossing. As well, in 1984 a larger hopper dredge was added to the fleet of dredges operating on the lower Fraser and is currently conducting maintenance dredging in the river channel. The Department has completed the dredge monitoring database and is preparing a final draft of the dredge guidelines which is expected to be published in 1985.

Water Quality

The Water Quality section is responsible for ensuring that water conditions are acceptable in fish-bearing watercourses, and for prohibiting the deposit of harmful substances into these watercourses. The section identifies and studies water pollution problems and participates in impact assessments of proposed and existing effluent and solid waste disposal schemes, pesticide spraying programs, and commercial uses of contaminants, such as tetra- and pentachlorophenol compounds.

Referral reviews and short-term monitoring studies are carried out to assess the impact on the aquatic environment and to recommend solutions to problems. The section also participates in two major referral systems--the Waste Management Branch and the Pesticide Control Branch--and responds to fish kills, chemical and oil spills, and answers public inquiries concerning water quality and the fisheries resource.

Dredging proposals, such as those concerning the B.C. Place and Expo 86 development projects in False Creek, require the review of monitoring data and discussions with the developers about the environmental impact associated with dredging and disposal of sediments contaminated with heavy metals and organic compounds.

Contact: Otto Langer,
Head, Habitat Management Unit,
New Westminster.

South Coast

The South Coast Division is responsible for the British Columbia coastline from Cape Caution to Howe Sound on the mainland, all of Vancouver Island and those waters down to the international boundary. Divisional headquarters are located in Nanaimo.

The available harvest for salmon was at one of its lowest points in recent years. The large projected run of sockeye salmon to Barkley Sound did not meet expectations and the normal fall chum fishery did not occur due to severely depressed levels of wild chum salmon. This is the second year in a row that this fishery has been curtailed following the recommendations of the Johnstone Strait Fraser River Chum Salmon Advisory Committee.

The 1984 roe herring fishery was successful except for the overrun of the seine quota on the West Coast of Vancouver Island and a non-achievement of the gillnet quota in the Strait of Georgia. Herring stocks in all areas of the South Coast continue to be on the decline due largely to environmental conditions.

Shellfish and groundfish (hook and line) fisheries continue to attract more fishermen, particularly those who have depended on salmon for the major portion of their livelihood. This has spurred intense interest in these fisheries including sea urchins, sea cucumbers, geoducks, clams and prawns.

During 1984, the Pacific Region

Salmon Stock Rebuilding Plan was launched. Its objective is to rebuild natural stocks using management, habitat and SEP strategies. The plan will be reviewed in 1985 and future plans will be developed in consultation through advisory processes with each of the user groups.

In late 1984, a draft agreement on the Canada/U.S. Pacific Salmon Treaty was reached. The Treaty allows new management and enhancement initiatives to be developed and implemented that will help rebuild wild stocks, particularly the chinook salmon. The Treaty has major implications for all salmon fisheries in the South Coast Division area, as a mixture of Canadian and United States stocks are fished here.

An important year in the history of resource management, 1984 marks the beginning development of comprehensive and complex plans to rebuild all salmon stocks on the Pacific Coast.

Contact: Dennis Brock,
Area Manager,
South Coast Division,
Nanaimo.

Nanaimo District

The Nanaimo District is responsible for that portion of the Strait of Georgia from Shelter Point on the east coast of Vancouver Island, just south of Campbell River to Satellite Channel, at the southern end of Saltspring Island and from Toba Inlet to the entrance of Howe Sound on the mainland. There are six subdistrict offices, located in Duncan, Nanaimo, Qualicum, Comox, Powell River and Pender Harbour. The District covers approximately 17,018 square kilometres. The major fisheries are for salmon, shellfish and roe herring.

Commercial Salmon Fishery

The commercial salmon fishery in 1984 comprised the inside troll fleet and two major net fisheries.

The troll season was shortened to two months, commencing July 1 and ending August 31.

The Sabine Channel net fishery, directed on passing Fraser sockeye, ran from July 22 to the end of August.

The fall net fishery for Qualicum chum was restricted in area to protect

Table 15

NANAIMO DISTRICT

1984 Commercial Salmon Catch and Escapements

Species	Gillnet	Seine	Troll	Total	Escapement
Statistical Area 14 (Parksville/Qualicum)					
Sockeye	59	16	858	933	200
Coho	10,200	6,150	46,077	55,342	104,000
Pink	403	0	1,599	2,002	85
Chum	88,185	134,500	23	222,685	218,246
Chinook	430	320	28,186	29,340	9,745
Steelhead	0	0	0	12	0
Total	99,277	140,986	76,743	310,314	332,276

Table 15, Cont'd

NANAIMO DISTRICT

1984 Commercial Salmon Catch and Escapements

Species	Gillnet	Seine	Troll	Total	Escapement
Statistical Area 15[1] (Powell River)					
Sockeye			23	23	0
Coho			3,740	3,740	3,715
Pink			0	0	0
Chum			0	0	87,115
Chinook			4,271	4,271	600
Steelhead			0	0	0
Total			8,034	8,034	91,430
Statistical Area 16 (Pender Harbour)					
Sockeye	12,168	51,381	1,290	64,839	1,115
Coho	365	3,702	751	4,818	6,339
Pink	289	454	4	747	0
Chum	12	51	2	65	76,206
Chinook	566	3,935	1,552	6,053	30
Steelhead	0	0	0	0	0
Total	13,400	59,523	3,599	76,522	83,690
Statistical Area 17[1] (Nanaimo)					
Sockeye			9,545	9,545	0
Coho			5,269	5,269	4,387
Pink			54	54	0
Chum			1	1	124,946
Chinook			12,379	12,379	3,275
Steelhead			0	0	0
Total			27,248	27,248	132,608
Statistical Area 18[1] (Cowichan)					
Sockeye			0	0	0
Coho			700	700	7,000
Pink			0	0	0
Chum			0	0	75,000
Chinook			1,839	1,839	4,500
Steelhead			Unknown	Unknown	
Total			2,539	2,539	86,500

[1] No gillnet or seine fisheries.

Fraser and Puget Sound stocks passing through Georgia Strait.

Fishery plans for chum in Johnstone Strait and the Strait of Georgia were reviewed by the Johnstone Strait Chum Salmon Advisory Board, which reflected industry concerns, yet helped to ensure

that the desired escapements were reached in the Fraser River and Vancouver Island rivers.

The District sold 3,421 licences; 3,356 one-year personal commercial fishing licences in 1984 and 65 five-year licences.

Sport Fishery

A target catch ceiling of 225,000 chinook (sport and commercial troll) was announced by DFO early in 1984. However, this target was greatly exceeded and the final catch was close to 500,000 chinook. The recreational catch of salmon (all species) in the Nanaimo District was the largest ever at 369,000.

The inside commercial troll season was shortened to two months to July 1 to August 31 from the recent historic April 15 to September 30 season. This meant that more chinook were available to the sport fishery prior to July 1, but there was considerable controversy between the sport and troll user groups over whether or not the catch foregone by trollers was reallocated to the sport fishery or went to the spawning grounds.

Table 16

NANAIMO DISTRICT

1984 Sport Fish Catch*

* See Table 37--Georgia Strait Creel Survey--in South Coast Management Biology.

Indian Food Fishery

Most of the food fish requirements for local Indian Bands were met by the excess fish taken from the Big Qualicum River facility.

The Nanaimo Band retained a seine vessel to fish for their needs. Traditional in-river fisheries took place on the Nanaimo, Chemainus, Cowichan and Sliammon Rivers.

For the second year, the Qualicum Band was able to sell surplus production under agreement with Crown Assets Disposal Corporation.

Total fish sold were coho, 27,660 (5,433 jacks); chinook, 79 (55 jacks); and 966 chum.

Table 17

NANAIMO DISTRICT

1984 Indian Food Fish Catch

Species	Catch
Sockeye	107
Coho	6,775
Pink	0
Chum	18,634[1]
Chinook	730

1 1,420 chum were taken by seine gear in tidal waters for food fish under permit.

Herring Fishery

The 1984 food and bait fishery had only 10 seines operating with all the catch coming out of Trincomali Channel in the Nanaimo area. The total catch was 454 tonnes.

The Comox roe herring fishery opened for one and a half days on March 9 in Tribune Bay at the south end of Hornby Island. The hailed catch from six hundred fifty gillnets was 5,443 tonnes; 2,087 tonnes short of the quota. A second fishery opened in Upper Lambert Channel, March 11 for five hours. The hailed catch was 2,109 tonnes for a total gillnet catch of 7,552 tonnes.

From February 23, the stocks off Westview/Powell River were assessed daily to monitor stock size and maturity. Stocks were often mixed, and it was difficult to separate mature from the immature.

The Powell River seine fishery

The hailed catch of the roe herring gillnet fishery in Lambert Channel was just over 2,100 tonnes.

opened in early March for one and three quarter hours in the area above the Powell River Pulp Mill to Sliammon Reserve. The hailed catch from 59 vessels was 590 tonnes. Two days later, the fishery opened in the same area for four and one half hours. The hailed catch was 3,436 tonnes for a total seine catch of 4,026 tonnes of roe herring.

Table 18

NANAIMO DISTRICT

1984 Herring Spawn Deposition

(standard square metres x 1,000)

Area	1984	1983	1982
14	616.07	3,325.83	6,229.67
15	738.29	537.46	1,235.43
16	--	--	10.80
17	959.18	1,819.72	2,174.35
18	--	7.50	37.35
Total	2,313.54	5,690.51	9,687.60

Table 19

NANAIMO DISTRICT

1984 Commercial Herring Catch (tonnes)

	Seine	Gillnet	Total
Statistical Area 17			
Food & Bait	454	0	454
Roe	0	0	0
Statistical Area 14			
Food & Bait	0	0	0
Roe	0	7,552	7,552
Statistical Area 15			
Food & Bait	0	0	0
Roe	4,026	0	4,026

Salmon Escapements

Chinook and coho escapements continue to be well below required levels with only minimal improvements noted in wild stocks of chinook to the Nanaimo, Chemainus and Cowichan rivers. The Puntledge River chinook return is very low despite enhancement efforts.

Chum escapements to most streams were at or near optimal levels.

Both the Big Qualicum and Little Qualicum rivers and facilities reached their escapement targets with Puntledge River chum being below expectation.

Other Fisheries

Shellfish continues to be an important commercial fishery and the recreational harvest of clams is increasing greatly. Field staff must identify closed areas and conduct sampling programs throughout the year to establish areas free of contamination or paralytic shellfish poisoning (PSP).

Prawn and crab trap fisheries continue throughout the District and provide year-round income for a fleet of smaller vessels.

Diver related fisheries for geoducks and sea urchins continue on a commercial quota with special licences. Sport diving continues for abalone and rock scallops. A substantial decrease in spearfish has been noted in the last few seasons.

Enforcement

The number of charges laid were similar to the number laid in 1983, with a higher level of compliance in both the commercial and recreational fisheries. Of the 163 charges, the majority were in the sport fishery (95) and in the commercial fishery (65). Regulatory changes have improved the level of success in the courts and the general appreciation of the legal requirements has also increased.

Each prosecution results in at least one formal court appearance while many go to trial. The 163 court cases among approximately 20 fishery officers represents a substantial time commitment in preparation and court appearances.

The major habitat case, which is still before the courts, involves charges against a pulp mill.

In 1985 there will be a "ticket system" in place which will reduce court time and costs for some recreational violations of a minor nature.

Habitat

The District processed over 560 formal referrals from other federal and provincial agencies. Many involved onsite inspections with the proponents and often in conjunction with officials from other resource agencies.

The South Coast Habitat Division is consulted on an ongoing basis and continues to provide timely technical support when requested.

The emphasis continues on proactive enforcement intended to protect the aquatic environment rather than reactive, after the damage has been done.

The volume of referrals is similar to previous years.

Table 20

NANAIMO DISTRICT

1984 Habitat Protection Referrals

Type	Number
Water Licences	86
Forestry	170
Navigable Waters Protection Act	43
Land Use Applications	154
Urban Development	48
Ocean Dumping & Dredging	1
Pollution Control Board:	
Pesticides	44
Waste Management	16
Highway Development	1
Placer Mining	0
Other	0
Total	563

Contact: Kip Slater,
District Supervisor,
Nanaimo.

Port Alberni District

The Port Alberni District office supervises fishing and related activities for the west coast of Vancouver Island. Subdistrict offices are located in Tofino, Tahsis and Port Hardy.

Commercial Salmon Fishery

During June and July a commercial net fishery for sockeye salmon took place in Barkley Sound - Alberni Inlet, Area 23. A gillnet fleet of 551 vessels and a seine fleet of 338 was the highest on record. A total of 918,500 pieces were caught.

For the sixth year, a gillnet chinook fishery took place in Area 23. A record number of 425 gillnets participated in a three-week operation, with a total catch of 43,500 pieces. The number of boats operating in only seven miles of inlet is too great.

Net fisheries for chum salmon took place in Nootka Sound in September and October for two openings, one opening in early October in Kyuquot Sound and

Table 21

PORT ALBERNI DISTRICT

1984 Commercial Salmon Catch and Escapements

Species	Gillnet	Seine	Troll	Total	Escapement
Statistical Area 21 (Swiftsure)					
Sockeye	0	0	4,436	4,436	
Coho	8	291	247,850	248,149	
Pink	0	0	2,376	2,376	
Chum	10,030	156,617	292	166,939	
Chinook	0	135	20,486	20,621	
Steelhead	0	0	0	0	
Total	10,038	157,043	275,440	442,521	
Statistical Area 22[1] (Nitinat Lake)					
Sockeye					11,506
Coho					Unknown
Pink					0
Chum					76,000
Chinook					2,200
Steelhead					NA
Total					89,706
Statistical Area 23 (Barkley Sound)					
Sockeye	455,946	462,589	19,317	937,852	285,336
Coho	6,565	883	1,055,784	1,063,232	Unknown
Pink	164	2,298	18,240	20,702	0
Chum	542	249	752	1,543	41,807
Chinook	44,870	1,544	236,598	283,012	(Wild) 6,625
Steelhead	NA	NA	NA	NA	NA
Total	508,087	467,563	1,330,691	2,306,341	333,768

Table 21, Cont'd

PORT ALBERNI DISTRICT

1984 Commercial Salmon Catch and Escapements

Species	Gillnet	Seine	Troll	Total	Escapement
Statistical Area 24[2] (Clayoquot Sound)					
Sockeye			5,653	5,653	7,150
Coho			322,857	322,857	2,150
Pink			7,758	7,758	0
Chum			313	313	54,000
Chinook			68,662	68,662	400
Steelhead			NA	NA	NA
Total			398,243	398,243	63,700
Statistical Area 25 (Nootka Sound)					
Sockeye	21	208	2,902	3,131	2,689
Coho	715	1,746	127,392	129,853	1,968
Pink	530	173	3,219	3,922	755
Chum	35,754	68,958	431	105,143	116,037
Chinook	249	1,983	18,891	21,123	3,308
Steelhead	NA	NA	NA	NA	NA
Total	37,269	73,068	152,835	263,172	124,757
Statistical Area 26 (Kyuquot Sound)					
Sockeye	0	0	2,063	2,063	2,000
Coho	51	130	105,951	106,132	3,400
Pink	0	0	8,469	8,469	200
Chum	5,853	30,237	921	37,011	71,300
Chinook	3	145	29,443	29,591	3,075
Steelhead	NA	NA	NA	NA	NA
Total	5,907	30,512	146,847	183,266	79,975
Statistical Area 27[2] (Quatsino Sound)					
Sockeye			7,924	7,924	50
Coho			269,434	269,434	3,370
Pink			24,016	24,016	4,125
Chum			10,189	10,189	13,850
Chinook			82,561	82,561	620
Steelhead			NA	NA	NA
Total			394,124	394,124	22,015

[1] No commercial operations in 1984.
[2] No gillnet or seine operations.

one opening in late October seaward of Nitinat Lake. This was the first time in recent years a net fishery has been allowed seaward of the "surf line."

Sport Fishery

The sport fishery in Area 23 continued to increase in both effort as well as catch. Prior to and during July, the majority of effort took place in Barkley Sound, moving into Alberni Inlet during August and September. Chinook salmon make up 90 percent of the catch.

Local marinas have increased in size, but are still overloaded and launching is a problem.

The people of Port Alberni refer to this area as the "Salmon Capital of the World."

Sport fishing effort increased in Clayoquot, Nootka, Kyuquot and Qautsino Sounds. As in Barkley Sound, most of the effort is focused on chinook.

Table 22

PORT ALBERNI DISTRICT

1984 Sport Fish Catch*

Species	Tidal
Sockeye	3,060
Coho	12,000
Pink	50
Chum	2,200
Chinook	27,000
Steelhead	NA[1]

* Estimates only.
[1] Not available.

Indian Food Fishery

The majority of the 1984 catch and effort was in Area 23, Somass River system. Gillnet and a drag seine fished sockeye returning to Sproat and Great Central Lakes. In September, permits were issued for a gillnet operation on Robertson Creek hatchery chinook. Minor food fisheries took place in all subdistricts for chum and coho.

During the sockeye migration, after existing permits had expired, the two local bands used a drag seine based on a "Band By-law" concept. Charges were laid and the matter is still before the local court.

Table 23

PORT ALBERNI DISTRICT

1984 Indian Food Fish Catch

Species	Catch
Sockeye	24,000
Coho	2,150
Pink	0
Chum	6,000
Chinook	21,000
Steelhead	NA

Salmon Escapements

Chum salmon escapements were below optimum levels. Sockeye escapement below optimum in Area 23; chinook populations, with the exception of the Somass River, decreased.

Herring Fishery

The west coast roe herring fishery opened in Area 27, Winter Harbour, from March 3 to 6. The nine to 14 gillnets operating caught 214 tonnes. Area 25, Esperanza, opened from March 5 to 6. A fleet of 98 gillnets operated and caught 771 tonnes.

Table 24

PORT ALBERNI DISTRICT

1984 Herring Spawn Deposition

(standard square metres x 1,000)

Area	1983	1982	1981
23	286.19	928.11	291.93
24	1,107.74	181.36	168.66
25	160.78	561.15	720.49
27	293.08	1,378.69	722.32
Total	1,847.79	3,049.31	1,903.40

Seines were opened in Area 23 from March 5 for one hour and forty-five minutes. Fifty-nine seines operated for a catch of 6,196 tonnes, satisfying the gillnet and seine quota.

Roe yield was excellent in all fisheries. Overall spawning was less than adequate in all subdistricts. A closure will be recommended for 1985.

Table 25

PORT ALBERNI DISTRICT

1984 Commercial Herring Catch (tonnes)

	Seine	Gillnet	Total
Statistical Area 23			
Food & Bait	0	0	0
Roe	6,196	0	6,196
Statistical Area 25			
Food & Bait	0	0	0
Roe	0	771	771
Statistical Area 27			
Food & Bait	0	0	0
Roe	0	214	214

Other Fisheries

Geoduck diver operations, shellfish fisheries and lingcod fisheries were among the other fisheries operating in 1984. All shellfish were monitored and PSP was no problem.

Enforcement

From June through to October, enforcement was a priority in all areas where there were conservation problems. Emphasis on enforcing regulations for all user groups ensured a system of fairness.

The majority of enforcement was carried out during the major commercial net fisheries, the tidal sport fishery, native food fisheries and on overall poaching problems.

In 1984, 251 charges were laid throughout the District compared to the 1983 level of 123 charges.

Enforcement objectives were achieved by using a schedule which involved all District staff in their own and other subdistricts. Performance by District staff was impressive, as measured by the positive feedback from user groups.

Table 26

PORT ALBERNI DISTRICT

1984 Habitat Protection Referrals

Type	Number
Water Licences	32
Forestry	329
Navigable Waters Protection Act	13
Land Use Applications	59
Urban Development	7
Ocean Dumping & Dredging	6
Pollution Control Board:	
Pesticides	59
Waste Management	9
Highway Development	10
Placer Mining	4
Other	159
Total	687

Salmonid Enhancement

The Robertson Creek hatchery enhances chinook, coho and steelhead. Its production allows a commercial gillnet fishery to catch 43,000 pieces with an average weight of 10.5 kg in only three weeks. Facilities at Nitinat and Tlupana Inlet continue to enhance chum salmon.

Contact: Don McCulloch,
District Supervisor,
Port Alberni.

Campbell River District

This District, composed mainly of sheltered waters, is extremely mountainous, with extensive ice fields at headwaters of some of the mainland river systems. Climatic conditions vary considerably, with the coastal areas being relatively mild and wet, while the heads of the mainland inlets experience greater extremes in temperature and heavy snowfall. The District manages the largest multiple-use area in Pacific Region; more than 103,6000 sq km from Campbell River to Cape Scott, with subdistricts at Port Hardy, Alert Bay and Campbell River. The Campbell River District has 127 spawning streams, extensive logging and mining interests, and a large commercial and sport fishery.

Commercial Salmon Fishery

The catch of 1,653,766 salmon by all gear was the lowest since 1969. The total catch in 1984 was one-fifth of the 1983 catch of 9,080,000. The majority were sockeye returning to

Table 27

CAMPBELL RIVER DISTRICT

1984 Commercial Salmon Catch and Escapements

Species	Gillnet	Seine	Troll	Total	Escapement
Statistical Area 11 (Port Hardy)					
Sockeye	27,371	0	2,494	29,865	0
Coho	998	0	128,129	129,127	2,400
Pink	1,727	0	9,840	11,567	0
Chum	488	0	5,026	5,514	31,347
Chinook	93	0	26,388	26,481	0
Steelhead	53	0	0	53	0
Total	30,730	0	171,877	202,607	33,747
Statistical Area 12 (Alert Bay)					
Sockeye	188,432	559,466	3,346	751,244	50,800
Coho	11,914	74,533	30,490	116,937	16,414
Pink	23,398	134,067	1,781	159,246	308,800
Chum	7,716	19,212	387	27,315	95,862
Chinook	2,836	16,046	7,478	26,360	4,910
Steelhead	347	0	5	352	0
Total	234,643	803,324	43,487	1,081,454	476,786
Statistical Area 13 (Campbell River)					
Sockeye	14,908	157,708	2,958	175,574	4,576
Coho	2,361	16,375	12,659	31,395	51,358
Pink	267	2,667	296	3,230	30,203
Chum	534	17,033	3	17,570	149,445
Chinook	445	9,485	33,412	43,342	5,281
Steelhead	8	0	0	8	0
Total	18,523	203,268	49,328	271,119	240,863

spawning grounds in the Fraser system. 1984 was an off year for Fraser pinks.

In order to conserve Fraser chum, there was no fall chum fishery permitted. During sockeye fishery 36,598 chum were taken as incidental catch. Diversion rate (approximately 25 - 30 percent) of the Fraser sockeye run through Johnstone Strait appeared to be back to normal.

As in previous years, restrictions were imposed on the commercial fleet for the conservation of depleted Gulf pink and chinook salmon. Commercial fishing was reduced to seven weeks, allowing 14 days for seine fishery and 18 for gillnets. Management reduced catch of chinook salmon by 45 percent over the previous year.

Sport Fishery

The recreational fishery continues to expand in area and number. Port Hardy is now a major sport fish center and more sport fish camps are moving into mainland inlets around Alert Bay. With a bag limit of four chinook per day above Chatham Point, more sport fishermen will fish the upper portion of the District.

Table 28

CAMPBELL RIVER DISTRICT

1984 Sport Fish Catch*

* See Table 37--Georgia Strait Creel Survey--in South Coast Management Biology.

Indian Food Fishery

The Indian food fish catch decreased to 44,127 in 1984 from 49,891 in 1983.

Table 29

CAMPBELL RIVER DISTRICT

1984 Indian Food Fish Catch

Species	Catch
Sockeye	19,627
Coho	552
Pink	3,463
Chum	20,506
Chinook	359
Steelhead	6

Salmon Escapements

Sockeye escapements to the Nimpkish system were down from 1983. Pink salmon escapements to Areas 12 and 13 were below that of 1983. Even-year pink are still recovering from the massive flood of 1980 when up to 80 percent of pink escapement was washed out. Escapement of local chum salmon remains poor.

Herring Fishery

Herring stocks in the Campbell River District are not adequate enough to support a roe herring fishery. A catch of 775 tonnes was taken as food and bait.

Table 30

CAMPBELL RIVER DISTRICT

1984 Herring Spawn Deposition

(standard square metres x 1,000)

Area	1984	1983	1982
11	0.88	2.99	--
12	206.81	72.10	169.83
13	5.78	617.16	480.91
Total	213.47	692.25	650.74

Table 31

CAMPBELL RIVER DISTRICT

1984 Commercial Herring Catch (tonnes)

	Seine	Gillnet	Total
Statistical Area 11 (Port Hardy)			
Food & Bait	0	0	0
Roe	0	0	0
Statistical Area 12 (Alert Bay)			
Food & Bait	149	0	149
Roe	0	0	0
Statistical Area 13 (Campbell River)			
Food & Bait	626	0	626
Roe	853	0	853

Enforcement

There was a total of 68 prosecutions in 1984: 47 commercial, 18 sport and three habitat.

Habitat

During the year, there were 585 referrals processed by District staff.

Table 32

CAMPBELL RIVER DISTRICT

1984 Habitat Protection Referrals

Type	Number
Water Licences	32
Forestry	325
Navigable Waters Protection Act	14
Land Use Applications	84
Urban Development	40
Ocean Dumping & Dredging	12
Pollution Control Board:	37
Pesticides	14
Waste Management	17
Highway Development	9
Placer Mining	1
Other - Gravel Removal	0
Total	585

There are a number of major developments in the District which could have a major impact on habitat; such as the destruction of a small area of salmon rearing and migration areas. The Campbell River Indian Band marina is a large development which will have a major effect on Campbell River foreshore. The placement of Salmon River dryland log sort has not been resolved.

The Middle Point Barge Terminal conflict has been resolved with the Department of Fisheries and Oceans receiving $100,000 compensation for any loss of fish habitat. The money will be used for salmon rehabilitation in local streams.

Salmonid Enhancement

The small public involvement project on the Nimpkish River system is enhancing sockeye and chum. Nimpkish Lake has been fertilized for four years. The first adult (sockeye) returns from fertilization are expected in 1985.

The construction of a fishway on the Kakweiken River was a complete success with regard to pink salmon. On even years, pinks would not go beyond the falls. Since the construction of the ladder, even-year pinks now utilize an additional 9.7 kilometres of spawning area.

The small hatchery at Scott Cove is operating successfully.

Contact: Norm Lemmen,
District Supervisor,
Campbell River.

Victoria District

The Victoria District is responsible for the management of commercial, recreational and Native fisheries and related habitat in the Strait of Juan de Fuca and Victoria/Saanich (Areas 19 and 20). Offices are located in Sooke and Victoria.

Table 33

VICTORIA DISTRICT

1984 Commercial Salmon Catch and Escapements

Species	Gillnet	Seine	Troll	Total	Escapement
Statistical Area 19[1] (Victoria/Saanich)					
Sockeye					0
Coho					400
Pink					0
Chum					21,000
Chinook					18
Steelhead					0
Total					21,418
Statistical Area 20 (Sooke)					
Sockeye	151,069	421,720	2,563	575,352	200
Coho	11,278	63,581	3,980	78,839	24,544
Pink	36	3,387	0	3,423	200
Chum	112	460	1	573	25,092
Chinook	3,278	17,466	277	21,021	1,850
Steelhead	NA	NA	NA	462	NA
Total	165,773	506,614	6,821	679,670	51,886

[1] No commercial fishery.

Public information and awareness continues to be a major function. In addition to the presentations made to various groups in the area, a major Department of Fisheries and Oceans awareness campaign was undertaken in November. The campaign presented all phases of Department of Fisheries and Oceans to the public and was well received.

Commercial Salmon Fishery

The sockeye return through Juan de Fuca waters provided more fishing than expected. There were 12 days of fishing for a total catch of 680,000 salmon (85 percent sockeye), peaking towards the end of August.

Sport Fishery

Effort in local waters increased slightly, even though 1984 was an off-cycle for pinks. The increase was attributed to unexpected high catches of chinook salmon in Saanich Inlet, Sidney and Oak Bay. Increases ranged from 70 percent to 300 percent over the previous year, with several old-time Saanich Inlet fishermen claiming it to be the best chinook fishing in 20 years. The high catches were largely attributable to a shortened gulf troll season. As in the previous year, coho catches were excellent in March and July.

Shellfishing effort, particularly for crab and shrimp, is increasing.

Table 34

VICTORIA DISTRICT

1984 Sport Fish Catch*

* See Table 37--Georgia Strait Creel Survey--in South Coast Management Biology.

Indian Food Fishery

Goldstream River chum salmon surplus again provided most of the food fish requirements of the local bands. The majority were taken using a seine boat and distributed to various bands in the area.

Table 35

VICTORIA DISTRICT

1984 Indian Food Fish Catch

Species	Catch
Sockeye	NA
Coho	315
Pink	NA
Chum	4,379
Chinook	100
Steelhead	NA

Salmon Escapements

Chum escapements continued to be strong throughout the District. Chinook and coho returns continued to increase in the San Juan system, as the SEP production is now on-line. Sooke River also showed surprising returns of chinook.

Herring Fishery

No commercial herring fishery took place in the District in 1984. Minor spawning deposition occurred in Portage Inlet and the run provided approximately 4,500 angler-days of shore fishing.

Other Fisheries

Approximately 173 tonnes of crab were landed from Sidney to Port Renfrew. Fishermen reported excellent landings and good prices during the summer, with some fishermen recording $1000 days. The red sea urchin quota of 76 tonnes was taken during the first quarter of the year.

The Sooke Basin trap fishery for coonstripe shrimp produced 23 tonnes and the Saanich Inlet prawn fishery produced 2.4 tonnes during the one-month opening.

A trawl fleet of 12 boats fishing for grey cod operated off the Victoria waterfront all year. Landings were down considerably over previous years.

A geoduck fishery (the first one in four years), with 10 to 15 boats participating, harvested the 115-tonne quota within a two-week period. Octopus, abalone, halibut and lingcod were the other species fished.

Enforcement

Enforcement effort focused on the heavy year-round sport fishery and the Area 20 commercial salmon fishery in 1984.

There were 103 charges: 62 sport, 36 commercial, two habitat, and three obstruction of fishery officers. Of the 103 charges, there were 92 convictions, one stay, six withdrawn, two dismissed, and two still outstanding.

Most prosecutions were successful, with fines ranging from $25 to $1,500. One person received a sentence of two months in jail for possessing too many clams.

Table 36

VICTORIA DISTRICT

1984 Habitat Protection Referrals

Type	Number
Water Licences	38
Forestry	21
Navigable Waters Protection Act	21
Land Use Applications	21
Urban Development	14
Ocean Dumping & Dredging	15
Pollution Control Board:	-
Pesticides	25
Waste Management	11
Highway Development	5
Placer Mining	3
Other	0
Total	174

Habitat

In 1984, 174 referrals were processed by staff. This represented a decrease of approximately 25 percent from the previous year. Two prosecutions took place this year; one company was fined $200 and the other company was required to restructure the damaged area to the Department's satisfaction.

Salmonid Enhancement

Public involvement in SEP within the District continued to recruit enthusiastic participants. In addition to the 1.5 million coho eggs and 450,000 chinook eggs incubating (includes the Port Renfrew Community Economic Development Project), extensive stream rehabilitation work, fry feeding and fry salvage programs took place. The volunteer groups were assisted by employees of a job creation program. The crew also built and maintained a counting fence and trap on Craigflower Creek.

Contact: Larry Duke,
District Supervisor,
Victoria.

The 1984 DFO Awareness Campaign included a trout-filled tank for a kids' fishery at the Hillside Mall in Victoria.

South Coast Inspection District

The South Coast Inspection District, which includes Vancouver Island, the Gulf Islands and all islands accessible from Vancouver Island, is responsible for ensuring that fish and fish products for domestic and export trade meet Canadian and/or foreign country standards for grade, handling, identity, processing, quality and safety. As well, Inspection is responsible for ensuring that federally-registered plants meet national construction, operating and processing standards and that all fishing vessels meet national standards for construction and operations.

The South Coast Inspection team is a staff of ten people--eight in Victoria and two at the Qualicum suboffice. This team controls the activities of 62 federally-registered processing operations--31 fresh/frozen, 26 shellfish and five canneries.

The Victoria Inspection laboratory performs bacteriological and biochemical analyses on fish and fish products. Commercially harvested shellfish are tested for sewage pollution as well as the presence of paralytic shellfish poison (PSP). Other imported and domestic fish products such as raw fillets and crustaceans, cooked shrimp, smoked fish and herring roe products are analysed for organisms which either indicate poor processing techniques or are harmful to humans. Processing plant water, which must meet Inspection regulation standards, is also routinely checked.

In 1984 the South Coast Inspection District undertook:

- 172 plant surveys
- 335 plant inspections
- 932 vessel inspections, with 38 failing to meet requirements, 72 advised about deficiencies that needed

to be corrected and 822 passed

- 67 unloading, handling and holding facilities inspected, of which three failed

- 24 fish camps inspected, with nine not recommended to be issued a 1985 provincial licence until deficiencies observed are corrected

- 613 inspections for product certification which resulted in the issuing of 332 export certificates--244 by Vancouver office and 88 by the Victoria office (of these 88, 51 were issued to fishermen who directly export the product)

- 733 product inspections, of which 318 were shellfish, to ensure wholesomeness

- 12 consumer complaints received, most of which were concerned with imported product. Domestic complaints were concerned primarily with parasites, one case only pertaining to poor quality

- 1,870 routine laboratory analyses performed--378 to extract PSP and 1,492 for bacteriological quality.

Other events for 1984 included:

- a special project conducted on a minimum scale to investigate the relationship between grade and incidence of bruises and blood spots on seine and gillnet chum salmon

- further development of a plant and unloading, handling, holding and transportation rating system

- a focus on in-plant quality control.

Contact: Wayne Holmes,
Inspection Supervisor,
South Coast Division.

A load of bacteria-contaminated shellstock is returned to the water on a controlled private lease for long term storage and purification. Later, it will be reharvested.

This inspection officer finds a truck load of frozen fish that has thawed without the carrier's knowledge. Identification of such problems is essential to ensure product quality.

Management Biology

The Management Biology Unit undertakes investigative programs and various other activities to provide the biological basis for, and to assist in, the management of fisheries.

Salmon Programs

a) Test Fishing - Area 12 and 13

The chum seine test fishing program in the upper portion of Johnstone Strait was carried out during September and October using similar methods and fishing patterns as used since 1965. Tissue samples were taken from 150 chum salmon per week for later electrophoretic analysis to determine a multistock timing curve. In addition, during the early part of October, in-season analysis of samples determined fishery timing and effort on passing Qualicum chum stocks. Test fishing in lower Johnstone Strait was conducted in a similar fashion to that in past years. Tissue samples were taken from chum during this fishery to aid managers in total Johnstone Strait assessment of the in-season stock strength, timing and composition.

b) Test Fishing - Area 14

A gillnet test fishing program was conducted in portions of Area 14 used by returning Qualicum chum salmon stocks. Test sets were made weekly during October and November and combined with seine-caught fish, 150 samples of chum tissue were taken for electrophoretic analysis. A 36-hour turnaround of results enabled managers to effectively crop Qualicum stocks while at the same time reduce exploitation of Fraser chum. Three successful gillnet and seine fisheries took place.

c) Stock Identification

A pink salmon stock identification program initiated in 1983 continued in 1984. This program, cofunded and shared by Field Services and the Fisheries Research Branch, uses electrophoretic analysis techniques to identify genetic stock patterns. Samples of pink salmon muscle tissue, eye, heart, liver and meristic data were taken from east coast Vancouver Island, northwest coast Vancouver Island and mainland inlet streams.

A similar program conducted since 1981 on chum salmon was completed. Hearts were taken from 100 chum from major contributing streams in an attempt to isolate genetic differences between stocks.

d) Barkley Sound Sockeye Sampling

This program, undertaken jointly by the Management Biology Unit and the Parasitology and Fish Health Section at the Pacific Biological Station in Nanaimo, examined samples for stock-specific parasites. Using the resulting information, managers can respond to unexpected deviations in stock abundance during the fishing season.

Catches and escapements were less than expected, but still considerable. Escapement targets in the Sproat and Stamp Rivers were not reached (285,336 fish escaped to the two systems) and the catch was 818,572 fish. Total return to the system was 1.1 million fish.

e) West Coast Chum Fishery

This test fishery determines quality as well as harvestable surpluses of west coast Vancouver Island chum.

The vessel Pachena No. 1 was chartered to carry out this test fishery. Fishable surpluses were found returning to the two hatcheries (Conuma and Nitinat) and harvestable numbers of wild fish were found in Kyuquot Sound. The catch from these areas was 363,335 fish.

f) Swiftsure Monitoring Program

Conducted again in 1984, the program chartered one vessel to monitor abundance of chinook shakers (fish below the legal size limit) during the early season troll fishery. The program started April 15 and ran to June 30.

The vessel "Cowichan" fished on Swiftsure Bank and South Bank, keeping records of shaker and keeper chinook. These data were telephoned daily to Nanaimo for analysis.

The monitoring vessel patrolled areas where shakers were being taken in large numbers and requested the fishermen move from that particular area. Compliance with the test vessel was excellent, and no closure was required in spite of several incidents of large shaker catches.

g) Georgia Strait Creel Survey

During 1984, sport fishermen were surveyed again for catch and effort information. Anglers' success was high during most of the year. Creel survey sampling included 55 overflights and 32,000 interviews. From the data collected, it was estimated that 651,100 boat trips caught 828,300 salmon.

The accompanying table shows the annual effort and catch of coho and chinook salmon by statistical area.

Table 37

GEORGIA STRAIT CREEL SURVEY

Estimates of Sport Fishing Activity by Statistical Area, 1984

Statistical Area	Fishing Effort[1]	Coho Kept	Chinook Kept
13	142,800	152,200	93,200
14	105,300	106,400	55,000
15	10,600	7,700	6,100
16	81,300	51,900	50,000
17	86,500	57,500	52,800
18	42,400	4,500	24,600
19A	37,500	3,300	24,300
19B+	67,000	41,700	24,300
28	40,000	7,200	16,400
29	37,700	11,200	22,200
Total	651,100	443,600	368,900
Confidence Bound[2]	±3%	±6%	±4%

[1] Effort measured in boat trips.
[2] Ninety-five percent confidence bound of total.

h) Escapement Estimation Upgrading Program

The study of the methods used to estimate salmon populations in streams was continued in 1984. Traditional methods to estimate the number of salmon (stream walking, rafting, snorkeling and overflights) was combined with two one-week long training sessions at the Big Qualicum River facility for fishery officers from the region. The trainees walked, rafted and snorkeled the river, recording the numbers of each species seen and estimating the totals present.

These numbers were compared to the actual count determined by the fence count. The number of chum in the spawning channel were estimated by walking, strip counting and by fixed wing and helicopter overflights.

As well as providing valuable information on the accuracy and precision of current estimation techniques, the program allowed the participants to compare their estimation techniques against a known number of fish. If training is combined with standardized survey techniques and data recording methods, the usefulness of our salmon escapement data can be increased.

i) Chinook Key Streams

To increase knowledge of certain key chinook stocks, escapement to the Campbell-Quinsam River system was investigated. Previous studies have shown considerable numbers of hatchery-origin fish spawning in the Campbell River and in the Quinsam below the hatchery. A study was designed to determine the population size, the coded-wire tag rate and distribution, the sex ratio and the age structure of these chinook.

The chinook population spawning in the Campbell and Quinsam Rivers was determined by tagging carcasses from the hatchery and releasing them throughout the spawning areas. Two spaghetti tag types were released in each river and a dead recovery and sampling program was carried out on each river. The recovery rate of tagged carcasses indicated the efficiency of the dead recovery (33 percent on the Campbell and 50 percent on the Quinsam), from which population size could be calculated. Coded-wire tag rates and the age composition determined the contribution of Quinsam hatchery fish to the natural spawning in the Campbell and Quinsam.

Investigation of chinook escapement to the Somass River system was part of an initiative to gain more knowledge of certain key chinook stocks. An estimate of hatchery fish spawning in the Stamp River outside the Robertson Creek hatchery is needed to estimate harvest rates and stock recruitment parameters.

Petersen tagging throughout the run estimated the fish population at the head of Alberni Inlet. Chinook were captured by a seine operated from the "RD 104" and tagged with distinctively-colored spaghetti tags. Recoveries were made at Stamp Falls fishway, on the spawning grounds and at Robertson Creek hatchery.

Counts of all fish passing through Stamp Falls fishway were made. These counts normally took place during daylight hours, but a number of 24-hour counts were made.

A dead recovery effort yielded information on prespawning mortality, spaghetti tag and coded-wiretag mark rates and distribution, sex ratio and age structure.

A severe flood prevented all movement of fish at Stamp Falls from October 7 to 18 and disrupted normal migration timing and spawning distribution throughout the river. The results are presently under analysis.

Shellfish and Other Marine Species Programs

This section provides advice for the management of invertebrate fisheries: abalone, geoduck clams, horse clams, intertidal clam species, mussels, scallops, octopus, squid, sea urchin, sea cucumbers, crab, shrimp, prawns and euphausiids. Also monitored by logbooks and fisheries are anchovy, surf and pile perch, smelt and eulachon.

Landings of almost all shellfish increased in the south coast. This was due, in part, to improved statistics from reviewing catch records, data from Z licences, and company surveys.

A management advisory committee of prawn fishermen is proposed.

The section monitored commercial prawn catches. Catch rates, sex and size composition and fishing effort in various management areas were examined to allow for escapement of an adequate spawning stock. Recommendations were made to close an area if the index of

Prawn catches are monitored by fisheries biologists for the commercial prawn fishery. Catch rates, sex and size composition and fishing effort are examined to ensure adequate spawning stock.

female spawners fell below a monthly minimum acceptable level.

Biological programs included clam surveys in Clayoquot Sound, Barkley Sound and Savary Island. Several proposals for mariculture were reviewed. A fisheries mariculture policy is being developed.

This Section was also involved in consultations with the Pacific Shellfish Standing Committee, and industry fishing groups such as the Abalone Harvesters Association and the Underwater Harvesters Association for geoduck, horse clam, sea urchin and sea cucumber licence holders.

A sea urchin survey was carried out to estimate stocks.

A sea urchin survey to estimate stocks and recruitment was undertaken under a job creation program. The diving team also carried out counts of geoducks, sea cucumbers and abalone.

Monitoring of anchovy catches in Barkley Sound was carried out. No further work on inshore rockfish landings by hook and line was funded.

Herring Programs

a) 1984 Food and Bait Fishery

This project provided the food and bait herring manager with data on abundance, age and size prior to and during the food and bait fishery.

Traditional echo sounding and seining techniques were used to provide data on distribution, abundance and biological samples for age and size.

The MV Walker Rock was used as the

working platform for this project in conjunction with the patrol vessels involved in the fishery.

b) Prefishery Seine Charters

This regional program provided fishery managers with estimates of stock tonnage and biological data required to manage the roe herring fishery. Twelve commercial seine boats were chartered to carry out test seine sets and provide samples from potential commercial fishing areas. Samples were also obtained from areas where no commercial fisheries are permitted.

The biological data were supplied to fishery managers for the purpose of changing fishery strategies when necessary.

Samples taken from each test are sent to the Vancouver laboratory for further analysis. The data are then sent to the Pacific Biological Station, Nanaimo for use in herring population stock assessment, which is vital in herring management predictions. A charter report was completed.

c) Annual Fishery and Spawn Report

This report provides information on all B.C. herring fisheries as well as data on the size and timing of the spawn depositions along the coast. The highlights of the current year's fishery and spawnings are documented for use by District fishery officers, fishermen, processors and the public.

Spawn maps and spawn summary tables are collected from district offices and sent to the Pacific Biological Station in Nanaimo. Analyses of the spawn data convert the length, width and density of spawn deposition to standard square metres. These figures, compared with depositions of previous years, give an indication of escapement to the spawning areas. This report also shows any shift in herring spawning habits, which can be crucial in the management of subsequent fisheries.

Hydroacoustic Equipment Assessment

This Section conducted the field assessment of hydroacoustic equipment to the placed on board Ship Division vessels. This assessment was done in cooperation with the Technical Services Branch and research scientists.

From the results of the tests, 33 echo sounders (J.F.F. 101) are being purchased and thirteen were installed for the 1984 roe herring fishery. This Section also developed the setting-up techniques which will be used for the 1985 herring echo sounding program aboard Ship Division patrol vessels.

Several sonars were assessed as part of the upgrading program and a particular make and model selected.

Herring Management Course

At the request of the Field Services Branch training and career development officer, this Section developed a basic course in herring biology, current management practices, and the technical and practical aspects of using sonar and echo sounders to locate and estimate the biomass of herring stocks. Fishery officers and Ship Division staff attended the course, which was held over a two-week period at Comox. The "Walker Rock" and Ship Division's vessels were utilized to provide actual field experience in locations and in estimating herring stocks.

Contact: Don Anderson,
Senior Management Biologist,
Nanaimo.

Habitat Management

The Habitat Management team, consisting of eight people (manager, four biologists and three technicians) provides advice and assistance to the area manager, fishery officers and members of the business community on fish habitat management matters.

In 1984, the group was involved in project referral work and in several cooperative federal/provincial initiatives, as well as undertaking a pilot coordinated resource management project. A stronger planning structure has been incorporated into habitat activities in 1984, with an Area Planning Committee working with overall Department objectives.

Water Quality

a) Pulp Mills

Eight coastal pulp mills were the major source of water quality concerns in 1984. In excess of 577,000 litres of lube oil, white liquor and weak black liquor, and an indeterminate amount of bunker C was spilled in four events at three of the pulp mills. As well, emergency operational discharges to foreshore areas were recorded at four of the pulp mills. In one case this amounted to a discharge of approximately 4.5 million litres of chemical process liquor and a two-week environmental monitoring program undertaken jointly by Habitat and Quatsino subdistrict staff. Overall, spill volumes were relatively small compared to the 1.4 billion litres average total daily discharge authorized for mills in the division. Over the review period, one mill with an average daily discharge of 200 million litres of effluent failed every quarterly toxicity test.

b) Pesticide Applications

In 1984, in excess of 150 pesticide application multiyear permit referrals were received, bringing the divisional area total to more than 30,000 ha under application for chemical silvicultural treatment. Of this, 15,00 ha was scheduled for aerial treatement over several years, most of it with the newly registered herbicide for aerial use, "Round Up" (glyphosate). Habitat staff rode the rails during CN and CP Rail line spraying, monitored aerial spray research trials, and discussed pesticide concerns at a public meeting in Madeira Park.

c) Waste Management Referrals

Approximately 50 Waste Management Branch referrals were reviewed in 1984, of which 34 percent were related to municipal refuse or woodwaste landfills and 66 percent related to effluent discharges.

d) Black Spot Disease

In the last three months of the year, and in close cooperation with Victoria District staff, investigations of "black spot disease" in red rock crab was undertaken in the Esquimalt Harbor area.

Disease incidence rates of 80 percent in some areas were assessed by Habitat dive teams. By December, an extensive crab and sediment sampling program was underway, and the cooperative effort had expanded to include Fish Inspection, Habitat Pacific Region, and EPS/DFO Lab Services. Sediment contaminant concentrations proved to be high, but edible crab tissue concentrations were considered to be acceptable by Health Canada.

e) Quinsam Coal Project

Waste Management permits for the coal loading facility at Middle Bay near Campbell River are presently being reviewed. Permits for the effluent discharging from the mining operation itself will be processed following a review of results of a research study. The study was designed to determine effects of mine discharge on water quality in the Quinsam River.

f) Mount Washington Copper

An open pit copper mine operated on Mount Washington in 1965-67. In 1979-80 Esso Resources operated an experimental test leaching operation at the old mine site. This was abandoned in 1980. It was stated in Esso's letter of application to the Provincial Ministry of Environment (1979) that considerable natural leaching of water of low pH and high dissolved metal content has been draining into the soil and creeks for many years.

Pyrrhotite and McKay Creeks have their headwaters at the old mine site. Both creeks flow into Murex Creek, a tributary of the Tsolum River. Sampling done by the Waste Management Branch 1979-82 reported total copper levels from 0.67 to 12.7 mg/L. As a result of the information received from the Waste Management Branch in early 1984, this Department initiated sampling on Murex Creek, Tsolum River, Headquarters Creek and the Puntledge River.

Sampling done in 1984 by DFO in Murex Creek reported levels of 13 µg/L in March to 75 µg/L of dissolved copper in June. The Tsolum River increased from 3 µg/L in April to 50 µg/L in June. Most natural waters in this area have dissolved copper levels below 1 µg/L.

DFO has written to the Environmental Protection Service requesting the assistance of the Provincial Ministry of Energy, Mines and Petroleum Resources in solving this problem.

Water Use

a) Foreshore Proposals

Six major foreshore development proposals were dealt with during 1984. Two were marinas (Saanichton Bay and China Creek), two involved log handling (Port McNeill dry land sort and Cachalot Inlet) and two were in support of heavy industry (an oil rig drilling platform construction site in Alberni Inlet and a gravel barge facility in Trail Bay, Sechelt).

Final approvals for the Saanichton Bay marina were given after an eelgrass transplant program was proposed to compensate for seagrasses lost during marina construction. At China Creek, an onsite parking area was excavated to provide additional moorage space. This preserved unique foreshore adjacent to the marina and creek.

The Port McNeill dryland sort was approved when Western Forest Products agreed to set aside a portion of their foreshore lease as an environmental preserve (an undisturbed mudflat) in exchange for an equivalent area of foreshore, already degraded by woodwaste, which was filled for a log sorting area. At Cachalot Inlet, a major logging operation (camp, sort, dump and storage) was proposed. The group rejected the proposal after a field evaluation and recommended alternative siting of the operation. The forest company involved is considering other locations for their operations.

The oil rig drilling platform construction site required an upland basin, with an access channel to Alberni Inlet. The basin would be flooded upon completion of each platform so that it could be towed into the Inlet and out to sea. Conditions for approval included strict water quality standards and an elaborate system of screens and nets to prevent entrapment of juvenile fish in the platform basin. The project has not proceeded beyond initial discussions.

At Trail Bay, the gravel barge terminal was given conditional approval subject to an analysis of erosion and longshore drift effects and with the proviso that a small patch of eelgrass and kelp affected by the development would be relocated to an adjacent site.

b) Marina Impact Study

A job creation program assessed the impact of seven coastal marinas on fish and fish habitat. The program collected data on water and sediment quality, sediment benthos, breakwater and piling/float communities, plankton and fish use of the marinas. The seven sites studied were Saanichton Bay (proposed), Canoe Cove, Nanaimo, French Creek, Comox Municipal, Freshwater (Campbell River) and Beach Gardens (Powell River). A report describing study findings is in preparation.

Habitat management staff collect data at French Creek Marina for epibenthic sampling. This was part of a marina impact study.

Land Use

a) Linear Development

Projects reviewed within the Division included Highway 19 reconstruction of sections between Victoria and Campbell River; storm sewers within greater Nanaimo; bridge crossing sites at Knarston and Roberts Creeks, and Sooke and Marble Rivers; culverts at Kennedy Lake, Nunns Creek, Cowichan River and along Highway 4; and a power supply line from Port Hardy to Holberg.

b) Drainage Feasibility

Proposals related to screened water withdrawals and urban development included Maffeo Sutton Park, Crofton intake on Cowichan River, Black Creek storage and channel improvements, the recently completed Kokish River Atlantic Salmon Hatchery and residential subdivisions in Langdale and Nanaimo.

c) Habitat Restoration and Development

Proposals reviewed during 1984 included the installation of a flow regulating structure and bank protection to enhance a fry rearing area of Morrison Creek in Courtenay; completion of the Angus Creek restoration and stabilization program in Sechelt, which included the installation of a settling basin, overflow channel, rock weir, riprap bank protection and excavation of the lower streambed to reestablish spawning substrate; design for the Brooklyn Creek culvert tailwater control and fishway; Nunns Creek and Hardy Bay flood gate modifications to prevent tidal backup and allow unobstructed fish passage; and Hollings Creek restorative works to reestablish lost fish habitat.

d) Forestry

Assistance was given to District staff in 36 separate stream problems affecting fish habitat. Seven 5-year forestry development plans were referred to the South Coast Division Habitat Group for advice on specific concerns such as rate of cut and cumulative effects. Three major watershed plans were developed for proposed areas of forest development.

In return, ten fishery officers helped with gravel sampling at Carnation Creek. This continuing program is an excellent method for further aquainting District staff with this research program.

A review and finalization of the Coastal Logging Guidelines is now complete. In addition, the Tree Farm Licence subsidiary agreement was developed and is ready for application in 1985.

Fisheries staff are on site to mark debris that should be removed or cleaned up to restore fish habitat.

Habitat management staff contributed to the Rate of Cut Handbook now developed by the Forest Service. Field trials will be conducted during 1985.

A physical survey of profiles and salinity data was collected at the Beaver Cove tidal lagoon. The lagoon enclosure will be restored to full estuarine production in early 1985.

d) Cowichan Bay - Dinsdale Farm

Negotiations between DFO, the Province of British Columbia, Ducks Unlimited, the Nature Trust of B.C. and the Dinsdale family of Cowichan Bay are aimed at securing over 16 ha of dyked wetlands. The land has been used by the Dinsdales to grow hay crops.

When all agreements have been ratified, the land will be returned to the effects of tidal and river waters. By opening the existing dyke and manipulating some of the existing elevations, the property will provide more fish and wildlife habitat to the Cowichan River estuary.

f) Cowichan Bay - Blackley Farm

Additional farm wetlands were acquired on the Blackley farm. About 4.9 ha of dyked farmland will be returned to a seminatural state where river and tidal waters will increase fish and wildlife habitat. Some manipulation of dyke openings and elevation will be required to speed up the recovery process.

Biological Studies

a) Cowichan Estuary Study

Studies began, which will measure and document the rate of recovery of benthic communities and sediment quality in areas where there is intensive log storage. The storage has adversely affected the historical populations of flora and fauna considered important to rearing juvenile salmonids, herring and Dungeness crab.

Log storage areas in the study area will be reduced by about 60 percent. Sampling was undertaken in both active log storage areas and in areas where little or no log storage has taken place. In 1985/86, a third sampling area will be designated where log storage has been discontinued. This area will indicate the rate of recovery of the benthos and sediment quality.

Planning

a) Cowichan - Koksilah Water Management Plan

The Cowichan - Koksilah watershed is limited in its potential to accommodate a wide variety of water uses, particularly during the low summer flow period. It is expected that demand for instream and consumptive water use will intensify as population, agricultural and industrial activity increase. A federal/provincial integrated approach was initiated by the Ministry of Environment to plan future water allocation in the basin. The plan and process is viewed as a pilot approach to reconciling resource management and water allocation issues.

b) Coordinated Resource Management

DFO's Regional Planning Group provided funding to expedite a Divisional pilot planning project. Howard Paish and Associates were hired under contract to the Habitat Management group to develop a coordinated planning process, with the municipality of Campbell River, Comox Strathcona Regional District, MacMillan Bloedel, B.C. Forest Service, B.C. Ministry of Environment and the Department of Fisheries and Oceans. The project will be completed in 1985.

Inventory

a) Flow Limitations Assessment Program

Chronic low stream flows on the east coast of Vancouver Island reduce the capability of streams to rear juvenile salmonids, reduce stock productivity and production potential. Management options to deal with these problems are not well defined, primarily because of the lack of information on water flow and fish habitat. Over the past two years, a federal/provincial cooperative program has been completed in which the

objective was the classification of watersheds in relation to the risk of fish production versus low summer flows.

b) Salmonid Habitat Information Program

A prereconnaissance inventory approach was developed for several areas in the South Coast Division. Habitat profiles of selected watersheds would assist with two objectives:

- to assess the feasibility and desirability of Salmonid Enhancement Program Transition Plan projects
- To compare and evaluate methods and costs for improved natural fishery production.

The prototypes have been developed specifically to aid operational fish management planning within the Division.

Contact: Rick Higgins,
Senior Habitat Management Biologist,
Nanaimo.

Northern Operations

Northern Operations, based in Prince Rupert, includes District 7 (Kitimat), District 8 (Prince Rupert), and District 9 (Queen Charlotte Islands), as well as commercial fishing Areas 1 through 10. Inspection, Habitat, Licencing and Management Biology units work from the Prince Rupert headquarters. An Enforcement team and a Native Affairs position were added in 1984. Northern Operations is responsible for an area encompassing 153,000 square km, extending from Cape Caution to the Alaska border, including the Queen Charlotte Islands and the entire Skeena and Nass River watersheds.

In 1984, staff worked closely with resource users on many pressing issues, some of which were: chinook conservation, especially as it affected commercial trolling, sport fishing and Indian food fishing; habitat concerns such as logging in very sensitive coastal areas as well as highway/railway expansion, port expansions and mining.

During the salmon season the Skeena and Nass runs showed above average returns with the exception of Nass River sockeye. There was a record return of pinks to the Yakoun River in the Queen Charlotte Islands. The main bright spot on the Central Coast was the chum returns to the Neeka. There were good chinook returns to the Atnarko as well as some of the Skeena and Nass tributaries.

The 1984 northern sac roe herring fishery was again carried out successfully under the area licencing and quota management concept. In addition to the areas fished in 1983 there was a northern gillnet fishery at Port Simpson following a five year closure as well as a seine fishery at Kitkatla after a two year closure. Stocks appeared healthy in these areas.

Interest in aquaculture is accelerating, especially for salmon species. The first northern project to become operational was initiated by the Prince Rupert Fishermens' Cooperative Association.

The Pacific Salmon Treaty will undoubtedly bring with it new management challenges and the mechanism to develop a stock rebuilding program for the north coast salmon resource.

Contact: Eric Kremer,
Director;
Tom Perry,
Operations Manager,
Northern Operations.

Kitimat District

This District extends from Kitimat to Cape Caution, an area of approximately 77,000 km of coastline, containing 240 salmon-producing systems. The major population centers are Kitimat, Bella Bella and Bella Coola, and there are numerous smaller centers and Native Indian communities throughout the District.

Management of the fisheries and protection of fish habitat in the District is complicated and costly because of the vast distances between and remoteness of the areas involved.

Commercial Salmon Fishery

In Area 6 (Butedale) the salmon season was shortened to four net fishing days. A pre-season test fishery, carried out during July confirmed predictions of weak pink and chum returns. The first opening, on August 12 for 48 hours, resulted in a small fleet taking moderate catches of pink and light catches of chum. The second opening, on August 18 and 19 resulted in a large fleet taking good pink

Table 38

KITIMAT DISTRICT

1984 Commercial Salmon Catch and Escapements

Species	Gillnet	Seine	Troll	Total	Escapement
Statistical Area 6 (Butedale)					
Sockeye	662	5,573	467	6,702	15,865
Coho	2,602	24,096	44,905	71,603	45,528
Pink	10,667	586,311	15,826	612,804	638,878
Chum	10,037	20,623	1,145	31,805	119,354
Chinook	42	2,503	14,269	16,814	5,314
Steelhead	44	88	19	151	1
Total	24,054	639,194	76,631	739,879	824,939
Statistical Area 7 (Bella Bella)					
Sockeye	369	14,851	678	15,898	2,931
Coho	2,619	9,599	61,122	73,340	2,724
Pink	2,314	116,447	9,871	128,632	170,610
Chum	55,062	159,581	3,137	217,780	145,688
Chinook	68	2,176	15,827	18,071	0
Steelhead	1	1	1	1	1
Total	60,432	302,654	90,635	453,721	321,953
Statistical Area 8 (Bella Coola)					
Sockeye	26,895	15,716	550	43,161	64,335
Coho	7,193	5,959	17,504	30,651	67,878
Pink	19,039	151,135	3,533	173,707	967,210
Chum	54,559	14,538	1,321	70,418	132,260
Chinook	1,172	2,809	4,475	8,456	20,020
Steelhead	1	1	1	1	1
Total	108,858	190,157	27,383	326,393	1,251,703

catches and poor chum catches. The final opening, August 25 and 26 for 24 hours, with heavy effort, resulted in a high catch of pink but continued poor showings of chum.

Overall, pink catches were better than anticipated, although this was at the expense of spawning escapement, with just over 50 percent exploitation rate in spite of the fishing season being cut to four days. Chum catches were poor. However, the exploitation rate was held to about 20 percent.

Area 7 (Bella Bella) provided late chum catches well in excess of expectations. Gillnets and seines fished seven and one-half days, spread from late July until early October. The season's highlights were the August 12 to 14 fishery on what are considered to have been passing chum and those in late September and early October which targeted on an unexpectedly strong return of Neekas River chum. Other species, as expected, were weak throughout the season. Escapements were generally low in spite of stringent conservation measures. Overall exploitation rates were 43 percent for pinks and 67 percent for chum; although in the case of chum, this is misleading due to the very strong run to one river and weak returns elsewhere.

The poor returns (due to floods in the brood years) of all salmon species to Area 8 (Bella Coola) were as anticipated. In six one-day gillnet and three one-day seine openings, the pink catch was 11 percent of the five even-year cycle average and the chum catch was 35 percent of the 10-year average. The stringent conservation measures kept exploitation rates low, with 15

Table 38, Cont'd

KITIMAT DISTRICT

1984 Commercial Salmon Catch and Escapements

Species	Gillnet	Seine	Troll	Total	Escapement
Statistical Area 9 (Rivers Inlet)					
Sockeye	53,327	-	305	53,632	215,800
Coho	6,383	-	4,543	10,926	17,600
Pink	79,114	-	2,796	81,910	137,000
Chum	11,253	-	333	11,586	27,000
Chinook	1,052	-	1,026	2,078	1,400*
Steelhead	1	-	1	1	1
Total	151,129	-	9,003	160,132	398,800
Statistical Area 10 (Smith Inlet)					
Sockeye	20,618	-	562	21,180	89,000
Coho	1,485	-	16,590	18,075	2,200
Pink	474	-	3,992	4,466	3,500
Chum	3,114	-	965	4,079	-
Chinook	280	-	2,663	2,943	770
Steelhead	1	-	1	1	1
Total	25,971	-	24,772	50,743	95,470

* Wannock chinook - 750 - extremely poor.
1 Unknown.

percent, 34 percent, and 16 percent for pinks, chum and chinook respectively; resulting in spawning escapements that, although below optimum, should provide reasonable returns in the cycle years. For the first time, there was no directed chinook net fishery. With each opening indicating light returns of all species, there were no extensions granted.

In Area 9 (Rivers Inlet), the total expected return of sockeye was 816,000, short of the optimum spawning escapement of 1,000,000. By July 9, the sounding program indicated about 484,000 sockeye in the upper part of Rivers Inlet and a fair showing existing further out. On this basis, a test commercial gillnet fishery was called for in the outer portion of the area. Catches were poorer than expected and the area was closed after 24 hours. With incidental sockeye taken in subsequent pink catches, the sockeye catch was about 52,000 pieces. As it turned out, the number of sockeye estimated in the sounding program was highly optimistic. Pinks returned in about the expected numbers, but contrary to expectations, most spawned in the Clyak River rather than Johnson Creek where strength was expected and where the fish seemed destined.

In Area 10 (Smith Inlet), the sockeye returns, totalling about 111,000, were at the low end of the prediction range. The one-day test fishery on July 8 and 9 took only 22,000 pieces. This, together with the slow build-up at the Docee fence, resulted in no further sockeye fisheries. The exploitation rate in this brief "dip" was about 20 percent. Because of low expectations, there was no directed pink salmon fishery. One August 5 and 6, the Area opened for a one-day chum fishery. About 64 gillnets took about 3,500 chum for an exploitation rate of about 25 percent. No further net fisheries took place.

Sport Fishery

Tidal waters provide most of the salmon sport fishery in the District. Limited nontidal fishery occurs in the Bella Coola and Kitimat areas. An estimated 2,100 coho and 800 chinook were taken in the nontidal sport fishery, down slightly for both species from 1983.

The major tidal salmon sport fisheries are concentrated in Douglas Channel (Area 6); Rivers Inlet (Area 9) and Hakai Pass and North Bentinck Arm (Area 8). The total tidal water salmon sports catch is estimated at about 16,500 coho, 2,650 pinks, and 5,400 chinook. In Area 6, an estimated 6,500 rod-days accounted for about 3,250 salmon, substantially better than the previous year with the largest fish reported being about 27 kg. Halibut fishing was reported as excellent compared to other years, with about 670 taken. Rivers Inlet, the best-known sport fishing area in the District, produced well in 1984, with 1,535 chinook taken; compared to 680 in 1983 when effort was comparable. Fish over 9 kg accounted for 709 of the total. Coho fishing was also reported to have been good.

Table 39

KITIMAT DISTRICT

1984 Sport Fish Catch*

Species	Tidal	Nontidal
Sockeye	200	0
Coho	16,500	2,100
Pink	2,650	0
Chum	300	0
Chinook	5,400	800
Steelhead	0	NA[1]
Halibut	800	0

* Estimates only
1 Not available

Indian Food Fishery

In Area 6, yearly food fishing licences are issued to the Kitamaat, Hartley Bay and Klemtu Bands with band councils issuing permits to individuals. Other subdistricts issue individual licences. Total catch in the Indian food fishery was about 18,000 sockeye, 5,000 coho, 3,000 pinks, 12,000 chum and 3,000 chinook. Catch statistics are compiled by observing fishing operations, interviewing fishermen and from numbers supplied by band councils. Once again, there were no prosecutions for infractions in the Indian food fishery. Illegal operations in the Central Coast are thought to be minimal.

Table 40

KITIMAT DISTRICT

1984 Indian Food Fish Catch

Species	Catch
Sockeye	18,000
Coho	5,000
Pink	3,000
Chum	12,000
Chinook	3,000
Steelhead	NA[1]

[1] Not available

Herring Fishery

In 1984, the roe herring fishery operated under a quota of 15,200 tonnes (9,700 t seine and 5,500 t gillnet). Of this, 6,600 tonnes (3,600 t seine and 3,000 t gillnet) was the quota for the Central Coast. Stock assessment commenced March 1 and by March 5, a total of 15,000 tonnes had been located. Thereafter, the stocks appeared to drop off, fluctuating between 7,000 and 14,000 tonnes. Stock did not build up as usual in the traditional seine areas (Thompson Bay, Stryker Bay), but a build-up of 2,000+ tonnes was noted in East Higgins Pass. On March 16, this area opened to seine with a catch of 2,800 tonnes and on the following day with a catch of 735 tonnes completing the Central Coast seine quota. Stock continued to fluctuate, with an unusual pattern of "trickle" spawnings. Following meetings with industry on March 24 and 26, Kitasu Bay, Cecelia Island and lower Thompson Bay areas opened to gillnets on March 27. Fishing was slow and remained open until the morning of March 29 for a gillnet catch of 3,500 tonnes, bringing the total to 7,035 tonnes. Roe yields ranged from 12 to 17 percent.

Four roe-on-kelp operations took place in the Central Coast, two in Area 6, one in Area 7 and one in Area 10.

Table 41

KITIMAT DISTRICT

1984 Herring Spawn Deposition

(standard square metres x 1,000)

Area	1984	1983	1982
6	396.71	660.86	424.09
7	448.00	1,062.12	1,546.45
8	174.59	168.52	190.40
9	3.34	11.32	54.02
10	144.92	54.21	181.84
Total	1,167.56	1,957.03	2,396.80

Table 42

KITIMAT DISTRICT

1984 Commercial Herring Catch (tonnes)

	Seine	Gillnet	Total
Statistical Area 6			
Food & Bait	0	0	0
Roe	0	680	680
Statistical Area 7			
Food & Bait	0	0	0
Roe	3,535	2,820	6,355

All but one had varying degrees of difficulty but eventually all obtained their product. As in the previous year, there were no food and bait herring fisheries in the Central Coast.

Other Fisheries

The Central Coast's geoduck fishery produced a catch of approximately 353,400 kg, with the majority of the landings from Area 7 and 8. In 1984, 9,800 kg of abalone were commercially harvested from Area 6 where most of the commercial effort for the central coast took place. A total of 12,000 kg of crab and 48,000 kg of prawns were also harvested.

Salmon Escapement

Area 6 sockeye escapement was similar to 1983; amounting to about 16,000, of which 10,900 was to Kitlope. All other stocks are depressed. Coho escapement was up to 42,000, about equal to the 10-year average. Pink escapement totalled 639,000 (50 percent of the target), with heavy seeding (240,000) in the Kemano but light to moderate in most of the other major producers. Area 6 chum escapement, at 119,000, was better than the past few years but only about 40 percent of target. Chinook escapement continued to be poor.

Area 7 sockeye escapement is at a low level; about 3,000 (20 percent of target). Coho appears to be in worse shape than sockeye, with Area 7 escapement estimated at 14 percent of target. Even with no directed fisheries, pink escapement in Area 7 amounted to only 171,000 (42 percent of target). Except for Neekas River, chum seedings were light, with the Area 7 total just under 50 percent of target, at 146,000.

In Area 8, sockeye escapement was approximately 70,000 (50 percent of target). Coho escapements are in a depressed state; about 20 percent of target. Even-year pinks are recovering from losses suffered in 1980 floods. Overall escapement was 965,000 compared to the target of just under 1.5 million. In the three major producers, the Atnarko had 650,000, the Kwatna had 30,000 and the Koeye 125,000. Chum escapement was approximately 135,000; just over one third of target. In particularly bad shape is the Bella Coola system with only 10,000, compared to the brood year count of 123,000 and target of 332,000. Other systems had chum escapements of 50 percent of target. The bright spot this year in Area 8 was the chinook escapement of 15,000 (target 25,000) to the Bella Coola-Atnarko systems. This is well above the brood year and the 10-year average. Overall escapement of chinook in Area 8 was 17,500.

Counting fence on the Docee River for enumerating salmon escapements.

Area 9 sockeye escapement was a bitter disappointment of 215,000. The discrepancy between this and the 485,000 estimated through the sounding program remain a mystery. The bulk of the pink escapement run moved into Clyak River rather than Johnson Creek where it was expected and where it milled off the mouth for some time. Overall escapement was less than 50 percent of target. Wannock River chinook spawning was one of the poorest on record. Runs to the Kilbella and Chuckwalla were also poor.

In Area 10, sockeye escapement amounted to only 89,000; less than one-half of target. Pinks were very weak. Chum escapement was about 14,000; less than 20 percent of optimum

and one of the poorest seedings on record.

Enforcement

Enforcement maintained a high profile again this year, with 28 charges laid; 12 in sport fishery and 15 in commercial fishery. Due to legal or technical problems regarding regulations, a number of charges, particularly in the sport fishery could not be laid, notably because of a misworded on the Tidal Water Sportfishing Licences. It is felt the reduced number of charges laid, in comparison to 1983, is the result of better compliance brought about by the high enforcement profile. There were no major habitat violations noted; minor problems were handled without laying charges.

Habitat

A large portion of a fishery officer's time is spent on habitat protection activities. Logging makes up the greatest part of the work, followed by industrial development. An ongoing study is presently underway on the Kitimat River estuary with the new possible harbor development.

Table 43

KITIMAT DISTRICT

1984 Habitat Protection Referrals

Type	Number
Water Licences	6
Forestry	193
Navigable Waters Protection Act	0
Land Use Applications	29
Urban Development	0
Ocean Dumping & Dredging	0
Pollution Control Board:	14
Pesticides	8
Waste Management	6
Highway Development	2
Placer Mining	2
Other	2
Total	262

Tissue samples were collected from pink salmon in the Quaal River for electrophoretic analysis.

Contact: W.H. McKenzie,
District Supervisor,
Kitimat, B.C.

Queen Charlotte District

The Queen Charlotte Islands consist of 150 islands with a combined area of 9,945 square kilometres and a total coastline of 3,200 kilometres. There are approximately 130 significant salmon-producing streams and rivers on the islands.

Major communities are: Masset, Queen Charlotte City, Sandspit and Port Clements. The Department of Fisheries and Oceans has offices in the first three communities. Haida villages are located at Haida and Skidegate Mission.

Commercial Salmon Fishery

Interception fisheries, operating again in Areas 1 and 2W, paid special attention to passing Skeena River and Fraser River stocks. A ceiling catch of 5,000 chinook was set in both instances.

The interception net fishery in Area 1 (Masset) occurs in the Langara Island area during July and August. This year, gear strength varied from five to

The Arrow Post at Queen Charlotte City docks.

21 seines fishing passing sockeye and pink stocks over eight commercial fishing days. One gillnet operated over three commercial net fishing days. The fishing periods were allocated in such a way that they kept incidental catch of chinook low.

This year an 18-day pink salmon net fishery took place in Masset Inlet, the first since 1968. The fishery began with 19 seines present August 20, peaked August 28 with 54 seines, and closed September 6 with only two seines remaining. Two gillnets operated over 12 of the 18 days, proving rather ineffective in the fishery. The difficult fishing conditions in Masset Inlet hindered the seine fleet from harvesting any more than approximately 50 percent of passing pink salmon stocks.

The troll fishery has been increasing in intensity every year, with up to 230 trollers fishing the area during peak times. Most fishing activity was concentrated along the shoreline from Wiah Point to Langara Island. This year, fishing effort in the A/B line area increased over previous years with up to 55 vessels fishing during peak times.

In Area 2W (West Coast, Queen Charlotte Islands), twelve fishing days were held for commercial fishing between July 14 and October 10. Six days, between July 15 and August 6, were spent at Cone Head for the interception of sockeye salmon. A large portion of pink salmon were also taken. Several local fisheries were held for the remaining time in order to

harvest chum stocks. Most areas of the West Coast were fished at one time or another. To provide for this harvest, an emphasis was put on better quality fish. This was successful to a large degree, with some fisheries reporting 90 percent bright fish. This year provided for the second best catch of local chum in at least the past 20 years.

Salmon net fishing in Area 2E (East Coast), targets strictly on local pinks and chum. A small predicted surplus of pinks was harvested late August in Darwin Sound, with over 60 seines present. By early September, a build-up of chum became apparent, particularly in Skidegate Inlet, and by October 22, 273,000 chum had been harvested; the best chum return in recent years with a very high age three component.

The salmon troll fleet in the area was small and usually transient, headed for more productive grounds.

Sport Fishery

Most sport fishing in the District takes place in Area 2E (East Coast) subdistrict. The catch is mainly coho.

Table 44

QUEEN CHARLOTTE DISTRICT

1984 Commercial Salmon Catch and Escapements

Species	Gillnet	Seine	Troll	Total	Escapement
Statistical Area 1 (North Coast Q.C.I.)					
Sockeye	55	15,248	17,900	33,315	18,500
Coho	35	5,644	334,648	366,046	28,850
Pink	2,346	723,720	1,177,577	1,905,577	1,213,900
Chum	60	4,749	50,532	55,276	52,775
Chinook	20	3,480	117,905	140,549	300
Steelhead	0	NA	NA	NA	NA
Total	2,516	752,841	1,698,562	2,500,763	1,314,325
Statistical Area 2W (West Coast, Q.C.I.)					
Sockeye	0	100,660	992	101,652	1,553
Coho	34	5,886	34,664	40,584	868
Pink	0	78,157	25,052	103,209	67,480
Chum	3,694	114,721	2,563	120,978	63,870
Chinook	0	4,720	31,551	36,271	0
Steelhead	0	0	10	10	0
Total	3,728	304,144	94,832	402,704	133,771
Statistical Area 2E (East Coast, Q.C.I.)					
Sockeye	0	0	296	296	11,000
Coho	2,151	2,100	34,848	39,094	24,225
Pink	124	42,086	18,474	60,684	188,640
Chum	64,776	185,623	2,312	252,711	277,735
Chinook	112	26	10,647	10,785	0
Steelhead	42	0	0	42	0
Total	67,205	229,835	66,577	363,612	501,600

Fishermen had less than optimum conditions for salt or fresh water coho fishing in the fall due to high water levels and storms. Visitor levels continue to increase and the catch by visiting charter vessels is definitely rising.

Area 1 (Masset) is the second most active area with tidal water sport fishing concentrated at the mouth of Masset Sound near Entry Point. Non-tidal fishing for coho is concentrated at the Sangan, Hiellen and Yakoun Rivers. To protect weak stocks, chinook fishing in Masset Inlet and the Yakoun River is closed during the summer.

The 2W subdistrict areas that experience sport fishing include Englefield Bay, Skidegate Channel and Rennell Sound. The remaining areas are limited due to weather conditions and inaccessibility. Due to the decreasing population on the West Coast, catches have decreased.

Table 45

QUEEN CHARLOTTE DISTRICT

1984 Sport Fish Catch*

Species	Tidal	Nontidal
Sockeye	0	0
Coho	2,005	1,485
Pink	205	0
Chum	120	0
Chinook	336	0
Steelhead	NA[1]	871
Rockfish	900	-
Halibut	240	-
Crabs	700	-

* Estimates only.
1 Not available.

Indian Food Fishery

The Masset Band participates in a sockeye food fishery in the spring, in the Yakoun and Awun Rivers. During late August and early September fishing effort on pinks took place in the Yakoun River. During October a fishery is held for chum at the Ain river. Several permits were given to commercial seine boats to supply food fish needs from the Langara Island area.

In the 2E subdistrict, the Coper Bay sockeye fishery had an excellent harvest of 8,000 fish from May to June, with a good escapement. One seine and 20 gillnet licences took approximately 1,500 chum and 20 coho. Additionally, numerous Hook Angling Licences took small quantities of salmon and halibut.

There was no interest expressed this year in a food fishery in the 2W subdistrict.

Table 46

QUEEN CHARLOTTE DISTRICT

1984 Indian Food Fish Catch

Species	Catch
Sockeye	10,730
Coho	200
Pink	1,807
Chum	2,950
Chinook	250
Steelhead	32

Salmon Escapements

In Area 1, sockeye escapements remained similar to past years. The number of coho spawners remains low but consistent over previous yearly escapements. Chum escapements to the Masset Inlet and Naden Harbour streams were good. The chinook escapement of 300 to the Yakoun River was disappointing. A large escapement of pinks to the Yakoun River was experienced for the first time since 1968, and all other Masset Inlet and Naden Harbour pink streams supported strong escapements.

In Area 2E, the pink salmon return was generally poor, with the exception

of Darwin Sound, for a total of 188,000 spawners compared to 413,000 on a five-year (even year) average.

The chum was well above the 10-year average at 277,000, but below the 400,000 optimum. Coho escapements were generally below average.

In Area 2W, pink escapements to streams totalled 67,480 pieces. There was no fishery on local stocks and no incidental catches of pinks were taken during local chum fisheries. Escapements of 63,870 chum and 1,550 sockeye were recorded.

Herring Fishery

1984 was the second year for the fixed quota management system. There appears to be favorable acceptance of this system from within the Department and the fishing industry.

The pre-season plan was to fish both the 2E and 2W subdistricts. The quota for the Charlottes was 4,600 tonnes.

Because of the quota system, the 2W subdistrict was not considered for a fishery after the 2E fishery took more than the planned quota. As it turned out, stocks returned to the "west coast" in lower than expected numbers and in all likelihood would have been unfishable.

Spawn deposition in 2E was slightly above average. The majority of the spawn occurred in the Skincuttle/Juan Perez area with major spawnings occurring in Poole Inlet, Jedway Bay, Huston Inlet and Alder Island/Huxley Island areas.

Spawn deposition in 2W was below average. The major spawnings took place in Port Louis and Inskip Channel.

Eleven spawn-on-kelp licences took the majority of their quotas from Skincuttle. A small portion of spawn-on-kelp quota was taken in Skidegate Inlet in mid- to late May. The total production for these licences was 75.8 tonnes.

There were four bait operations in the 2E subdistrict, two each in Skincuttle and Skidegate. A total of 95.4 tonnes of bait for the halibut fishery was supplied. There were also two bait operations at Langara (Area 1) which supplied 40 tonnes to the halibut fleet.

Other Fisheries

As in most years, the main search for halibut was in Areas 1 and 2E, with an estimated 40 and 30 vessels, respectively, participating. It has been noticed that dogfish are a problem that

Table 47

QUEEN CHARLOTTE DISTRICT

1984 Herring Spawn Deposition

(standard square metres x 1,000)

Area	1984	1983	1982
1	--	1.54	110.87
2E	1,669.66	556.15	1,224.00
2W	208.87	1,020.71	550.79
Total	1,878.53	1,578.40	1,885.66

Table 48

QUEEN CHARLOTTE DISTRICT

1984 Commercial Herring Catch (tonnes)

	Seine	Gillnet	Total
Statistical Area 1			
Food & Bait	40	0	40
Roe	0	0	0
Statistical Area 2E			
Food & Bait	95.4	0	95.4
Roe	4,297.7	525.8	4,823.5
Statistical Area 2W			
Food & Bait	0	0	0
Roe	0	0	0

appears to be on the increase.

Dungeness crab is fished for approximately nine months of the year in Area 1, primarily in McIntyre Bay and Virago Sound in the spring and fall, and Naden Harbour, with rings, in the winter. Catches continue to decline in McIntrye Bay and Virago Sound. Naden Harbour catches are consistent and productive enough for a small local wintertime fishery. In recent years most catches have been flown fresh to Vancouver.

The District took 59 percent of the coastal abalone landings. The breakdown by subdistrict is:

- Area 1 - 18 percent
- Area 2E - 37 percent
- Area 2W - 4 percent

An extensive stock survey conducted during the summer in 2E showed a definite decline in abundance, both in open and closed commercial areas.

A razor clam fishery on North Beach (Area 1) produced 103 tonnes of product valued at $165,000 to the local diggers.

Enforcement

There were 33 charges laid in the district:

- 3 B.C. General Regulations
- 4 sport fishing
- 3 habitat
- 13 commercial fishing violations.

Many of these cases are still before the courts, but the present disposition is: 11 convictions, three absolute discharges, one not guilty, five stayed and 13 pending.

Habitat

The continued depression in the timber market has maintained a large number of development and cutting plan amendments for areas high in cedar values with emphasis on grapple vs. tower yarding shows. Long-range timber development plans indicate little regard for the current watershed rate-of-cut guidelines. The impact of debris slides and torrents continues to predominate formulation of logging recommendations as development proceeds into the sensitive upslope regions.

Poor maintenance of forest roads persists as a chronic problem, with a negative impact upon fish habitat. Staff spent considerable time attempting to resolve the problem through consultations with the Ministry of Forests and forest companies.

The Fish/Forestry Interaction Program concluded investigative studies aimed at understanding harvesting impacts on fisheries habitat and forest sites; at minimizing logging-induced slope instability through the use of alternate logging methods; and in mitigating damage caused by landslides, using stream and forest site rehabilitation techniques. Report preparation now is in progress.

District staff participated in the review of the Initial Environmental

Table 49

QUEEN CHARLOTTE DISTRICT

1984 Habitat Protection Referrals

Type	Number
Water Licences	2
Forestry:	
5-Year Development Plan Areas	10
Cutting Permit Areas	51
Amendment Areas	33
Stream Crossings/Road Works	24
Timber Sale Applications	18
Foreshore Lease Applications	11
Navigable Waters Protection Act	1
Ocean Dumping & Dredging	1
Land Use Applications	13
Highway Development	7
Mineral Development	13
Pollution Control Board:	
Pesticides	8
Waste Management	5
Other	19
Total	216

Evaluations submitted by Petro-Canada Inc. and Chevron Canada Ltd. concerning renewed exploration for oil and gas in the waters surrounding the Queen Charlotte Islands. In addition, staff represented the Department at public information meetings convened by the Assessment Panel.

Salmonid Enhancement

The majority of the 46,000 chum catch in Cumshewa Inlet this year was from Pallant Creek enhanced stocks.

Pallant Creek hatchery is filled to capacity with 11 million chum and 340,000 coho eggs. Headwater coho stocking in the upper Pallant system is under intensive study.

Mathers Creek pilot facility did not operate this year, but should be on line again by 1985.

Community Economic Development projects involved both the Masset and Skidegate Bands. The Skidegate project again operated a counting flash plate for the Copper River sockeye in the spring. Both projects operated production facilities on several systems.

There are presently 17 volunteer projects taking place in the District, with 2 new ones being considered for the future. There is a very keen interest being shown by the local residents.

In area 2E, SEP's Small Projects Unit assisted with barrier removal on two debris jams and opened up a total of 5 km of coho spawning habitat. More works are required.

Contact: Chris Dragseth,
District Supervisor,
Queen Charlotte City.

Prince Rupert District

The Prince Rupert District is the most northerly coastal district in the Pacific Region. On the coast, it extends from the southern tip of Banks Island (Grenville-Principe subdistrict) in the south, to the Alaska/B.C. border in the north. Inland, it includes the Nass River and Skeena River watersheds.

The major population centers are Prince Rupert, Terrace, Smithers and Houston. There are also numerous small centers and native communities throughout the District. Subdistrict offices are located at Prince Rupert, Terrace, Hazelton, Smithers and Nass Camp.

The Ridley Island coal terminal was completed and the first shipment left the facility on January 5, 1984. No major environmental problems have been encountered during the first year of operation. The grain terminal on the same island is nearing completion and the first shipment is expected in March 1985. The economic situation in the forest industry remains poor, although logging continues at a high rate of production. Timber harvesting in the interior is almost entirely aimed either at containing infestations of bark beetles which threaten the forestry resource or the salvage of beetle damaged timber. Unfortunately, the methods of dealing with this problem could have major impacts on the fisheries resource. Logging of cottonwood in the valley bottoms has slowed down, as most of the high quality easily accessible wood has been harvested. The slowdown in the mining industry also continues. The Scotty Gold mine at Stewart closed in the latter part of 1984 because of falling gold prices. Equity Silver's mine at Houston is the only major mine operating in the district. The Amax mine at Kitsault and the Granisle and Bell Copper mines on Babine Lake all remain closed.

Fisheries staff monitored both high-

way and railway upgrading to ensure minimal alteration of fish habitat.

The future of the proposed Dome Petroleum liquefied natural gas plant at Port Simpson is still uncertain. Alcan announced the shelving of its proposed Kemano completion project. Both of these major projects and the potential impact on the environment have attracted considerable public interest.

Generally, the weak economy has led to a push for low cost development that will yield high employment benefits. Low cost frequently means reduced expenditures on habitat protection, and the Department is having to spend more effort in monitoring these projects to ensure the maintenance of habitat quality.

Commercial Salmon Fishery

The Prince Rupert District continued

Table 50

PRINCE RUPERT DISTRICT

1984 Commercial Salmon Catch and Escapements[1]

Species	Gillnet	Seine	Troll	Total	Escapement
Statistical Area 3 (Lower Nass)					
Sockeye	98,995	80,775	1,542	181,312	182,450
Coho	23,990	38,030	74,088	136,108	73,500
Pink	202,010	1,725,815	106,407	2,034,232	530,800
Chum	108,950	172,845	5,211	287,006	67,400
Chinook[2]	3,760	6,180	7,496	17,436	12,820
Steelhead	4,080	3,920	Unknown	8,000	Unknown
Total	441,785	2,027,565	194,744	2,664,094	866,970
Statistical Area 4 (Lower Skeena)					
Sockeye	690,189	316,510	4,689	1,011,388	1,075,715
Coho	34,409	14,596	53,948	102,953	26,556
Pink	646,106	570,460	72,338	1,288,904	1,037,778
Chum	87,191	34,225	2,803	124,219	30,021
Chinook[2]	5,624	6,250	10,138	22,012	37,698
Steelhead	24,010	7,362	Unknown	31,372	Unknown
Total	1,487,529	949,403	143,916	2,580,848	2,207,768
Statistical Area 5 (Grenville-Principe)					
Sockeye	12,670	34,750	65	47,485	17,200
Coho	6,210	9,425	10,685	26,320	8,475
Pink	25,283	562,930	2,255	590,468	162,500
Chum	12,289	11,614	139	24,042	6,830
Chinook[2]	134	351	2,185	2,670	25
Steelhead	142	379	0	521	Unknown
Total	56,728	619,449	15,329	691,506	195,030

[1] Net figures are field hails, troll figures are preliminary sales slip information.

[2] Does not include jack chinook.

to provide good fishing opportunities in 1984. Areas 3, 4, and 5 opened to salmon gillnet fishing on July 8, somewhat later than normal, due to poor early test fishing results. Gillnets operated for 23 days in Area 3, 22.5 days in Area 4 and 15 days in Area 5. Seining commenced July 15 in Areas 3 and 5. Area 3 opened for 20 days and Area 5 for a total of 14 days. Seines operated in Area 4, starting July 21, for a total of six and one quarter days. Nass sockeye stocks remained weak, while Skeena stocks increased substantially through July. Pinks were strong in all three subdistricts and chum were surprisingly strong in Areas 3 and 4. Chinook also showed an increase over past years. The above average return of coho to Area 3 provided good fishing for gillnetters and trollers towards the end of the season.

The sockeye migration pattern into the Skeena was somewhat different this year and, accordingly, seines caught a record 316,000 fish in Area 4, mainly in the outer waters.

A good proportion of the Skeena pinks migrated through Area 5 and this, together with a strong pink return to upper Grenville Channel, resulted in a record Area 5 catch of 550,000 pieces.

Trolling was designed to limit the chinook catch to 275,000 pieces in the entire north coast to start to rebuild the depressed chinook stocks. Trollers fished from May 23 to June 3 and July 1 to September 19.

Sport Fishery

The main District objective for 1984 in the sport fishery was to maintain the present chinook catch level and continue to provide a high quality fishing experience. To achieve these goals, the nontidal bag limit for large chinook was reduced to one (possession limit two) and a barbless hook restriction was implemented; both conservation actions covering the Nass and Skeena watersheds. A reduced fishing season was allowed in the Ecstall River which has been receiving increased pressure. A general trend continues of increased pressure on the more remote systems. Water conditions were unfavorable during much of the nontidal chinook season, but fishing was fair to excellent when conditions allowed. A highlight this year was the extremely strong steelhead run in the Skeena.

In tidal waters, concern continues over abalone stocks. Reduced bag limits should be in effect in 1985. The general increase of halibut stocks lead to excellent fishing for this species. Coho stocks also showed strength in some locations.

Table 51

PRINCE RUPERT DISTRICT

1984 Sport Fish Catch*

Species	Tidal	Nontidal
Sockeye	100	0
Coho	4,400	5,500
Pink	1,225	0
Chum	0	0
Chinook	2,983	2,777
Steelhead	NA[1]	NA[1]

* Estimates only.
[1] Not available.

Indian Food Fishery

The major management goal in the food fishery in 1984 was to stabilize the chinook catch when stocks were expected to show a stronger return due to limits placed on the commercial fishery. This goal was generally achieved due to good cooperation by some bands and poor net fishing conditions during the chinook runs. As in the past, most food fisheries were administered through the band permit system. Effort remains strong for sockeye and this is reflected in the higher catch reported this year.

A significant increase in interest in herring spawn-on-kelp was noted, particularly by natives from interior bands. An estimated 28 tonnes of spawn-on-kelp were harvested, mainly from the north shore of Porcher Island. There was less effort for abalone due to low abundance, but an increase in the number of permits issued for crabs and groundfish.

Table 52

PRINCE RUPERT DISTRICT

1984 Indian Food Fish Catch

Species	Catch
Sockeye	205,085
Coho	30,214
Pink	47,142
Chum	6,047
Chinook	11,566
Steelhead	9,922[1]

[1] Incomplete

Salmon Escapements

The upper and lower Nass received good escapements on all species except sockeye, which fell short of the target due partially to a 12.5 percent overestimate by the test fishery. Pink escapements were nearly double the even-year average, with coho and chinook more than twice the 10-year average. Conservation measures for chinook during the commercial and Indian food fishery appear to have substantially aided efforts to increase chinook escapements.

The Skeena river received good escapements of sockeye, pink, chum and chinook. Coho appeared to be about average. The sockeye escapement of one million was ideal, but unfortunately 50 percent of these fish were returning to enhancement facilities, (36 percent is optimum), leaving the unenhanced systems with a less than adequate seeding. The pink escapement of one million was adequate, but poorly distributed between systems. The Lakelse River received 750,000, leaving less than required for many of the smaller systems. In particular, some Area 4 coastal streams had very poor escapements, likely due to high exploitation during fisheries on passing stocks. The Skeena chinook escapement was the highlight for 1984. At 37,698 it was the highest since 1977 and the second highest since 1959. As in Area 3, commercial fleet restrictions as well as lower catches by the Indian food fishery were a factor in the large escapement.

Area 5 received poor escapements of all species with the exception of pink salmon in Porcher Inlet and Upper Grenville Channel. Area 5 chum and sockeye stocks are in particularly poor condition and drastic measures must be taken if these stocks are to be maintained.

Herring Fishery

Roe herring targets were set at 2,000 tonnes for seines in Kitkatla Inlet and 2,000 tonnes for gillnets in the Port Simpson - Big Bay area. The seine fishery lasted for 1 hour and 45 minutes at the north end of Gurd Island where 118 vessels caught 1,636 tonnes* on March 21. Roe content averaged 11 percent and there was some concern over the pale color of the roe. No major problems were encountered in the fishery. The total estimated stock in the inlet was 9,100 tonnes.

The gillnet fishery commenced slowly on March 26 with only 22 licenced vessels present. When the fishery closed on March 30, 145 vessels were fishing. Roe content was excellent, averaging 16 percent, and 2,003 tonnes* were caught. Stocks in excess of 10,000 tonnes were monitored during the season. Despite strong winds and rough seas during the gillnet fishery, no major problems occurred.

* Based on hail figures from fishing vessels and packers.

Spawnings were well above average for Port Simpson - Big Bay, above average for the north shore of Porcher Island and below average for Kitkatla. This, coupled with a fairly well balanced age composition, indicates that herring stocks in the Prince Rupert District are in relatively good shape.

All but one of the eight spawn-on-kelp licence holders filled their quotas for a total harvest of 55.3 tonnes, all with good quality product.

Table 53

PRINCE RUPERT DISTRICT

1984 Herring Spawn Deposition

(standard square metres x 1,000)

Area	1984	1983	1982
3	77.42	49.05	28.18
4	1,604.17	1,765.60	727.12
5	429.20	864.14	359.75
Total	2,110.79	2,678.79	1,115.05

Table 54

PRINCE RUPERT DISTRICT

1984 Commercial Herring Catch (tonnes)*

	Seine	Gillnet	Trawl	Total
Statistical Area 3				
Food & Bait	0	0	0	0
Roe	0	0	0	0
Statistical Area 4				
Food & Bait	14	0	0	14
Roe	0	1,579	0	1,579
Statistical Area 5				
Food & Bait	31	0	91	122
Roe	1,542	0	0	1,542

* Based on sales slip figures.

Only four of the five vessels licenced for the November-December food and bait season fished, landing a total of 136.38 tonnes. All fishing occurred in Area 5 and southern Area 4. Three bait pond operators sold 105 tonnes of fresh bait from Area 4 during the first two halibut openings. Two other licence holders did not participate this year.

Other Fisheries

Strong stocks and a high catch per unit effort resulted in the Area 2B halibut quota being taken in the first two of four scheduled openings. A total of 1,678 tonnes were landed in northern ports (mainly Prince Rupert) compared with 1,035 tonnes in 1983. Groundfish landings increased slightly from 7,836 tonnes to 8,152 tonnes, the major species being rockfish, sole and grey cod.

Increased effort and a reduced catch per unit effort led to a January 1 to March 31 closure for prawn fishing in Work Channel in 1984. In 1985, a permit-only prawn fishery for Work Channel will be instituted to more closely monitor the situation. Over 113 tonnes of geoducks were harvested from the upper west coast of Banks Island; the first major fishery on this species in the District. Steady effort continues for crabs, with most of the catch being flown fresh to Vancouver. There have been some concerns over the level of effort directed towards Dungeness crab. Again this year there were no clams harvested commercially in the District.

Import permits for 3,276 tonnes of salmon and 431 tonnes of herring from Alaska were issued by the Prince Rupert office in 1984, adding considerably to employment in the fish processing plants.

Enforcement

This year, 88 charges were laid against 60 individuals. The two categories with the highest number of violations were the B.C. Sport Fishing

Regulations with 56 and the Pacific Commercial Salmon Fishery Regulations with 13 violations. The balance of the violations came under Pacific Shellfish Regulations, Pacific Fishery (General) Regulations, Pacific Fishery Registration and Licencing Regulations and Pacific Halibut Regulations. Fines totaling $9,180 were levied on 54 charges, and forfeited fish were sold for $7,300. Not guilty decisions were handed down on five cases, while one resulted in an absolute discharge. Stays of proceedings were entered on 13 charges, and 15 files are still before the courts.

Habitat

Fishery officers worked closely with Habitat Biology staff in commenting on referrals, monitoring developments and investigating possible violations. One area of particular concern is the interior logging directed at controlling forest pests such as the mountain pine beetle and the spruce bark beetle. Plans including logging both sides of salmon streams and requests for large clear cuts are frequently received. Coastal logging also created problems in areas like Silver Creek (land slides) and Kumealon Inlet (foreshore habitat destruction). Fishery officers responded to a normal number of oil and chemical spills. There were no habitat related charges laid in the District this year.

Table 55

PRINCE RUPERT DISTRICT

1984 Habitat Protection Referrals

Type	Number
Water Licences	37
Forestry	292
Navigable Waters Protection Act	5
Land Use Applications	53
Urban Development	3
Ocean Dumping & Dredging	5
Pollution Control Board:	
Pesticides	72
Waste Management	8
Highway Development	23
Placer Mining	3
Other	65
Mining (other than placer)	104
Total	670

Salmonid Enhancement

Approximately 35 special projects were carried out from mini-hatcheries to streamside incubation boxes and small classroom incubators. Numerous organizations and individuals have taken an active part in operating small projects, with DFO staff providing technical aid as required.

This year, there were 710,000 chinook eggs and 620,000 coho eggs taken for the major facilities as well as a few thousand more for the 20 or so classroom incubators.

The Prince Rupert Salmonid Enhancement Society mini-hatchery did not reach the expected operational stage for the fall of 1984 due to funding problems, but some progress was possible with a $15,000 cash grant from the Prince Rupert Rotary Club. Site preparation and the laying of the waterline were well underway by the end of the year. Barring unforeseen problems, the hatchery should be operational by June 1985 with a Heath tray incubation capacity of one million eggs and three rearing troughs. The facility will also have a wetlab, classroom and tourist information area.

The Eby Street hatchery in Terrace underwent a few organizational changes this year, but with the local fisheries staff and a good group of volunteers, a successful egg take of 200,000 took place. The Kispiox community project, having overcome its water problems, is incubating 207,000 chinook and 118,000 coho eggs this year and has so far had a survival rate of 91 percent and 95 percent, respectively, to the eyed stage.

Other facilities, such as Fort

Babine, Kincolith, Deep Creek, Kloiya/ Diana Creeks, as well as the classroom incubators, have done well. No eggs were taken for the Emerson Creek chinook hatchery this year and this facility will be dismantled in 1985. It will be replaced by the Toboggan Creek hatchery, nearing completion near Smithers. This facility was constructed by workers in a job creation program and will be used by both federal and provincial enhancement groups with 50,000 steelhead eggs and some 200,000 chinook/coho eggs being reared in 1985. The hatchery will be run by the Evelyn Station Conservation Society.

Contact: Gus Jaltema,
District Supervisor,
Prince Rupert.

Northern Inspection District

The Northern Inspection District encompasses the area North of Cape Caution to Portland Canal from the Queen Charlotte Islands inland. To ensure consistent quality of fish products destined for domestic and foreign markets, Inspection staff monitors conditions of catch through subsequent handling, processing and distribution.

Ten processing plants operated in 1984, one of which was a new facility, Port Clements Cold Storage, on the Queen Charlotte Islands. The Northern Inspection District monitored provincially registered facilities: fish camps, one cold storage operation, and inspection of two unloading sites established at Port Edward during the salmon season.

Inspection officers monitored landed product quality and final roe quality of approximately eight million kilograms of roe herring landed at northern ports. Inspections were conducted on every landing of roe-on-kelp into northern companies.

Approximately 3.23 million kilograms of Alaskan caught salmon were landed at Prince Rupert. The Northern Inspection District handled 15.6 million kilograms of salmon, 35 percent of B.C. coast landings; 8.2 million kilograms of groundfish, 31 percent of that landed coastwide; and 1.7 million kilograms of halibut, 61 percent of the total landed on the B.C. coast.

In 1984, the District conducted inspections for certification of 2.84 million kilograms of fish products destined for export markets, sampled 379 lots of canned salmon, monitored the mandatory screening of canned salmon to ensure container integrity, cleared 244 labelling orders of canned

The Coast Guard "Sikorsky S-61". The Coast Guard assists inspection officers in reaching fish plants in remote areas where other modes of transportation are restricted.

salmon for market and inspected 373 fish holds.

The Northern Inspection District can anticipate increased activity in 1985 with the start of groundfish processing at B.C. Packers' Prince Rupert Plant; two new processing facilities under construction on the Queen Charlotte Islands; and the potential reopening of Central Native Fishermens' Co-op and Port Simpson Native Co-op.

Contact: Vance McEachern,
Supervisor,
Northern Inspection District.

Management Biology

Owikeno Lake Adult Spawner Survey

The management biology group is responsible for the Owikeno Lake sockeye escapement estimates. As part of the two-month program, representatives from industry participate during the 10-day period at the peak of the run. The total sockeye spawning estimate for 1984 was 215,000.

Docee Fence Adult Enumeration

The adult sockeye return to Long Lake in Smith Inlet is counted through a fence on the Docee River, the outlet of Long Lake. The strength of the returning sockeye stock is estimated by the size and timing of the run through the fence. The regulation of the Smith Inlet sockeye fishery is based on these

estimates. The escapement in 1984 was only 89,000, with a catch of 22,000 during a one day commercial fishery.

Rivers Inlet Echo Sounding

Adult sockeye returning to Rivers Inlet generally hold at the head of the inlet prior to moving into the lake. The daily pattern of sockeye buildup is estimated by echo sounding along a prescribed grid. The estimates from the sounding program provide input into the in-season management of the area. In 1984, the peak sounding count was near 500,000. However, the Owikeno Lake escapement surveys indicated less than 250,000 spawners. The escapement count is considered to be the more accurate number, and at this time there isn't a good explanation for the discrepancy.

Chum and Pink Electrophoretic Sampling

Assistance was provided to a Fisheries Research Branch electrophoretic sampling program on pink and chum in Areas 6 through 10. The intent of the program is to determine the potential for stock separation through electrophoretic analysis, or from meristic or morphometric data.

Central Coast Database Development

Central Coast escapement data has been extensively reviewed, updated and organized in a new way that makes the information available for in-season management use. A report for each statistical area will be published in 1985.

The Central Coast fisheries are managed largely by comparing in-season catch data against historical catch and escapement information. In Areas 6, 7 and 8, the catch information used for management purposes is maintained for areas smaller than statistical areas. Since all fisheries catch databases are by statistical area, and not useful for our management purposes, we are developing systems to overcome the problem.

Area 8 Gillnet Test Fishery

This is a new program initiated in

Table 56

Accuracy of Skeena Test Fishing Index

Year	Estimated (X 1000)		Actual (X 1000)		% Error	
	Sockeye	Pink	Sockeye	Pink	Sockeye	Pink
1969	681	917	704	873	3.27	-5.04
1970	641	912	722	923	11.22	1.19
1971	806	961	885	1,090	8.93	11.83
1972	739	650	742	1,672	0.40	61.12
1973	1,197	855	962	1,251	-24.43	31.65
1974	970	343	792	314	-22.47	-9.24
1975	902	879	910	1,822	0.88	51.76
1976	628	514	658	597	4.56	13.90
1977	962	934	1,041	962	7.59	2.91
1978	669	837	526	703	-27.19	-19.06
1979	1,061	517	1,294	510	18.01	-1.37
1980	917	627	704	765	-30.26	18.04
1981	1,064	883	1,565	1,132	32.01	22.00
1982	1,158	438	1,315	710	11.94	38.31
1983	803	1,421	1,040	2,542	22.79	44.10
1984	845	914	1,072	979	21.18	6.64
				Average	±15.45	±21.14

1984 on a trial basis. A local gillnetter was chartered to test fish in upper Dean Channel; the purpose of the charter was to evaluate the feasibility of implementing an annual test fishery to determine the in-season abundance of upper Dean Channel sockeye and chum returns. The program was carried out from July 1 to August 22.

Area 6 Seine Charter

In 1984, the commercial fishery in Area 6 was severely restricted to conserve the expected low returns of chum and pink salmon. Because no commercial fishery was planned to assess stock strength, a seine vessel was chartered to fish in Area 6. From July 9 to August 2, the charter carried out a qualitative evaluation on whether stocks were abundant or not abundant. The evaluation indicated that stocks were low and this was subsequently confirmed by escapement surveys.

Skeena River Test Fishery

The Skeena River test fishery was established in 1956 to provide a daily estimate of sockeye and pink escapements beyond the commercial fishery boundary. This information was considered essential for the effective management of these stocks. Indices for chinook, coho, chum and steelhead are also calculated to determine timing and relative abundance. All species are sampled for age, length and sex to fulfill both short-term management and longer-term data inventory requirements.

Following the completion of the 1984 program, the Fisheries Research Branch began an indepth analysis of the test fishery data to determine the cause of the increasing error in the escapement estimates for recent years. It is expected that the results from this analysis will be published in 1985.

Nass River Test Fishery

Since 1963, a test fishing operation on the Nass River has been conducted near the upriver fishing boundary. The test fishery is designed to provide a daily index of sockeye escapement from the fishing area. The data, in addition to estimates of commercial catch in the estuarine region, provide a complete picture of the strength of the run as it develops each year. The ability to approximate the escapement on a daily basis as soon as it has left the fishery is a valuable aid to the precise regulation of the fishery.

The 1984 season began with the placement, by tug boat, of the float at

Table 57

Relationship Between Annual Nass River Test Fishing Index of Sockeye Spawning Escapement and Recorded Annual Spawning Escapement 1963 - 1984

Year	Predicted Escapement*	Recorded Escapement	Percent Error
1963	-	unknown	-
1964	134,890	153,500	12.1
1965	111,405	127,000	12.3
1966	90,990	99,000	8.1
1967	95,360	76,700	-24.3
1968	132,730	110,000	-20.7
1969	-	182,100	-
1970	115,396	110,754	-4.2
1971	145,180	244,674	40.6
1972	94,072	175,866	46.5
1973	262,625	283,672	7.4
1974	175,610	193,203	9.1
1975	118,668	73,582	-61.3
1976	167,068	141,305	-18.2
1977	256,454	400,371	35.9
1978	148,335	144,610	-2.6
1979	182,418	212,920	14.3
1980	151,704	155,521	2.6
1981	232,608	255,668	9.0
1982	250,032	290,000	13.8
1983	174,599	185,000	5.6
1984	198,050	182,450	-8.6
		Average	±17.9

* Predicted escapement for 1964-1968 based on 1:500, 1970-1972 on 1:400, 1973-1978 based on 1:550, 1979-1982 based on 1:600, 1983 based on 1:615, 1984 based on 1:616.

the Monkley site. No accommodation trailer was provided this season. Fish caught during the operation were delivered to Prince Rupert once a week by the test fishing boat. The missing daily index was estimated by interpolating the indices of the day before and the day after the delivery run.

Babine River Counting Fence

a) Adult Enumeration

The Babine Lake system produces more than 90 percent of the sockeye salmon for the Skeena River watershed. The Babine River counting fence (established in 1947), near the outlet of Babine Lake, provides one of the best estimates of adult salmon escapements on the Pacific coast. It also serves as an invaluable calibration of the Skeena River test fishery.

The adult enumeration program was conducted from July 4 to October 1. In addition to the normal counting operation, tags were recovered from the international tagging program. This was the third year of a joint U.S./ Canada research program designed to determine interception rates in certain key fisheries.

Escapements to the Babine Fence were:

large sockeye :	1,052,385
jack sockeye :	120,752
pink :	69,422
coho :	2,956
chum :	3
large chinook :	1,400
jack chinook :	380
steelhead :	35

The native fishery was conducted from August 22 to September 3 with 39,961 jack sockeye harvested. All the fish were sold to B.C. Packers in Prince Rupert.

b) Smolt Enumeration

Using a modified mark-recapture method, the smolt migration out of Babine Lake has been estimated annually since the early 1960s. The 1984 program commenced on May 7 and continued until June 11; 70,375 smolts were tagged and released. The total smolt output of 83.5 million is the lowest since 1980. The data are useful in assessing the productivity of Babine Lake as well as in forecasting future returns.

Meziadin Fishway and Nass Survey

The Meziadin fishway was built in 1966 to help the sockeye migration bypass a series of falls. It also provides a convenient facility for enumeration of the sockeye run on its way into Meziadin Lake. To a lesser degree, chinook and coho stocks are also enumerated.

The 1984 enumeration ran from July 4 to September 8. Escapements to the fishway were:

large sockeye :	139,328
jack sockeye :	2,038
coho :	1,880
large chinook :	624
jack chinook :	158

In 1984 biosampling of three sockeye systems in the Nass (Bowser, Damdochax and Fred-Wright) was conducted from September 7 to 9. Age composition, length and sex information was collected for stock separation purposes in conjunction with sampling for brain parasite and electrophoretic analysis.

QCI Chum Sampling

In 1984, chum populations in various systems and fisheries in the Queen Charlotte Islands were sampled for length, sex, and age. In addition, tissues were collected for electrophoretic analysis. The program provides information on the status of chum populations in the Queen Charlottes; it also may provide ways of distinguishing between stocks or stock groups.

Cumshewa Inlet Gillnet Test Fishery

A gillnet vessel was chartered to test fish in Cumshewa Inlet from September 12 to October 24. The program was initiated in 1982 but was

not funded in 1983. Its purpose is to provide an in-season estimate of the abundance of chum returning primarily to Pallant and Mathers enhancement facilities. Information from the program would be used to manage the commercial fishery in Cumshewa Inlet.

Herring/Shellfish

a) North Coast Herring Seine Charter Program

As part of the coastwide herring test charter program, five vessels worked before and during the herring fishery: two in the Queen Charlotte Islands, one in the Prince Rupert area and two in the Central Coast. Biological sampling and in-season roe maturities sampling as well as hydroacoustic stock assessments were accomplished.

Biological samples go to the Pacific Biological Station (PBS) for age structure analysis; in-season maturities and stock patterns and assessment are provided to the District staff running the fishery.

b) Herring Stock Identification

A program to further delineate herring stocks or groups was accomplished using morphometric and meristic characters in discriminant analysis. Data were provided by PBS and analysis done by North Coast Management Biology staff. The report will be published in 1985.

c) Herring Management

The management biology group was an active participant in analysing data and information, and in preparing a report to the Herring Assessment Committee, Herring Management Working Group and Herring Industry Advisory Board.

Abalone Fishery

The commercial abalone season ran from January 15 to December 15, with each abalone licence being assigned a quota of 2,268 kg (5,000 lbs.). The coastwide allowable catch was set at 58,976 kg (130,000 lbs.), of which 554,578 kg (120,323 lbs.) were harvested. Forty-seven percent of the catch was harvested from the Queen Charlotte Islands (Area 1, 2E, 2W). The remaining 53 percent of the catch was distributed between the North Coast (Area 4, 5) with 15 percent, the Central Coast (Area 6) with 18 percent and the South Coast (Area 12, 20, 27) with 20 percent. The single largest producing area was Area 1, which produced 26 percent of the catch.

An abalone survey was conducted on the east coast of the Queen Charlotte Islands.

A survey was done of the abalone stocks in Area 2E and a report is expected soon.

An annual meeting with licence holders was held in November to discuss management plans for the 1985 season and to review the 1984 fishery.

Prawn Fishery

The commercial prawn catch monitoring program was continued in the North Coast. Catch rates, sex and size composition and fishing effort were examined in Area 3 (Work Channel and area), Area 6 (Gardner Canal and area), Area 7 and Area 8. Recommendations were made to close Kwatna Inlet and Work Channel for a period of time when

the index of female spawners fell below an acceptable monthly minimum level.

Geoduck Fishery

The commercial geoduck fishery was open from January to July 20 in Areas 6 through 10 and from January to September 12 in Areas 3, 4 and 5. The quota and catch for the North Coast was:

	Quota	Catch
Queen Charlotte Islands (Areas 1, 2E, 2W)	294,835 kg	negligible
North Coast (Areas 3, 4, 5)	158,757 kg	201,521
Central Coast (Areas 6-10)	453,593 kg	429,306
Total	907,185	630,827

"P" or processing licences, which allowed shucking of geoducks onboard the vessel, were issued to two vessels.

Contact: Paul Sprout,
Senior Management Biologist,
Northern Operations.

Habitat Management

The Northern Operations Habitat Management Biology group had an active year with referrals taking up the highest percentage of staff time.

Referrals

The slow economy of northern B.C. resulted in minimal industrial development. Logging referrals made up the major portion of staff work and ranged from applications for log storage on estuaries (Bella Coola/Stewart) to logging and road construction on unstable terrain.

Herbicide referrals are numerous since the Ministry of Forests (MOF) and logging companies are increasing the land base made available for reforestation.

A research project on the use of "Garlon", an unregistered herbicide, was scheduled to take place on islands on the Skeena River. MOF and FPMI, (Forest Pest Management Institute) initially could not be dissuaded to cancel this research project. The proponents wished to experiment with a new microfoil spray boom attached to a helicopter. In the opinion of DFO this research should have been planned for less fishery-sensitive areas. FPMI subsequently cancelled their plans to use Garlon in 1984; however, the proposed research could again be an issue in 1985.

In addition, staff handled referrals for the removal of large quantities of mud from Eucott Bay for pharmaceutical products and an application for water removal for foreign sale.

Biological Studies

a) Babine Lake Log Storage and Transport

In 1983, Houston Forest Products was granted conditional approval to develop a water transportation system in Babine Lake to facilitate the removal of beetle-infested timber from Morrison Arm. DFO and MOF are currently entering into the final year of a three-year joint study to determine what the impact of the log storage areas is on the fishery resource.

Babine Lake: preparations for underwater photographic surveys on log storage effects on benthos.

Habitat staff conducted a downstream trapping/beach seining program in the spring and an underwater photography survey in the fall. This information is pooled with the results of MOF's consultant each year. To date, the results are an increase in log debris at the storage site, reduced benthic organisms and the presence of a thick mucous-like slime from the logs.

Linear Development

a) Highways

Reconstruction and widening of Yellowhead Highway 16 between Terrace and Prince Rupert is nearing completion. The North Coast staff has recently met with Department of Highways officials and a compensation plan to create new marshland is being developed.

b) Railway

The development of the new coal and grain terminals on Ridley Island near Prince Rupert has resulted in increased traffic along CNR's northline track. A program to upgrade and expand this system has been ongoing for three years and will continue for at least five more. North Coast staff, Ministry of Environment (MOE) and CNR cooperate closely to ensure there is no net loss of habitat.

Fish/Forestry Interaction

Field work on the Fish/Forestry Interaction Program on the Queen Charlotte Islands was completed in 1984.

One of the projects was the improvement of spawning sites by installing gabions on Sachs Creek. The gabions have withstood numerous floods and have remained functional. A report on these projects will be published in 1985.

Job Creation Program

In 1984, young people were hired for fishery related projects. Northern Operations Habitat organized several projects to fulfill the need for additional information on a variety of areas and disciplines.

Two of the projects are described below; others are mentioned to provide a concept of the scope of the works.

a) Skeena River Estuary Study

Although the Skeena River system is one of B.C.'s largest salmon producers, biophysical knowledge of the estuary is almost nonexistent. A job creation crew of five was employed for five months to collect baseline data which will give better understanding of the biology and habitat utilization by juvenile salmonids within the estuarine zone.

b) Pallant Creek Coho/Cutthroat Interaction Study

A falls on Pallant Creek as it exits Mosquito Lake forms a barrier to anadromous fish. Removal of the falls would create substantial habitat on the lake and its tributary streams. To alleviate concerns of provincial agencies that a cutthroat trout population would be reduced by coho interaction, a study was undertaken with the support of staff from Pallant Creek hatchery and District staff. Conclusions of this investigation will be available in the fourth quarter of 1985.

c) Kitimat Estuary

A crew is collecting fish benthos and vegetation samples to document habitat utilization and primary productivity at a proposed development site in the estuary.

d) Habitat Inventory Collation - Nass/Skeena Watershed

A group collated known habitat information on the Nass and Skeena watersheds, and this was drawn on appropriate maps and indexed for future computer storage.

Habitat Inventory Program

Many of the streams on the north coast have not been formally documented to aid fishery officers and biologists in habitat and stock management. With the new habitat inventory program, Owikeno Lake tributaries were surveyed

and fish presence and habitat utilization documented. More work is planned for 1985. Another inventory project was carried out in the Kitkiata watershed in conjunction with Fish and Wildlife and District fishery officers.

Major Projects

During the year, two major projects were the subject of considerable investigation--Alcan Kemano Completion and Port Simpson LNG (liquefied natural gas) plant. Both of these projects are now held in abeyance pending market improvement.

Currently, the Ocelot ammonia plant at Kitimat and Klappan Coal appear to be the only viable major projects for Northern Operations.

Contact: Denis Rowse,
Senior Habitat Management
Biologist,
Prince Rupert.

A typical procedure for habitat inventory data collection.

Offshore

The Offshore Division was created to meet new surveillance, development and management needs arising from the establishment of Canada's 200-mile zone in 1977. As fishing activity within this zone has grown and diversified, Offshore Division's responsibilities have broadened.

Some of the responsibilities included in the Division's mandate are: developing and implementing a groundfish management plan; implementing an effective program of surveillance and enforcement; and managing offshore and near-shore trawl and longline fisheries, as well as other marine fisheries, such as the sablefish trap fishery.

Since Canada allows foreign countries to fish stocks unharvested by Canadian fishermen, the Division identifies surplus stocks, as well as those in which increased domestic activity has absorbed a previous surplus. Cooperative fishing arrangements between foreign countries and Canadian fishermen are authorized by the Division, as well as the terms and conditions under which foreign vessels are permitted to fish in the Canadian zone.

Contact: Ed Zyblut,
Manager,
Offshore Division.

Special Programs and Management

The Special Programs and Management Unit works closely with the Offshore Division manager to research and develop programs aimed at optimizing the

yield from offshore fishery resources. Through analyses of the Pacific fishing industry, experimental fishing, and processing and marketing programs, the Unit provides regional input into federal policy on foreign fishing within the 200-mile zone. The Unit also supplies data for international negotiations.

In 1984, the cooperative hake fishery, with fifteen Polish and four Soviet vessels taking part, netted approximately 42,000 tonnes of hake with a value of $4.7 million. During this fishery, the Unit, in conjunction with a federally-funded youth employment program, placed twenty-one observers on board foreign vessels to estimate catches and ensure adherance to Canadian regulations.

Experimental fisheries on squid brailing, seining for dogfish and sablefish mariculture were closely monitored by Special Programs. The Unit also monitored the offshore albacore tuna fishery and provided daily broadcasts of weather and fishing information.

In addition, the Unit serves as the regional contact for the International Halibut Commission.

Contact: Barry Ackerman,
Head,
Special Programs and
Management Unit.

Offshore Operations

The Offshore Operations Unit is responsible for the overall management of the groundfish resources in British Columbia. Both foreign and domestic fishing effort are monitored, in conjunction with the activities of the Surveillance and Enforcement Unit, to ensure that industry complies with quotas, management strategies and regulatory measures.

Some specific responsibilities of the Unit are to:

- coordinate the development and implementation of an annual groundfish management plan.
- develop regional guidelines for foreign cooperative and national fisheries
- compile and assess foreign and domestic catches, with a view to implementing closures or other regulatory measures upon attainment of quotas
- prepare licences, permits and fee assessments for foreign vessels engaged in both national allocation fisheries and cooperative arrangements with Canadian vessels
- maintain effective communications with other departmental agencies, commercial fishermen, industry representatives and foreign industry or government representatives
- evaluate and recommend changes to existing regulations and agreements pertaining to offshore fisheries.

Table 58

1984 Domestic Trawl Landings (t)

Species	1984*	1983
English Sole	798	532
Rock Sole	524	668
Petrale Sole	415	439
Dover Sole	1,124	871
Rex Sole	225	49
Starry Flounder	168	66
Other Flatfish	508	522
Pacific Cod	3,417	4,505
Lingcod	2,955	3,755
Sablefish	3,915	4,129
Pacific Ocean Perch	6,537	5,655
Dogfish	747	3,274
Pollock	706	1,070
Hake	3,056	3,122
Other Rockfish	7,561	7,024
Misc. Species	813	856
Total	33,469	36,537

* Preliminary data.

Table 59

1984 Foreign Fisheries

	Target Species	Target Quota(t)	Target Catch(t)	Incidental Catch(t)
Polish National	Hake	12,500	12,271	388
Polish Cooperative	Hake	12,500	9,213	106
Polish Supplementary	Hake	-	580	18
Soviet Cooperative	Hake	19,000	19,704	118

* Preliminary catch figures.

The management of domestic groundfish fisheries is conducted primarily by using the groundfish management plan. This document is the result of reviewing past performance, recommendations from the scientific community and meetings with both industry and advisory groups. In 1984, twenty-three quotas and four trip limits were implemented for management purposes. In addition, conservation concerns were addressed through area closures and the use of cluster quotas for various species of rockfish.

Contact: Keni Lorette,
Head,
Offshore Operations Unit.

Table 60

1984 Sablefish Catch (t)

Gear	1984*	1983	1982
Trap	3,343	3,375	3,340
K Longline	360	479	272
L Longline	32	7	18
Trawl	180	268	247
Total	3,915	4,129	3,877

* Preliminary data.

Offshore Surveillance and Enforcement

The Surveillance and Enforcement Unit has a responsibility to monitor both domestic and foreign fishing activities and to enforce management strategies and regulations in the offshore waters of the Pacific coast.

To fulfill the Offshore Unit's obligations, a variety of resources were used. The majority of surface patrols use DFO vessels and are supplemented by surface vessels and aircraft support from the Department of National Defence (DND). Canadian Coast Guard radio stations and Vessel Traffic Management centers provide valuable services and information.

Surveillance Activities

To assist the Offshore Division in its surveillance activities, DND provides regular Tracker and Aurora aircraft patrols. In 1984, Trackers flew a total of 522 hours on dedicated fisheries' patrols. In addition, Aurora aircraft logged a total of 320 hours. These flights are multi-tasked and while not directly assigned to Department of Fisheries duties, they do provide information if fishing activities

Table 61

1984 Surveillance Activities

Country of Origin	Vessel Sightings[1] (by surface patrol)	Vessel Inspections[2] (by Offshore F/Os)	Aircraft Sightings[3]
Canada	2,801	481	15,299
United States	20	11	20
Japan	0	2	0
U.S.S.R.	50	43	40
Poland	50	60	26
Total	2,921	597	15,385

[1] Includes vessels which may have been sighted on more than one occasion.

[2] Includes multiple inspections and does not reflect actual numbers of vessels operating in the Canadian zone. Included are both at-sea and port boardings.

[3] Includes vessels identified by name and/or gear type.

are observed during their patrols. These long-range aircraft also provide coverage of areas both inside and outside of the 200-mile limit which are outside the normal range of the Trackers.

Contact: J. Cairns,
Chief of Surveillance and Enforcement,
Offshore Division.

Operations Center

The Operations Center provides current information on commercial and sport fishing activities off the Pacific Coast of Canada to Department personnel, the fishing industry and general public.

During the year, Operations staff attended daily briefings and assisted management in gathering seasonal data and in preparing daily bulletins. This information becomes part of current and historical files maintained within the center for use by authorized personnel.

The Unit also produces two 24-hour recorded telephone messages for commercial and sport fishermen. These recordings provide an up-to-date summary of area openings, closures and regulations in effect during the season. The commercial fishing number is 669-2828 and recreational fishing information is available at 666-3169.

Contact: Vilma Miller,
Supervisor,
Operations Center.

Inspection

The Inspection Division of the Pacific Region maintains field offices and laboratories at the major fishing ports of Vancouver, Victoria and Prince Rupert. A subdistrict field office is located at Qualicum Beach to serve fishermen and processors located in the upper part of Vancouver Island. Processing plants, fishing vessels, transport vehicles and nloading sites are regularly inspected. Fish and shellfish products entering into interprovincial, export and import trade also receive inspection under authority of the Fish Inspection Act and Regulations to provide reasonable assurance that they consistently meet Canadian and/or foreign country standards for grade, handling, identity, process, quality and safety.

During 1984, the Inspection Division monitored 149 fish plants. A program of plant and product inspection was carried out to ensure production and marketing of quality products. Such inspections have become increasingly important because many importing nations will no longer allow products into their countries without accompanying certificates attesting to satisfactory quality and safety. Canada is the largest exporter of fish and shellfish products, therefore maintaining high quality standards is of prime importance.

The National Fish Quality Improvement Program, initiated in 1980, was fully integrated into the National Inspection Program. Quality improvement activities continued with the cooperation of industry in the areas of:

- improved quality control in processing plants: A quality control manual for groundfish processors is nearing completion. Efforts are being directed towards the implementation and enforcement of quality control and safety procedures for the bivalve mollusc processing and packing industry.

Inspectors are often asked to examine products for certification.

- quality grade standards for groundfish fillets: Inspection staff, together with groundfish processors, are investigating the applicability of Atlantic groundfish quality grade standards for Pacific species. Workshops, quality analyses and defect studies were initiated.

Fish Inspection field activities are reported in detail in sections dealing with Fraser River, Northern B.C. and Yukon, South Coast, and Northern Operations programs.

Contact: David Bevan,
Chief,
Inspection Division.

Inspection Engineering

The Inspection Engineering Section, with a staff of five, is responsible for the Regional Plant Construction Program, Facilities Compliance and Audit Program, including the Regional

Vessel Fish Hold Inspection Program and the Inspection Computer System and Evaluation Program.

In order to ensure that facilities comply with the Fish Inspection Regulation, the Engineering Section provides technical advice on fish plant construction and modification. The number of federally-registered processing facilities increased to 149 from the 145 reported in 1983.

The regional office is responsible for monitoring the compliance of the individual processing facilities under the Schedule I (Construction Requirements) and Schedule II (Operational Requirements) of the Fish Inspection Regulations.

In order that processing in all canneries could be evaluated and registered by the Department, heat distribution tests on all new retort installations was carried out during the 1984 canning season. Three new retort installations were evaluated to determine adequate venting procedures.

The container integrity program continued as a major project. The canning industry instituted quality control programs which have resulted in a lower production defect rate. The total production defect rate for Canadian canned salmon was:

- 1984: 6.4 defects/100,000
- 1983: 14.3 defects/100,000
- 1982: 11.6 defects/100,000.

The screening program for U.S. imported canned salmon resulted in a dramatic improvement in container quality level. The total production defect rate for U.S. import canned salmon after second screening of product was 8.7 per 100,000 in 1984, down considerably from 25.4 per 100,000 cans in 1983.

Table 62

Compliance Levels for Plant Construction (Number of Plants)

Schedule I (Construction Requirements)

	South Coast	Fraser River & Yukon Division	North Coast
A Excellent	57	28	26
B Good	38	40	61
C Satisfactory	7	23	23
D Fails[1]	6	9	0

[1] Plants failing inspection are closed or the registration is removed until the plant deficiencies are corrected.

Table 63

Compliance Levels for Plant Operations (Number of Plants)

Schedule II (Operational Requirements)

	South Coast	Fraser River & Yukon Division	North Coast
A Excellent	54	23	13
B Good	29	42	48
C Satisfactory	8	19	16
D Fails[1]	9	17	23

[1] Plants failing inspection are closed or the registration is removed until the plant deficiencies are corrected.

Vessel Hold Inspection

The Vessel Hold Inspection program is intended to ensure that the fish handling and storage facilities on board approximately 7,100 vessels in this region are constructed and operated to preserve the quality of the catch in a safe and sanitary environment. The program's success in the Pacific Region is reflected by the low failure rate in 1984.

Vessels Inspected		Failed Inspection
Construction	2,788	119 (4.3%)
Operation	334	18 (5.4%)

As well as applying to Canadian fishing vessels, the program has been expanded to include foreign (usually U.S.) vessels landing products at Canadian processing facilities. Canadian processors chartering U.S. vessels and many American vessel owners are now aware that these vessels must comply with the Fish Inspection Regulations. The number of vessels failing the inspection is low. Out of 33 U.S. vessels inspected in 1984, only one failed inspection.

The policy for licencing vessels to process fish on board ensures that all relevant DFO branches and the provincial Marine Resources Section have the opportunity to offer input to any new proposals. Vessels are now licenced to process dogfish, squid, geoducks and sea cucumbers on board.

The inspection of vehicles used in transporting fish and used as provincially licenced buying stations is coordinated by the Inspection Engineering Section. Of the 40 vehicle inspections carried out in 1984, four (10 percent) failed initial inspections.

The inspection computer system which has been in place for the past four years has been expanded to include an 80 MB hard disk to work in conjunction with the Wang 2200 LVP System.

The Inspection Division's Regional Management Information System (MIS) has been expanded to include use by laboratory staff, with the result that everyone in the Division is now benefiting from the time management system. MIS is also linked to a quarterly variance report.

Other files maintained on the computer are: the Canned Salmon Program (including the container integrity screening statistics); the Vessel Inspection Program; Plant Registration Program and the Word Processing Package.

Contact: Ian H. Devlin,
Senior Inspection Engineer.

Shellfish Coordinator

For the second year in a row, paralytic shellfish poison (PSP) outbreaks did not cause major closures of the commercial bivalve shellfish harvesting areas. The clam landings in 1984 exceeded 2,300 tonnes, representing a 40 percent increase over 1983. Part of this increase reflects the demand for shucked butter clams destined for the fresh and frozen market.

Gonyaulax activities were detected in the waters of greater Vancouver during the second week of July. As a result, Howe Sound and Burrard Inlet were closed on July 13 to the harvesting of all bivalve molluscs. Two weeks later, recreational boaters in Desolation Sound, Area 15, reported symptoms of PSP after eating clams they had harvested. Area 15 was then closed briefly for one week until further test samples from the area showed negative PSP results. On August 3, the Canadian portion of Juan de Fuca Strait was closed when mussel samples from Point-No-Point reached 190 micrograms per 100 grams of tissue. During the one-month period from mid-July to mid-August, minor PSP levels were detected at various sampling locations in the Strait of Georgia. None of these resulted in commercial closures.

On October 1, Area 12 was reopened for Manila and Littleneck clams. In addition, selected subareas were also opened to the harvesting of butter clams.

Sanitary closures of various durations were again initiated for the Crofton-Willy Island area, Kulleet Bay and Gabriola Bar, in Area 17. As a result of water quality resurveys by the Environmental Protection Service, Department of the Environment, five closures in Sooke previously closed

under Schedule I were lifted. The boundaries of the closure at Sooke Harbour were extended to include the Sooke Flats and the opposite shoreline of East Sooke.

The number of shellfish processing plants remained relatively constant at 57 as of December, 1984. Some of these processors have proceeded with expansions to upgrade their live holding facilities for the live crab and lobster trade.

The momentum towards mariculture accelerated during the year. The introduction of the French tube oyster spats collection method will increase the production of oysters within the next two years. With careful planning, British Columbia's shellfish industry will stand to gain a permanent share of the international market and retain it long after Expo 86.

Contact: Rudy Chiang,
Sanitary Shellfish
Coordinator.

Microbiology Laboratory

The microbiology laboratory was relocated to Burnaby during the year.

The total number of samples analysed decreased to 4,938 samples in 1984 from 5,154 samples in 1983.

There was a change in emphasis during the year with more domestic analyses and fewer imports examined. The number of domestic samples rose to 2,351 in 1984 from 1,861 in 1983. Import samples decreased to 2,587 from 3,293.

The imported product of greatest concern continued to be raw crustacea (57.5 percent of all import samples analysed). The incidence of salmonella-contaminated product has continued to rise.

One out of every ten inspected shipments of imported raw crustacea was

In April 1984, the Inspection Field Office and Regional Offices and Laboratories moved to new facilities at 2250 S. Road, Burnaby.

Table 64

Imported Raw Crustacea

	1980	1981	1982	1983	1984
Total Inspections	540	599	844	1,004	669
Salmonella-positive	10(1.9%)*	15(2.5%)	71(8.4%)	87(8.7%)	66(9.9%)
Excessive E. coli	20(3.7%)	37(6.2%)	29(3.4%)	58(5.8%)	11(1.6%)
Total Rejections	30(5.6%)	52(8.7%)	100(11.8%)	145(14.4%)	77(11.5%)

* Percentage of total inspections.

refused because of salmonella contamination.

There were 2351 analyses of domestic product in 1984. The product categories of primary concern were molluscan shellfish (24.8 percent of all domestic samples analysed), fish fillets and processed geoducks (24.6 percent), smoked fish (12.1 percent) and fish roe (13.1 percent). These categories accounted for 74.7 percent of all domestic samples analysed.

The compliance rate for domestic samples (i.e. the proportion of samples that met bacteriological guidelines) was better than 95 percent for most product categories. There were, however, four categories that showed a lower compliance rate: fillets (91.1 percent), water and ice (89.2 percent), molluscs (89.0 percent), and geoducks (79.5 percent).

After an absence of several years, sterility testing of heat-processed, low-acid canned food once more became a significant activity in the laboratory, primarily domestic salmon (1,800 cans).

Contact: Nick Neufeld,
Senior Inspection
Microbiologist.

Chemistry Laboratory

The 1984 activities of the Chemistry Laboratory fall in line with the overall objective of the Inspection Division to provide reasonable assurance that fish and fish products for domestic and export trade consistently meet Canadian and foreign standards for quality and safety.

The laboratory moved to new facilities during the year and experienced a change in problem areas.

The lower incidence of shellfish contaminated with paralytic shellfish poison (PSP) resulted in the smallest number of samples submitted for analysis over the past ten years. The amount of canned tuna requiring analysis for histamine--an indicator of decomposed fish--was also reduced. This was attributed to the significant improvement in products from the Philippines and Malaysia.

The analyses of food additives in imported fish products increased to 432. Food additives such as sorbic acid, benzoic acid and food color permitted at prescribed maximum levels in certain fish products, were generally in compliance with regulations. However, a problem was identified in the

use of prohibited sulphites in canned imported shrimp. The rationale for its use is the prevention of black spots (melanosis) which often form in shrimp shortly after removal from their environment. Out of 65 shipments examined, primarily from Malaysia and Thailand, 38 (59 percent) contained sulphite. Added sulphite was also found in imported canned crab meat, presumably to enhance whiteness. Twelve of 14 shipments examined were positive, of which four had an average showing greater than 100 ppm.

Another changing problem is the presence of extraneous or foreign material, particularly in canned imported fish products. The presence of insects, rust particles, charcoal, sand, paint chips, fibres, hairs, etc. is encountered too frequently in imported shipments of canned crab meat, clams and shrimps. For this reason, close to a thousand samples were analyzed, with the result that shipments were refused entry.

While the monitoring program for the presence of mercury in fish and fish products increased slightly to 306 from 234 analyses, there was a change in emphasis from imported to domestic products destined for the retail market. The results clearly confirm that products offered for sale to the Canadian consumer are safe.

Contact: Gin Farn,
Senior Chemist.

Table 65

Number of Analyses

	Domestic	Imports	Total
PSP	639	-	639
Histamine	-	1,439	1,439
Mercury	234	72	306
Food Additives	-	432	432
Extraneous Material	-	989	989
Heavy Metals	75	-	75
Trace Elements	32	-	32
Salt	47	26	73
Pesticides	-	-	220*
Others	106	145	251
Total	1,133	3,103	4,236

- Indicates no analysis.
* Analysis by Winnipeg Laboratory - (not included in total)

Product Inspection

The Product Inspection Division is responsible for the examination of imported and domestic fish, frozen and canned fish products to ensure that organoleptic quality (appearance, odor, flavor, texture, etc.), container integrity, additives and labelling comply with Fish Inspection, Food and Drug and Consumer Packaging and Labelling Regulations.

Product rejections are generally related to poor quality, container integrity, or improper labelling. Products which are decomposed or have in or upon them toxic substances or bacteria dangerous to the public's health are rejected as unacceptable for the consumer market. Canned products found to be underprocessed or having damaged containers may not be marketed and are detained until disposed of in a manner satisfactory to the Department. During 1984, the staff conducted 4,339 inspections of fresh, frozen and canned fish products.

The Canned Fish Inspection Laboratory examined 26,897 samples from 1,335 shipments, representing 8,738,959 kg of inspected product, an increase of 14.6 percent. The laboratory rejected 229 shipments, totalling 1,313,503 kg from these imports, an increase of 16.6 percent. During the year, the laboratory also inspected 1,284 lots of domestic canned salmon representing 14,946,867 kg. This is a dramatic decrease of 53 percent over the 1,486,136 cases (32,219,751 kg) in 1983.

The mandatory screening of all canned salmon continued to ensure proper container integrity. The screening by double dud detectors and check weighers is conducted as an integral part of labelling operations. A trend towards the screening of defective import lots has now developed.

The Fresh and Frozen Fish Inspection Laboratory examined 5,025 samples from 1,720 lots, representing 5,140 shipments of imported products which had a total weight of 11,227,975 kg. This represents a 5 percent increase in imports and a 10 percent increase in inspection, compared to 1983. The laboratory rejected 194 shipments totalling 272,503 kg, which represents a 3 percent decrease over the weight rejected in 1983.

The Division issued 512 export certificates for canned salmon in 1984, which represents a 15 percent decrease over the number issued in 1983. Approximately 316,500 equivalent 21.8 kg cases were certified.

Contact: Dom Di Palma,
Product Inspection Supervisor.

Habitat Management

Habitat management activities include enforcing appropriate sections of the Fisheries Act; investigating projects which threaten fish stocks and/or supporting habitats; conducting applied research; developing and maintaining intergovernmental and agency liaison and project referral systems; conducting internal and public information programs and coordinating the regional habitat restoration and inventory programs.

The Habitat Management Division in Vancouver is responsible for the development and implementation of habitat management policy, for conducting habitat planning functions and annual program reviews, the coordination of megaproject impact assessment, and the coordination and functional responsibility with three Area habitat staff.

Contact: Forbes Boyd,
Head,
Habitat Management Division.

Coordination, Inventory and Restoration

The Unit coordinates and plans habitat management activities within the Department and with various federal and provincial agencies. The Unit is currently finalizing a habitat management planning framework and developing specific plans for national policy implementation, fish habitat inventory and restoration programs, and participating in planning activities with provincial and municipal governments. The Unit is responsible for the participation of expert witnesses for prosecutions under the Act, job creation programs, and for developing workshops covering a variety of topics including cooperative resource management, no net loss and habitat restoration and development. In addition, the Unit has been directly involved with the Fish Habitat Management Branch in Ottawa in assisting in the review and development of the National Fish Habitat Management

Policy and in the preparation of implementation strategies.

Habitat Management Plan

Staff completed a draft habitat management section of the Regional Fish Management Plan, which is aimed at "conserving, managing and restoring fish stocks and their habitats." The habitat programs outlined to attain these objectives include:

- a regional overview of competing resource uses
- cooperative resource management
- habitat restoration and development
- maintenance and formulation of habitat research
- development of a comprehensive federal provincial habitat data base
- improved habitat enforcement
- programs fostering intergovernmental cooperation and liaison
- Federal/provincial Fish Habitat Inventory Program.

The habitat management plan is expected to be completed late in 1985.

Federal/Provincial Fish Habitat Inventory and Information Program

Habitat management strategies are dependent, in part, on a knowledge of the nature, extent, use and capability of available fish habitat to produce fish. Historically, the Department has been hindered by a lack of adequate knowledge on fish habitat. An information base on key watershed information and future watershed trends is not presently available in a useable format. In addition, both federal and provincial agencies require similar habitat information because of the overlap in freshwater fish habitat. To address this, the 1982 Pearse Commission on Pacific Fisheries recommended that:

"The government of Canada should invite the government of British Columbia to participate in a joint program aimed at compiling a comprehensive inventory of fish habitats in freshwater streams and estuaries in British Columbia. The inventory should describe the bio-physical characteristics of individual areas of fish habitat, and should include an assessment of their potential for producing fish."

In response to the recommendations the overall goal of the federal/provincial habitat inventory and information program is to compile a comprehensive inventory of the quality, quantity and productive capability of fish habitat in freshwater, estuarine and marine systems in B.C. The objectives of the program are:

- to identify habitat information required by both federal and provincial fisheries management programs
- to provide the means for coordination and cooperation in gathering, storing and retrieving habitat information
- to provide program funding for these activities, and for the coordination of other internal/external funding for habitat inventories
- to ensure that the products of the program are useful and used by Departmental staff.

A pilot project initiated in 1984, was to develop a computer-assisted digitizing and mapping process to provide a cost-effective means for storing, accessing and updating habitat information. The database will initially identify the present and potential distribution of salmonids, barriers and blockages to fish migration, and gradient profiles.

In 1984, two federal/provincial committees were formed to oversee the development and operation of the program. As well, "Pearse" positions have been established in the Habitat Management, South Coast and North Coast divisions to supervise the coordination, storage and retrieval of habitat information and to undertake field inventories. Subcommittees are presently being assigned with tasks to develop standards, criteria, computer systems, research needs, information links and so one.

Regional Habitat Restoration Program

The new staff position of regional habitat restoration biologist is responsible for developing links with government agencies and nongovernmental organizations, reviewing and documenting current restoration projects in the region, examining contemporary restoration techniques, developing restoration and evaluation guidelines and distributing program information to department staff.

In addition, the Unit established a program for identifying and coordinating large-scale restoration projects in cooperation with DFO, private industry and government agencies. A Regional Habitat Restoration Project Review Committee has been formed with representation from Habitat (Area and Core), Fisheries Research and SEP, and has met on a number of occasions to discuss potential restoration initiatives and to attempt to coordinate a habitat restoration program for the Region.

The program will assist the Department in meeting its resource goals and priorities by:

- providing a regional perspective on habitat restoration, mitigation and compensation
- priorizing restoration projects on a regional basis
- providing a large cross-section of expertise
- providing a focus for cooperative programs with outside organizations (e.g. Ducks Unlimited, etc)
- providing assessment and evaluation of restoration projects, techniques and strategies including socio-economic analyses
- coordinating the development of habitat restoration guidelines
- ensuring wide distribution of habitat restoration procedures, techniques and other information through regular committee meetings, seminars and workshops
- developing a regional habitat restoration and development plan
- assisting in the development and enunciation of regional restoration policy.

Restoration projects under consideration by the Committee include Tilbury Slough, MacDonald Slough (Sturgeon Banks) and the Cowichan River estuary. A habitat improvement workshop was held in Whistler, May 1984 with Canadian and U.S. Papers presented. Other activities pursued this year include producing a computerized bibliography of Pacific Northwest restoration reports, a catalogue of restoration projects completed by DFO, and a draft summary of restoration techniques and evaluation procedures used in the Region.

Workshops, Policy Development and Training Programs

The Unit coordinated workshops held to review the status of two major issues: cooperative resource management and no net loss. The intent was to examine, at a Regional level, items relating to the forthcoming national habitat policy document. These workshops provided for an initial dissemination of information and also a forum in which to discuss major habitat policy issues.

As a participant in the National and Regional Fishery Officer Career program, Habitat Management prepared teaching modules to introduce fishery officer trainees to various aspects of habitat management. Training sessions involved an introduction to Pacific and western regional habitat management organization and activities; ecology of habitat; habitat disturbances; field identification and sampling of habitat characteristics; steam restoration; and legal matters pertaining to habitat.

Habitat Prosecutions

The number and complexity of prosecutions for habitat offences has increased considerably since the amendments to the Fisheries Act in 1977. In order to improve and maximize the effectiveness of all Department staff involved in habitat litigation issues, the Unit prepared a procedure paper which:

- outlined roles of all participants
- formalized procedural steps
- outlined a reporting system to improve coordination and communication on cases and various habitat legal issues.

The Unit also initiated a Habitat Legal Reference Binder, containing record of charges, case summaries, reasons for judgement, habitat related Acts and Regulations and background papers.

Ministry of Environment

The B.C. Ministry of Environment has a mandate to plan for the management of provincial environmental resources, including water, air, fisheries and wildlife. Accordingly, strategic plans, based on resource supply and demand, management options and objectives, resource conflicts, and policy directives are being developed for various areas of the province. This Unit is coordinating the Department's input to the strategic planning process. In particular, the Unit provided fisheries resource (stock and habitat) information for the Thompson-Bonaparte and Fraser-Delta plans. Draft sections of the plans were reviewed within DFO and finalization is expected in 1985.

Municipal and Community Planning

The Unit coordinated departmental resource data input into a joint Comox-Strathcona regional planning process for the Baynes Sound foreshore area. A draft foreshore plan was reviewed by the Unit and DFO. Input to the final plan, through the Nanaimo District office, will continue in 1985.

Regional Resource Overview

An analysis of the regional overview of competing resource uses was completed in 1984. The purpose of the study was to identify the degree to which districts in the Pacific Region will likely require increased habitat management support as a result of increased pressures from competing land and water resource use.

Regional overviews contribute to and assist in establishing regional and area planning programs by identifying development trends for various resource sectors such as mining, energy and forestry which may have an impact on fish habitat. Specific development projects likely to proceed within five years were also identified for each management area. An internal report describing these data was prepared and will provide a basis for updating land and water use pressures and potential impacts.

Salmonid Habitat Evaluation Model (SHEM)

In spite of the wide natural variability of systems that produce salmonids, computer modelling can be used to link stock management strategies with habitat capability. A pilot model for coho was developed by Habitat Management in conjunction with the Cooperative Fisheries Research Unit of the University of British Columbia. The model, based on regional biostandards, continued to be developed and refined in 1984. Specific habitat characteristics and issues were used to test and improve the model and steps were taken to expand it to other areas and species. Specifically, a committee of habitat, SEP, and economic expertise was initiated to continue the SHEM development along the following lines:

- the model was used to test several stock scenarios for the Squamish River
- the economic component of the model was refined and improved
- the biostandards and biological inputs to the model were verified, defined and improved with new information.

Sport Fishing Piers/Artificial Reefs

The Unit continued to represent the Habitat Management Division on the DFO Artificial Reef and Sportfishing Pier Committee (ARSP) which provides a forum for discussion between Habitat, Research, Sportfishing, Economic and Small Craft Harbour components of DFO. Surveys of potential sites in the

Vancouver, Victoria, Nanaimo and Campbell River areas have been conducted. In addition, the Unit coordinated Habitat input into the development and review of two reports prepared for the ARSP Committee; one describing shore-based sport fisheries in Burrard Inlet and another providing site planning and design criteria for sportfishing structures.

Contact: Tom Bird,
Chief,
Coordination, Inventory and
Restoration Unit.

Land Use

The Land Use Unit provides specialized technical advice and functional direction regarding the prevention or mitigation of, and compensation for, adverse effects on fish habitat from land-based activities such as forest harvesting, railway construction and placer mining.

CNR Twin Tracking

This project involves the construction of 480 km of new track adjacent to the existing track between Valemount and Vancouver, along the Albreda, North Thompson, Thompson and Fraser Rivers.

Unit staff co-chaired a technical working group of federal and provincial agencies, CNR and consultant personnel. This group is undertaking an intensive technical review of the project, section by section, and formulating environmental design recommendations.

Construction began in 1984 on a 25 km section along the North Thompson River. Included was the creation of 1,500 m^2 of wetland at Peddie Creek to compensate for loss of coho rearing area. Environmental design recommendations were finalized for a 15 km section on the Thompson River from Basque to Martel.

Land Use Unit staff testify before the EARP panel inquiry on CN Twin Tracking.

Unit staff represented the Department at two series of public hearings on the project held in June and October by a Federal Environmental Assessment Review Panel at Clearwater, Kamloops, Lytton, Chilliwack and Vancouver.

Fraser-Thompson Transportation Corridor

The second part of the CNR twin tracking EARP panel's mandate is to examine potential transportation options along the Thompson and Fraser rivers from Kamloops to Vancouver and obtain agency and public input on associated environmental impacts. Unit staff attended a workshop to review a preliminary sensitive area analysis. Further workshops are planned for 1985 to develop the topic in more detail, prior to the Panel submitting recommendations to federal Ministers.

Vancouver Island Gas Pipeline

The British Columbia Utilities Commission concluded public hearings in July on the mainland to Vancouver Island portion of the pipeline project. The Commission recommended that the southern route from Roberts Bank to Nanaimo be chosen over the alternative northern route from Williams Lake to Powell River to Comox. They further recommended that B.C. Hydro be granted the energy certificate for construction of this portion of the project.

Further public hearings on the on-

island portion of the project were suspended by the provincial government until a federal commitment for funding is received.

In anticipation that the hearings will resume, DFO conducted a thorough review of the various route alternatives proposed for the on-island portion.

Once hearings have concluded and the successful applicant and route determined, DFO will become involved with the proponent in selecting final rights-of way, reviewing designs for stream crossings and monitoring construction to ensure that fisheries resources are protected.

B.C. Placer Mining

In July DFO signed a protocol agreement with several B.C. Ministries to establish Regional Placer Committees. The committees consist of regional representatives of agencies which have concerns regarding placer mining activity.

Through the establishment of these committees, it is anticipated that reviews of placer lease applications will be expedited. Associated with the protocol agreement, the Province of B.C. has also proposed substantial revisions to the administration system. These revisions are currently under review by DFO.

Departmental officials will be working closely with provincial counterparts to finalize an administrative procedure for placer mining which will streamline review procedures, and also ensure that protection of fisheries resources is not diminished.

Canadian Access to Alaska Panhandle

In 1984, the Department was asked by External Affairs for a preliminary assessment of the effects on fish and fish habitat of various options for a transportation route through the Alaska Panhandle to tidewater. Several routes were identified involving major salmon streams such as the Stikine, Iskut, Taku, Tatshenshini, Nakina, Alsek and Unuk Rivers.

Due to the lack of specifics available on route alternatives and the scarcity of resource information on the area, DFO was unable to advise on a preferred route alternative. The Department provided a general assessment of the potential impact on fisheries resulting from transportation developments and advised External Affairs that detailed studies and additional baseline data would be required before an informed decision could be made.

Annacis Crossing

In 1984, the Ministry of Transportation and Highways (MOTH) constructed two large sand islands in the Fraser River between St. Mungo's Bend and Annacis Island to provide protection for the piers supporting the new Annacis Bridge. DFO's major concern was that the islands would impede the upstream migration of salmon, particularly early Stuart sockeye. Hydraulic modelling studies were carried out by MOTH on the islands and, as a result, several groyne structures were installed along the face of the islands to create low velocity areas to ease fish passage. Monitoring studies were carried out by MOTH to assess their effectiveness.

ALRT Fraser River Crossing

In April 1984, B.C. Transit advised DFO and other agencies of their intention to construct a bridge between New Westminster and Surrey as part of the ALRT Surrey extension. The bridge will be built across the Fraser River, downstream of the Pattullo Bridge and will be supported by four bridge piers.

In July, consultants for the project held a workshop for concerned agencies and organizations. DFO concerns identified at that time included protection of potential fish rearing habitat on the south shore and possible interference with adult upstream migration.

Specifically, increases in local and average water velocities resulting from the bridge pier construction and the effects on the early Stuart sockeye and pink salmon runs needed to be assessed.

As a result of the workshop, the consultants are proceeding with further assessment and will develop an environmental report for departmental review early in 1985.

Forest Harvesting

a) Carnation Creek Watershed Project

This project, which was set up to gather information on the effects of logging on a small west coast watershed, is nearing the end of the post-logging assessment phase (1981-1985). Prelogging data were gathered between 1970 and 1975 to calibrate the watershed and establish baseline conditions. This was followed by six years of logging (1975-1981) during which time 41 percent of the watershed was clearcut and three different logging treatments were used in the streamside cutblocks.

Studies of spawning gravel quality, changes in stream channel morphology and large organic debris patterns and streamflow impacts continued. Findings include:

- gravel sampling has continued to show an increase of fines (small silt-like particles) following logging. Previously noted increases in the sand and fine portions of the spawning gravels continued. The number of sample points decreased in 1984 due to increases in pool depths which prohibited use of the freeze core samplers
- stream channel changes continued as evidenced by streambank erosion, changes in pool/riffle combinations, and alterations in channel profiles. The large organic debris in the channel continued to be redistributed downstream.

In 1984, several major events occurred at the creek. In January, the highest streamflow in the life of the project was recorded with a maximum instantaneous discharge of 64.9 m^3/sec (2,292 cfs). In October, a second major storm occurred which generated a maximum discharge of 28.2 m^3/sec (996 cfs).

Associated with the January storm, there was a slope failure in the canyon and a major mobilization of debris and gravel in the stream channel downstream. There were also two debris torrents in gullies in the upper logged area.

In September, the forestry agencies involved in the project conducted trials using aerial application of the herbicide "Round Up." The experiment is to monitor the impact of brush control in flood plain areas on fish and fish habitat.

As a result of the changes observed in the postlogging phase, plans are being developed to continue the monitoring process in order that the full impact can be adequately assessed.

b) Coastal Fish/Forestry Guidelines

DFO, the Ministry of Forests, the Ministry of Environment and the forest industry continued to work on four areas of the guidelines: administration, falling and yarding, roads, and silviculture. A final draft was produced at the end of the year and reviewed with senior management of the concerned agencies. Implementation procedures are being developed for trails that may commence in 1985.

c) Rate-of-Cut

Rate-of-cut in watersheds with fisheries concerns was identified as a section of the coastal fish/forestry guidelines which required further technical input. A committee composed of the Council of Forest Industries, DFO, MOF and MOE developed a workbook for field personnel in addressing rate-of-cut concerns and determining what limits should be imposed on the amount of a watershed which may be harvested over a given time span. In conjunction

with this workbook, a discussion paper outlining the rationale for using a reference level rate-of-cut was initiated. The workbook will be field tested in 1985 and revised where necessary. Information gaps are being identified and studies will be proposed to address those gaps.

d) Queen Charlotte Islands - Fish/ Forestry Interaction Program

This multidisciplinary study is sponsored by DFO and the provincial Ministries of Environment and Forests, with additional support from the Canadian Forestry Service and Forest Engineering Research Institute of Canada. The objectives of the study are to:

- document the extent and severity of the impact of debris torrents and landslides on fish habitat and forest sites
- investigate the potential of alternative logging planning and methods, including the use of skylines and helicopters, to reduce the incidence and severity of logging-induced slope failures
- assess alternative silvicultural treatments for maintaining and improving slope stability
- investigate the feasibility of rehabilitating stream and forest sites damaged by debris torrents and landslides.

Unit staff have been actively involved in the Technical Advisory Committee which guides the program.

Field work on the component studies of the program was completed in 1984. Working papers were published on:

- fish/forestry interaction program overview
- concepts of sediment transfer and transport
- regional overview of mass wasting
- natural revegetation, soil development and forest growth
- stream rehabilitation studies - a review of potential techniques
- spawning area improvement using gabions
- watershed rehabilitation options for disturbed slopes.

A second issue of the "Project Newsletter" was published during the summer. For other areas of the project, data analysis and report writing continued. During the final year of the project (1985), the emphasis will be on the publication of the remaining reports, the preparation of two interdisciplinary reports dealing with the impact studies and the prescriptive studies, and the development of management guidelines.

e) Campbell River Estuary Rehabilitation

In 1982, DFO, B.C. Forest Products Ltd. (BCFP) and other agencies worked together on a new facility for log handling and storage. An area of the estuary was rehabilitated to provide productive estuarine habitat. Five islets were constructed within the area of the old booming grounds, and log and debris accumulations were cleaned up. Marsh grasses were planted on the islets.

A report describing the design, construction and preliminary follow-up study results was published in 1984. Monitoring of the islets and assessment of their success continued.

f) Subsidiary Agreement

In 1983, the provincial Ministry of Forests unveiled a plan whereby holders of Tree Farm Licences (TFLs) could accept increased responsibility for management of timber resources. During 1984, Unit staff contributed to the formulation of the proposed subsidiary agreements, to ensure that the constraints needed to protect fisheries and fish habitat are clearly spelled out in the agreement documents.

Contact: John Payne,
Chief, Land Use Unit.

Water Quality

The Water Quality Unit is responsible for ensuring that acceptable quality conditions are maintained in the freshwater, estuarine and marine environments. The mandate of the Unit is based on the Fisheries Act (Section 33.2) which prohibits the deposition of deleterious substances into waters frequented by fish. Other sections, such as 33.1, provide authority to deal with specific pollution problems and to protect fish habitat.

Major responsibilities of the Unit include coordinating the review of major industrial developments such as new mines and proposed offshore oil and gas exploration; participating in national regulations review and policy development exercises; providing technical advice and training to area habitat and enforcement staff; and managing the DFO component of the joint DFO/EPS chemistry laboratory.

Freshwater Section

a) Regulations Review

As part of the current industry - government review of the Fisheries Act Pulp and Paper Effluent Regulations, consulting expertise has been obtained to produce a comprehensive review of the impact of pulp mill discharges. The consultants' report, once approved, will consist of a background information base for final discussions concerning the terms of any modifications to the toxicity provisions of the Regulations.

b) Acid Rain Monitoring Program

Two reports, near completion, outline the Region's activities and findings on baseline steam water and snowpack quality. A five-year study proposal for expanded Pacific Region studies has been forwarded to Ottawa Headquarters for inclusion in the DFO National Acid Rain Program Proposal.

c) Forestry Herbicides

Initiatives from the chemical industry and the Canadian Forestry Service to field test efficacy and off-target impact of brush control herbicides were addressed. Additional requests to field and laboratory test other herbicides are anticipated in the coming year as part of the registration and impact review process for proposed new pesticides.

d) Lower Mainland Refuse Landfilling

A review of the Lower Mainland Refuse Project's Concepts Report was completed and a DOE/DFO regional position paper was submitted. A Waste Management Plan is anticipated early in 1985 and will be critically examined to ensure that Departmental objectives in fish habitat management are fully recognized and addressed.

e) Quinsam Coal

Quinsam Coal Limited proposes to develop a million-tonne-per-year thermal coal mine in the middle Quinsam Lake area near Campbell River on Vancouver Island. The Quinsam River sustains natural populations of Pacific salmon and is also the site of the Quinsam River salmon hatchery. The department has been actively involved in the review of the project to ensure that existing water quality of the system is maintained and these fisheries resources protected.

In 1984, a report was released from the B.C. Commission of Inquiry into the project. As a result of deficient data on nutrient impact assessment, the department (FRB) initiated an independent nutrient research study.

The Unit will be reviewing the results of the study, developing a position and providing comments on outstanding provincial waste discharge permits.

f) Other Mines

The Unit reviewed a number of preliminary (prospectus/stage I) mining proposals including Telkwa Coal

(Smithers), Eaglet Fluorspar Mines (Quesnel), Mount Klappan Coal (Dease Lake) and Kutcho Creek Lead-Zinc Mine (Dease Lake). The Unit also reviewed various permit amendment applications, for Equity Silver Mine (Houston), Carolin Mines (Hope), Endako Mines (Endako), and abandonment plans (Bell Copper/Granisle Copper (Babine Lake), Canada Wide Mines (Stewart). The Unit was also responsible for coordinating overall departmental involvement in the mine review process.

g) Hazardous Chemicals Review

As part of a national review of the Department's involvement with hazardous chemicals issues, staff prepared a regional overview of research and other activities. Regional requirements for resources to address specific chemical hazards priorities were identified. A number of reviews of draft departmental policy documents were carried out.

h) Kemano Task Force

A member of the Unit was seconded to the Kemano Task Force for six months in 1984. As a principal investigator, that individual critically reviewed the various water quality implications of Alcan's hydro expansion proposal. A critique of the proponent's Impact Statement was produced in consultation with scientists in FRB and the International Pacific Salmon Fisheries Commission. Data shortfalls were identified and necessary monitoring and assessment strategies were designed.

i) Other Issues

Numerous public and industry inquiries were addressed and technical advice regarding freshwater pollution matters was provided to area habitat staff and fishery officers.

Marine Section

a) West Coast Offshore Oil Exploration

The Marine Section continued to coordinate Departmental participation in the public review and hearing process associated with the Chevron and Petro-Canada proposals to undertake oil exploration in West Coast offshore waters. Departmental coordination is being accomplished under the auspices of the DFO West Coast Offshore Developments Committee (WESCOD) which is chaired by the Marine Section and includes Regional and Headquarters Habitat, Research and Oceanographic representation.

The Marine Section participated in many multiagency meetings and workshops associated with this public review process, including a large government/industry workshop sponsored by the federal and provincial energy agencies to review the exploration proposals.

With the appointment in 1984 of an Environmental Assessment Panel, the requirements of government and industry in the proposal review and a tentative public hearing schedule were identified for the joint federal/provincial review and hearing process. Public hearings are tentatively scheduled for May and June 1985.

In response to the Panel's requirements, WESCOD undertook intensive reviews of the proposals and prepared several significant and comprehensive informational submissions to the Panel.

b) Hazardous/Toxic Material Transportation and Storage

The Marine Section reviewed several proposals to locate storage and transshipment facilities for petrochemicals and fuels within the lower Fraser River.

The Department has maintained strong opposition to industry initiatives involving increased handling and transportation of toxic materials and a corresponding increase in risk to fisheries resources in the lower Fraser River and estuary.

c) Ocean Dumping Control Act (ODCA)

The Marine Section reviews ODCA applications, which are presently directed to decentralized area habitat management for review and response, and provides Area staff with assistance/

advice on contentious issues (for example: False Creek dredging/dumping).

The Marine Section reviewed dredging/dumping proposals and helped area staff with several matters associated with the B.C. Place/Expo 86/City of Vancouver developments in False Creek.

d) Marine Pulp Mills

Area habitat staff and the Marine Section are involved in aspects of major pollution abatement and modernization requirements at several coastal mills.

e) Iona Sewage Treatment Plant

A regional position on the Iona sewage discharge was developed following review of reports on sewage treatment/disposal options. The recommended option is the installation of an extended outfall and discharge of sewage via diffusers.

f) Marine Emergency Spill Response

The Unit provided technical advice to area habitat management staff and enforcement personnel and legal expert witness testimony pursuant to several oil/fuel spills.

g) Training/Education

Freshwater and Marine Section staff conducted a four-day training program for North Coast habitat management and enforcement staff. Technical presentations included offshore oil exploration/development, mining, pesticides/contaminants, and emergency response.

h) Amax Molybdenum, Kitsault

Final reports on studies carried out to assess the impact of mine tailings from the Amax mine on Alice Arm were completed. These included reports on heavy metal accumulation in crabs and bivalves; parasitic infestation of king crabs; metallothionein induction; tailings burial studies and tissue histology.

i) Grey Whale Mortalities

During 1984, there were several incidents of dead grey whales on beaches in lower Georgia Strait and Puget Sound. The Marine Section responded to many media inquiries/interviews and prepared Ministerial/senior management briefing material. In cooperation with Fisheries Research Branch marine mammal scientists, a preliminary contingency/response plan was discussed and adopted.

j) Other Issues

Numerous other inquiries/proposals from the public and industry were addressed and the appropriate response or assistance to area habitat management staff was provided.

Chemistry Laboratory

The Department of the Environment (Environmental Protection Service) and the Department of Fisheries and Oceans (Water Quality Unit) jointly fund and staff an environmental chemistry laboratory in West Vancouver. In conjunction with the aquatic toxicity laboratory in North Vancouver, a wide range of chemical analysis and bioassay services are provided to DFO program staff. Main users are the Field Services Branch district offices, the Habitat Management Division, and the Salmonid Enhancement Program.

The laboratories provide three major services: routine, emergency and legal. High volume routine analyses are supported by sophisticated instrumentation and data processing equipment. Emergency response services provide field staff with immediate and accurate data. Legal services produce data for use in court proceedings. Laboratory staff are qualified to present such data as expert witnesses.

In 1984, the laboratories conducted approximately 41,000 analyses for DFO. Twenty-five DFO legal cases were processed, and staff made four court appearances in support of DFO legal actions. Highlights included the large chlorophenol spill in south Surrey, the Carolin Mines court case, and the investigation of "black spot" disease

in Esquimalt Harbor crabs.

Contact: Mike Nassichuk,
Chief,
Water Quality Unit.

Water Use

The Water Use Unit has a permanent staff of four, responsible primarily for resolving large-scale problems related to hydroelectric generation, water diversions and marine and estuarine developments such as ports. During the early part of 1984, the Unit's major initiative involved preparing for and holding public meetings on Alcan's Kemano Completion Project. Following these meetings, three of the Unit's staff members were seconded to the Kemano Completion Task Force. Following the Unit's temporary reorganization, major activities included impact assessments for the McGregor hydroelectric proposal, preparations for the Inquiry on Federal Water Policy, and the preparation of a background paper related to marina guidelines.

Freshwater Management Section

The Freshwater Management Section is involved mainly in assessing the impact of hydroelectric and thermal power projects; in mitigation/compensation negotiations; in water management and resource maintenance flow studies; and in reviewing water licence applications to determine screening requirements and the need for establishing resource maintenance flows.

a) McGregor Report Review

Late in 1983, with reference to the McGregor River hydroelectric proposal, the Department was asked to identify the scope of fisheries studies that would be necessary to meet DFO requirements and also to outline the criteria that would be necessary to judge the project's acceptability.

The concept of a McGregor River dam was first put forth in the mid 1950s as one of several options to reduce flood risk on the Fraser while at the same time generating hydroelectric power. From the 1950s to the 1970s, Fisheries staff and other agencies investigated engineering and environmental aspects related to Fraser River flood control and hydroelectric generation, including a McGregor dam. Both diversion (from the McGregor drainage to the Peace drainage) and nondiversion alternatives have been examined for the McGregor River.

In 1976, B.C. Hydro prepared terms of reference for detailed environmental studies. The studies began, but in January 1978, B.C. Hydro announced a suspension of the project based on information which indicated the diversion could introduce harmful parasites from the Pacific drainage into the Arctic drainage.

In order to satisfactorily complete the review of existing information, the Unit coordinated the involvement of technical experts both within the Habitat Management Division as well as within area habitat groups, Fisheries Research Branch, SEP, Western Region and the International Pacific Salmon Fisheries Commission. Our review has highlighted several issues including those associated with the impact of the transfer of water and fauna between the Pacific and Arctic drainages and the impact of changes in water temperature, flow, level and quality on McGregor and Fraser River fish and fish habitat. A report addressing all the technical aspects is expected in early 1985.

b) Deadman River

Construction of a storage dam on the Deadman River, a tributary of the Thompson River, was completed in the mid-seventies. Funding for the development was provided by the federal Department of Regional Industrial Expansion and the B.C. Ministry of Agriculture under the Agriculture and Rural Development Subsidiary Agreement. The objective of the development was to provide water storage at

Snohoosh Lake reservoir to meet the irrigation demand and to alleviate low flow problems for fish during summer and fall.

In 1979, a legal agreement was drafted by the Department and the Deadman's Creek Improvement District. The purpose of the agreement was to specify legal obligations regarding flow releases in order to protect fisheries resources, and to outline a plan for sharing of costs pertaining to operation, repair and maintenance of the flow control structure. This agreement was not signed until 1984, when Unit staff successfully revised the document. This document will likely serve as a model for future joint agreements between DFO and others.

c) Whitehorse Rapids Compensatory Hatchery

The hatchery built by the Northern Canada Power Commission (NCPC) to compensate for mortality of chinook smolts in the turbines at its Whitehorse Rapids hydroelectric station on the Yukon River proceeded to an operational phase during 1984.

Discussions were held with DIAND, NCPC, Ottawa Habitat staff and SEP. NCPC supplied money to operate the hatchery during 1984, and SEP took on the responsibility for overseeing its operation in 1984. Long-term funding arrangements are yet to be resolved.

d) Stikine-Iskut Hydro Projects

A U.S. interagency task force meets at regular intervals to review information related to assessing impacts associated with the proposed B.C. Hydro dams on the Stikine-Iskut system. The Unit attends these meetings; they are a valuable forum for exchange of technical information.

Although B.C. Hydro announced suspension of all studies on the project, a considerable amount of information has been collected relevant to the proposed dams. The Unit is currently assembling all available information with a view to obtaining resources to prepare a summary, an evaluation and a record of DFO's concerns about the project.

e) Inventory of Dams in B.C.

A job creation crew is preparing an inventory of all dams on steams utilized by Pacific salmon. Information under each dam will have four components: data on physical structure and flow regime; information on fish utilization and distribution; and information on existing minimum flow agreements, including comments on the impact on the fisheries resource. Completed copies will be available to the area habitat staff and fishery officers.

f) Coquitlam River

As reported in previous FSB annual reports, an ad hoc "Pipeline Road Mining Review Committee" was formed to provide a focus through which operators might have their plans examined. Since 1981, there have been a number of changes in the mining operations as well as reductions in the number of operators. The ad hoc committee was disbanded in December 1984.

g) Inquiry on Federal Water Policy

At the request of the federal Environment Minister, an inquiry was carried out to examine federal waste policy with an aim to avoiding a future water crisis. DFO was a major contributor to the Inquiry and participated in the public meetings. Unit staff wrote sections of the national DFO submission, coordinated Regional reviews of the draft document and attended the Vancouver meetings of the Inquiry. In December 1984, the Department made its written submission to the Inquiry.

Foreshore Management

The Foreshore Management Section works with area staff in reviewing major port, marina and other types of development proposals in estuarine and marine areas, in order to preserve and protect productive fish habitats. Upon

request, advice is provided to area staff on the handling of project reviews submitted through established referral systems. The Section often represents the Department on various foreshore management and planning task forces, working groups and interagency studies. This year, Foreshore Management assessed the implications to the Department, of the Environmental Assessment and Review Panel Report on the Beaufort Sea hydrocarbon production and transportation proposal, reviewed the Campbell River Indian Band marina proposal and sat on the Roberts Bank superport Environmental Review Committee. Staff also produced a draft background report on marina impacts as a preliminary to preparing development guidelines.

a) Roberts Bank Superport

The National Harbours Board's expansion of the Roberts Bank superport in the Fraser River estuary has been reviewed by an Environmental Assessment and Review Panel (EARP). At the review, the Department successfully defended the position that full-scale expansion was unwarranted and unacceptable. EARP subsequently recommended to the federal Minister of Environment that a reduced expansion should proceed and this work has since been completed.

Staff continue to represent the Department on an Environmental Review Committee which is acting on the EARP recommendations, including those related to replacing lost productivity. Crab studies have been completed and a summary report on the four years of crab studies prepared. A survey of fish and benthic utilization of artificial habitats created as part of the compensation program was also undertaken with assistance from area staff. In addition, field and laboratory work related to eelgrass limiting factors, transplanting techniques and changes in the aerial extent of eelgrass beds was commissioned and completed.

b) Arctic Offshore Development

The Unit represents the Pacific and Yukon region on the Arctic Offshore Development Committee (ARCOD). ARCOD provides a Department-wide forum for the coordination of advice on marine environmental and related socioeconomic issues arising from Arctic offshore developments.

A major activity was the participation in a review of the "Final Report of the Environmental Assessment Panel on the Beaufort Sea Hydrocarbon Production and Transportation Proposal". This review culminated in a report, "Response to the Final Report of the Environmental Assessment Panel on Beaufort Sea Hydrocarbon Production and Transportation." The response outlines how the Panel considered DFO's submissions and identifies how the Department proposes to respond to the recommendations of the Panel.

In addition, the Unit provided input to other northern activities, such as the proposed port development at King Point. It has provided advice on the Department's role in the Inuvialuit Agreement - Environmental Impact Screening and Review Process, reviewed material from the Northern Conservation Task Force and identified potential studies under the Northern Oil and Gas Action Program.

c) Campbell River Indian Band Marina

The proposed Campbell River Indian Band marina and waterfront development would provide berthage for 1,000 pleasure craft and 200 commercial fishing vessels. In addition, proposed upland developments include a civic center, hotel, retail developments and commercial fishing facilities.

During the past year, the Unit attended meetings with the Band and others, documented potential impacts and identified the necessity of habitat compensation measures in the marina basin and possibly in the Nunn's Creek portion of the Campbell River estuary should the development proceed. The concept of an Environmental Management Committee charged with identifying

impacts and implementing appropriate mitigation and compensation measures has been proposed and is being studied by all parties involved.

d) Tsawwassen Salt Marsh Dyke Alignment

In 1976, construction of a flood control dyke around the Tsawwassen Indian Reserve salt marsh was stopped in order to ensure protection of productive fish habitat. Alternative proposals were investigated and in 1983 a mutually acceptable proposal was developed which incorporates DFO requirements concerning tidal flows through the offshore dyke or breakwater, and the limitations imposed by the Tsawwassen Indian Band Council (TIBC) on the height of the road which constitutes the existing inshore dyke. In 1984, the Department of Indian Affairs and Northern Development made a submission to Treasury Board seeking funds to meet the additional costs associated with the revised scheme. Final construction drawings incorporating special features such as the gap, culverts and ditches have been submitted to the Department for review. The project will move into construction phase if the final plans are acceptable and if Treasury Board approval is obtained.

e) Marina Guidelines

In order to minimize, if not eliminate, the harmful impact of marina construction and operation on fish and fish habitat, the Water Use Unit plans to produce marina guidelines. A background paper is being finalized which discusses available information on the known impacts of marinas. It contains sections dealing with site selection, marina design and construction methods, and operation and maintenance. The marina design and construction method section is subdivided into overall marina design, flushing, general construction methods and activities, dredging, blasting, breakwaters, bulkheads, docks and piers, boat launching ramps, channels, sewage disposal, fueling and oil pollution. In addition, guidelines for marinas developed by other jurisdictions have been examined. The Unit is also codirecting with South Coast area habitat staff, a job creation field study investigating habitat conditions within selected B.C. marinas. Once completed, a technical committee will review the information and begin drafting actual guidelines for the siting, design, construction and operation of marina facilities in British Columbia waters. Upon completion of the guideline document, it is anticipated that the guidelines will be implemented on a trial basis, assessed as to their practicality and usefulness, adjusted as necessary and publicly released.

Contact: Gordon L. Ennis,
A/Chief, Water Use Unit.

Kemano Completion Task Force

Previous submissions to annual reports have provided considerable background information to the Water Use Unit's activities regarding the Kemano Completion Project. Only those activities undertaken in 1984 are reported here.

A discussion paper, "Toward a Fish Habitat Decision on the Kemano Completion Project" was released in January 1984. At the same time, the International Pacific Salmon Commission released the paper, "Potential Effects of the Kemano Completion Project on the Fraser River Sockeye and Pink Salmon."

Following release of the DFO and IPSFC papers, a series of public meetings were held in the communities of Vanderhoof, Smithers, Vancouver and Prince Rupert during March and April to give the public an opportunity to comment or ask questions on the papers. The meetings also provided input to DFO as it proceeded to formulate a position with respect to the project.

Upon completion of the public meet-

ings a verbal report was made to senior management of DFO in Ottawa. It was agreed that because of the magnitude and complexity of this project and the implications it has for the fisheries resources of the Morice/Bulkley and Nechako River systems, the Department assigned a special task force to address the project.

The Kemano Completion Task Force was formed to carry out three tasks:

- to review and respond to Alcan's Energy Project Certificate Application and supporting documents, including a 22-volume Environmental Impact Statement
- to prepare a DFO position on the proposed development and participate in a formal hearing
- to review any findings of a hearing or inquiry and prepare recommendations to Cabinet.

These tasks encompassed a number of subjects including biology, economics, hydrology, water quality and mitigation.

The Task Force established a liaison with the staff of the provincial Ministry of Environment who were also undertaking the extensive review of the proponent's applications and supporting documents. This liaison ensured that duplication of effort was avoided and that there was a consistent approach to the presentation of technical information.

In October 1984, Alcan announced the decision to postpone further review of its application. The company also stated its commitment to realizing the potential of the Kemano Completion Project when conditions permitted. Since the announcement withdrawing Alcan's application, the Kemano Task Force has directed efforts towards winding down its activities. At time of writing, a review of the environmental documents is nearing completion and an audit trail of the activities of the Kemano Task Force has been completed.

Contact: Rod Bell-Irving,
Director,
Kemano Completion Task Force.

Management Services

During 1984 the first organizational elements of the enforcement program were put into place. Three Division enforcement coordinators were selected and will work out of Division headquarters offices. It is expected that these units will be fully staffed by the end of 1985, although planned activities will commence early in 1985.

The National Enforcement Committee met several times in 1984 and reviewed issues ranging from fishery officer rank insignia to the Department's firearms policy.

Twelve new fishery officers were hired in order to fill upcoming enforcement positions and they represented a significant percentage of those who attended the National Training Program in Ottawa.

Land claims negotiations have continued with the Nishga. While some progress has been made in the areas of catch allocation and joint management, there are still wide gaps between the two positions.

Contact: Alan Gibson,
Chief,
Management Services Division.

Field Services Systems

Regulations

The Acts and Regulations are the main tools for management, control and protection of the fisheries resource. Without these, none of the aims and objectives of the Department could be met or maintained.

The Regulations Unit is responsible for compiling and forwarding all proposed changes to regulations in the region.

Regulations processing did not fare as well as was expected. The change in government delayed promulgation of regulations in 1984. The annulment of licencing regulations resulted in confusion and necessitated some emergency amendments to these regulations.

A large number of amendments to the Sports Fishing Regulations were passed. Delays in getting these through the process also resulted in delays to follow-up amendments promised for 1984 to be delayed until 1985. In addition, regulations in the works in 1983 did not pass in 1984. More stringent review procedures promise further delays for 1985.

On the positive side, amendments are now better prepared and as the regulations are in reasonably good shape, fewer large packages will be required.

Enforcement

The voluntary penalty system was finalized and will be implemented in 1985. This will reduce the amount of time fishery officers spend in court, thereby allowing for more field time. Earlier implementation plans were frustrated by problems with the provincial court system.

Court Liaison Officer

This officer spent the better part of the year dealing with constitutional issues. These ranged from the effect of higher court decisions on the Charter of Rights and Freedoms on fisheries enforcement to jurisdiction in fisheries.

Violations

Enforcement officers charged 1,139 violators, involving 1,449 charges. Of the charges filed, 489 have not yet been resolved; they will be going to trial in 1985.

The number of convictions at trial is very low. Of 120 charges where the defendant pleaded "not guilty", there were 47 (39 percent) convictions. Fifty-nine charges (49 percent) were dismissed in the trial process.

Total fines assessed against convicted violators was $71,741. The average fine is $152., with the highest fine being $4,500 and the lowest $2.50.

Five individuals were sentenced to jail terms for violation of the Fisheries Act or Regulations. Three received seven-day sentences, one of 14 days, later reduced to four days on appeal, and one of 60 days.

Table 66

Summary of 1984 Charges (all Districts)

Statute	Charges
Fisheries Act	56
Coastal Fisheries Protection Act	1
Pacific Halibut Regulation	11
Criminal Code	4
B.C. Fisheries Act	9
Pacific Salmon Regulations	171
Licencing Regulations	79
Pacific Herring Regulations	21
Pacific Shellfish Regulations	107
B.C. Sport Fishing Regulations	732
Yukon Fisheries Regulations	10
B.C. (General) Regulations	248
Total:	1,449

Table 67

1984 Violations (all Districts)

Total number of charges laid	1,449
Total number of persons charged	1,139
Number of charges cleared by guilty plea	754
Number of "not guilty" pleas	120
Number convicted at trial	47(39%)
Number dismissed at trial	59(49%)
Charges stayed or withdrawn	168
Number of persons receiving probation	8
Number of persons receiving a Suspended Sentence	43
Number of persons receiving an Absolute Discharge	23
Number of charges still unresolved	489
Total fines to date	$71,741
Average fine per charge	$152

Investigations

a) Abalone Investigations

Surveillances of the abalone fishery in the Victoria area was carried out in late January and early February. According to information available, no investigations have been conducted on this resource user group in the past. The operation proved very successful with one major poaching operation identified and successfully taken through the court system. Considerable intelligence was gleaned for further use by the Victoria subdistrict.

b) Herring Roe

Several undercover contacts have been made which might be followed up in future.

c) Sports Fish (Vancouver Island)

Several long-term investigations were entered into. Because of the nature of the investigations and continuing interest, further elaboration is not possible at this time. Investigations, however, did identify a number of violations which were successfully prosecuted, including two sales to commercial establishments.

d) Commercial Clams

Surveillance was conducted on a load of clams being exported to the U.S.A.

Planned Developments for 1985

Improved reporting from the subdistrict officers and entering violations on a computer should improve the information capabilities of these reports for field use.

In 1985, the number of violations is expected to increase to at least 3,000-4,000 with the implementation of the voluntary penalty ticket. To meet the information needs of the Department, access to a commercial computer service bureau was requested and the first phase of the system should be operational by April 1985. This will provide more data and more flexibility for rapid reporting.

Contact: Tinker Young,
Chief, Field Services Systems.

Recreational Fisheries Coordinator

Secretariat duties of the Sport Fishing Advisory Board and the smaller subcommittees still occupy much of the time of the recreational fisheries coordinator. This was particularly evident this year when stringent measures were proposed for the commercial troll and sport fisheries on chinook salmon in the Strait of Georgia. The change in administration made it difficult to introduce any substantial conservation measures on the sport fishery, with the result that their catch of chinook salmon doubled the level of the previous year's catch in the Strait.

The new Minister confirmed the

desirability of a higher profile for the sport fishery, but how this is to be achieved has yet to be developed.

The coordinator continues to be involved in two problems: the issuance of licences in a timely fashion and the implementation of sport fishing regulations in a predictable time frame. Input from field staff is a problem, primarily one of coordination; it is difficult to know precisely at what stage previous submissions are at in the approval process.

The on-going involvement of the coordinator with the recreational fisheries advisor has assisted in making the Department more aware of the concerns of the sport fishing community, and it is expected that this relationship will continue to expand in 1985. Although there is continued talk of a higher profile for the sport fishery, increased resources will not be provided for management of recreational fisheries without a better understanding as to how the higher profile can be achieved. To this end it can be expected that there will be many discussions with field staff and the sport fishing community before any changes are implemented.

Contact: Bob Wowchuk,
Recreational Fisheries
Coordinator.

Training and Career Development

The Training and Career Development Unit continued to develop new courses and update existing material in 1984 for the National Fishery Officer Training Program. Significant in this area is the work in:

- beginning development of the upgrading module: Salmonid Management Data Collection for existing fishery officers
- updating Enforcement Documents modules
- developing the Spawning Stream Enumeration module

In addition, the Unit planned a three-day orientation program for 12 new fishery officers.

The Unit participated in the development of the 1984 Expert Witness course. This course, which was handed over to the Training and Career Development Unit during 1984 is for use by nonfishery officers. Senior Habitat Biologists for the Fraser River Division were also involved in the course development.

Included in the task of providing training materials for fisheries officers, the Unit began development of three courses: Training for Field Trainers, Training for the Classroom Instructors and Dealing with Hostility. Completion of these achieves the 1983 goal of establishing a common format for division or unit heads to conduct cost effective time-saving training programs.

Courses in Expert Witness were offered at the Justice Institute during the latter part of the year.

Throughout the province, courses in Dealing with Hostility were offered to fisheries officers and to conservation officers from the Provincial Fish and Wildlife Service. Spawning Stream Enumeration courses were offered to fisheries officers at the Big Qualicum River Facility.

Among the functions carried out by the Training and Career Development Unit in 1984 were:

- first year recruit field assessments in various field locations
- a workshop with the districts regarding the "Salmonids in the Classroom" package
- conducting meetings in Nanaimo, New Westminster and Prince Rupert with district supervisors to discuss fishery

officer work requirements with corporate personnel

- met and held discussions with the new Native Extension officers, as part of their orientation to DFO
- attendance, as Pacific Region representative, at the National Uniform Committee meeting in Ottawa.

Over 20 students attended the 1984/85 Regional Orientation course in Chilliwack.

Planning for the January 1985 Regional Orientation Program, to be held in Chilliwack, began early in the fall of 1984. Training modules were reviewed and prepared for printing, attendance was confirmed for 20 students and arrangements were made for training facilities.

As part of its commitment and ongoing liaison with educational institutions, the Unit participated on the Selkirk College and Lethbridge Community Advisory Boards and held lectures at the B.C. Insititute of Technology.

Activities planned and underway for 1985 consist of:

- the Regional Orientation Course in Chilliwack for January
- training for field trainers and classroom instructors
- the sounder/sonar course to be held in Comox
- the screening of new recruits
- attendance at a Trainers Conference in Quebec City
- attendance at the Lethbridge Community College Advisory Board meeting
- monitoring and assisting the instruction of a course on evidence gathering, enforcement and court procedures, in Burnaby.

Contact: Brian Richman,
Training and Career
Development Officer.

Licencing

The Licence Division is responsible for the administration and development of both the commercial and tidal water sport fishing licence programs.

In 1984, a third major master file, the licence file, was developed in the commercial licence computer program to complement the existing person and vessel files. Each commercial fishing licence has now been assigned a permanent number, which, together with the category letter constitutes a unique identifier. It will now be possible to trace the history of a licence, (issuance, transfers from vessel to vessel or person to person, cancellations, reinstatements etc.,) by looking at one record. These three master files - vessel, person and licence - form a complex matrix of information on the commercial fishing licences, one which is being constantly shaped as the commercial licence program develops and expands.

Responsibility for providing both administrative and support services for the Pacific Region Licence Appeal Board was delegated to the Licence Division in 1984. The Board continues to sit and hear appeals as an impartial body, however, the link with licencing has provided the Board ready access to current and developing issues in licencing policy.

Tidal Water Sport Fish Licencing Program

The 1983 licence covered a 15-month period (January 1983 to March 1984) to phase in a change over from the calendar year to the fiscal year. This change over was completed and the 1984

licence covers the 12-month period from April 1984 to March 1985.

At the same time as the licence period change over, an improved distribution and agency contract system was implemented. Distribution of licences to agents in 1984 was done semiannually, ensuring that every agent had supplies at all times. The agent's service contracts were changed from an annual contract to a continuous-year contract and included a cancellation clause which could be invoked at the request of the agent, or by the Department for default of contract terms.

In support of the new distribution cycle, licence design was changed from four separate licences to a licence with multiple use. The new form can be marked for the type of licence issued, ensuring that agents have adequate supplies of all licence types at all times.

The development of a computerized licence inventory system was initiated in 1984. The system will account for the serial numbers of some 350,000 licences distributed to and sold by approximately 650 agents. It will record the revenue received and calcu-

Table 68

1984 Commercial Fishing Licences and Personal Commercial Fishing Licences as of November 19, 1984

Designation	Licence	Number Issued	Licence Value $	Revenue $
A	Salmon (vessel under 9.14 m)	266	200.00	53,200
A	Salmon (vessel over 9.14 m)	2,974	400.00	1,189,600
A	Salmon (vessel over 42.45 m)	580	800.00	464,000
A	Salmon (Indian-owned, reduced fee paid)	343	20.00	6,860
B	Salmon (10 years only)	11	20.00	220
C	Schedule II	1,051	10.00	10,510
D	Packer	221	10.00	2,210
E	Abalone	26	200.00	5,200
G	Geoduck	53	10.00	530
H	Roe Herring (gillnet)	925	200.00	185,000
H	Roe Herring (seine)	190	2,000.00	380,000
H	Roe Herring (Indian gillnet)	402	10.00	4,020
H	Roe Herring (Indian seine)	62	10.00	620
J	Herring Spawn on Kelp	12	2,000.00	24,000
J	Herring Spawn on Kelp (Indian)	16	10.00	160
K	Sablefish	47	10.00	470
L	Halibut	425	10.00	4,250
N	Salmon (N.N.F.C.)	252	20.00	5,040
P	Processor	4	10.00	40
S	Shrimp (by trawl)	236	10.00	2,360
T	Groundfish (by trawl)	134	10.00	1,340
Z	Special Fishery (with vessel)	1,070	50.00	53,500
Z	Special Fishery (without vessel)	73	10.00	730
PCFL	Annual	13,776	10.00	137,760
PCFL	Five Year	484	40.00	19,360
Total				2,550,980

Table 69

Tidal Water Sport Fishing Licence Sales Comparison 1983/84 - 1984/85 — **Both Periods As of Nov. 7**

Type			1983/84 Quantity	1983/84 Value	1984/85 Quantity	1984/85 Value
Resident	Annual	(R)	224,633	$1,123,165	218,752	$1,093,760.00
Non-Resident	Annual	(N)	16,736	334,720	18,524	370,480.00
Non-Resident	3-Day	(T)	11,119	111,190	12,885	128,850.00
Resident/Non-Resident	1-Day	(D)	17,990	62,965	25,238	88,333.00
Combination	4-Day	(C)			185	2,497.50
Totals			270,478	$1,632,040	275,584	$1,683,920.50

Note: The 1983/84 figures include the additional 3 months allowed for that period.

late the agent's commission. The system will be capable of generating reports by agent or cumulatively by licence distribution, sales, revenue, commission, address labels, and delinquent agents.

It will also be used to reconcile all licences as sold, void, or unused. It is intended to store two years of data on-line at any one time with data prior to this to be stored on tape. This will be used with particular reference to ready identification of agents' nonperformance.

At this time, some segments of the system remain in the developmental/testing stage with just the agents' contracts and licence distribution being on-line. The system is expected to be in full operation by the end of March 1985.

Pacific Region Licence Appeal Board

In 1984, after considering the recommendations of the Pacific Region Licence Appeal Board, the Minister made 65 decisions on licence appeals, primarily dealing with salmon and roe herring licences. Of these, 54 were approvals.

Table 70

1984 Licence Appeal Decisions

Licence	Approved	Denied	Total
Salmon (A)	27	2	29
"C" Licence	4	1	5
Goeduck	5		5
Roe Herring	10	5	15
Sablefish	1		1
Halibut	2	3	5
Shrimp Trawl	1		1
Groundfish Trawl	4		4
Total	54	11	65

Contact: Dick Carson,
Manager,
Licencing.

Headquarters Support

Herring Coordinator

Food and Bait

The Total Allowable Catch (TAC) for the 1984 food and bait fishery was 1,000 tonnes. This reflects the continuing poor market value for food and bait products. The TAC was supported by the Herring Industry Advisory Board and was designed to fulfill domestic food requirements (i.e. fillets, roll mops, salted) as well as local commercial bait requirements.

The 1,000 tonnes was divided up on a coastwide basis, with 250 tonnes allocated to the North Coast (Areas 3, 4, 5); 250 tonnes allocated to Johnstone Strait (Area 13) and 500 tonnes allocated to lower Strait of Georgia (Area 17).

As in the past two years, individual 50-tonne vessel quotas were established and vessels chosen by random lottery draw.

Applications for each area were invited and vessels selected for one particular area were not allowed to fish in the other two areas.

Of the 20 vessels licenced to fish, 19 participated, for a total catch of 860 tonnes. This represents 85.6 percent of the TAC. Preliminary estimates of the landed value for this fishery amounts to $270,000 and is an increase over the 183 fishery when 780.5 tonnes were caught for a value of $225,000.

North coast

The northern subdistrict opened by public notice on October 1 and was closed December 9. All fishing took place in the top portion of Area 5, bottom portion of Area 4 and Bonilla Rock's area. The fishery was hampered by poor weather conditions and frequency of small fish in the sets. Only four of the five licenced vessels caught fish, for a total hailed catch of 136 tonnes.

South Coast

Johnstone Strait - The lower portion of Area 13 in the vicinity of Deepwater Bay opened on October 23 and closed November 19. All five licenced vessels participated and hailed a catch of 226 tonnes.

Lower Strait of Georgia - The fishery commenced at noon on November 7 with sub-areas 17-3, 17-4 and the northern portion of 17-2 opened until midnight December 3. All ten vessels licenced to fish in this area participated. A total of 498 tonnes of herring were taken. The fishery proceeded slowly because of the inaccessibility of desirable sized fish. Sea lions also contributed to the difficulty in completing seine sets.

Roe Herring

Roe herring area licencing was implemented again in 1984. As in past years, each holder of a valid roe herring licence was asked to choose one of the designated areas in which to fish. The three areas and distribution of licenced gear is shown in the accompanying table.

In addition to area licencing, fixed quotas were established for each area. The quotas are based on forecasted returns of herring to each of the major populations, and adjusted annually depending upon the predicted stock strength for the next year. The use of annually fixed quotas meant that fishery managers could fish on the first available stock of suitable roe maturity and provide for a more orderly fishery.

Table 71

1984 Roe Herring Fishery
(Gillnet & Seine)

Area	Hailed[1]		Sales Slips[2]		% Difference
	tons	tonnes	tons	tonnes	
2E	5,691	5,163	5,268.99	4,779.92	+7.5%
4	2,208	2,003	2,072.25	1,879.90	+6.2%
5	1,835	1,665	1,704.11	1,545.90	+7.2%
6-7	7,734	7,016	7,587.68	6,883.39	+1.9%
14	8,325	7,552	6,648.19	6,031.11	+10.2%
15	4,438	4,026	4,009.99	3,637.78	+9.7%
23	6,000	5,443	5,889.76	5,343.07	+2.0%
25	1,026	931	946.19	858.36	+7.8%
27	200	181	188.17	170.70	+6.0%
Total Catch	37,457	33,980	34,315.33	31,130.18	+8.4%

[1] Estimated by fishery officers based on interviews with fishermen during the fishery.
[2] True landed catch based on fishermen/processor sales slip information.

Table 72

1984 Roe Herring Seine Fishery

Area	Hailed		Sales Slips		% Difference
	tons	tonnes	tons	tonnes	
2E	5,100	4,627	4,679.60	4,245.20	+8.3%
5	1,835	1,665	1,704.11	1,545.90	+7.2%
6-7	3,886	3,525	3,641.39	3,303.40	+6.9%
15	4,438	4,026	4,009.99	3,637.78	+9.6%
23	6,000	5,443	5,889.76	5,343.07	+1.8%
Total Catch	21,259	19,286	19,924.85	18,075.40	+6.6%

Table 73

1984 Roe Herring Gillnet Fishery

Area	Hailed		Sales Slips		% Difference
	tons	tonnes	tons	tonnes	
2E	591	536	589.39	534.68	-
4	2,208	2,003	2,072.25	1,879.90	+6.1%
6-7	3,848	3,491	3,946.29	3,579.99	-2.5%
14	8,325	7,552	6,648.19	6,031.11	+20.1%
25	1,026	931	946.19	858.36	+7.8%
27	200	181	188.17	170.70	+5.9%
Total Catch	16,198	14,694	14,390.48	13,054.70	+11.2%

The total quota is divided 55 percent/45 percent between seines and gillnets.

An area by area account of the 1984 in-season stock assessment and resultant fishery is presented in each District's report.

Contact: Lloyd Webb,
Herring Coordinator.

Table 74

Landed Weight and Value of British Columbia Roe Herring Catches 1979 to 1984

Year	Landed Weight		Landed Value
	tons	tonnes	$ million
1979	42,807	38,834	$ 120.86
1980	19,330	17,536	22.06
1981	32,087	29,109	34.68
1982	29,593	26,846	27.01
1983	40,236	36,501	48.91
1984	34,315	31,130	34.30

Table 75

Distribution of Licenced Gear by Type and Area Quotas Including 1984 Roe Herring Catches (tonnes)

Area	Seine	Quota	Catch	Gillnet	Quota	Catch	Total Catch
Area A North of Cape Caution	120	9,700	9,094.50	487	5,500	5,994.57	15,089
Area B Strait of Georgia	59	4,000	3,637.78	714	7,600	6,031.11	9,669
Area C W.C.V.I.	61	3,500	5,343.07	124	1,000	1,029.06	6,372
Total	240*	17,200	18,075.35	1,325	14,100	13,054.74	31,130

* Seine total does not include 12 chartered vessels.

Salmon Coordinator

Based at Regional headquarters, the salmon coordinator continues to be the focal point for salmon management matters.

For the first two months of 1984, the coordinator was seconded to the Regional Biological Review Team which was responsible for reviewing all biological investigations in all branches. The team submitted its report to the director-general in April.

Following completion of the biological review, the coordinator became involved, at the last minute, in development of the proposed Pacific Fisheries Restructuring Act. This legislation was never passed.

During the 1984 salmon season, the Fishing Vessel Owners Association and the Gulf Trollers Association took the Department to court over allocation between user groups and won their cases. The proceedings required the coordinator to spend many hours in lawyers' offices and in the court room.

The 1984 salmon season started with

very poor expectations for all species in most areas, chinook catch ceilings for commercial trollers on the West Coast of Vancouver Island and the North Coast, and a two-month troll season for inside trollers. This all resulted in considerable dialogue with fishermen and industry. The coordinator attended about thirty formal meetings during the year. Overall, however, the salmon runs were much stronger than expected. In December, the Canadian and American negotiators initialled a salmon treaty.

Contact: Dave Schutz,
Regional Salmon Coordinator.

Salmon Services

The Salmon Services Unit receives funding from the Field Services Branch, the Salmonid Enhancement Program and the Fisheries Research Branch to conduct the province-wide Mark Recovery Program and to operate the Regional Scale Laboratory. The Unit collects data on the age, species, size, and origin of salmonids and recovers coded-wire tags, Petersen discs, Floy tags, and multiple fin-marks from B.C. salmonid fisheries.

The Mark Recovery Program

The goal of the Mark Recovery Program (MRP) is to randomly and representatively sample 20 percent of the Canadian commercial troll and net fisheries for adipose-marked coho, chinook and steelhead. Effort is also directed at selected fisheries anticipated to contain coded-wire tagged chum, pink, and sockeye or fin-clipped chum and pink. During sampling, salmonids from individual boats are counted and checked for missing fins. The marked fish are removed, their length and weight are recorded and a scale sample is taken. The heads of adipose-only fish are retained for dissection.

Sport fishermen are requested to submit heads from adipose-clipped salmonids to an extensive network of head depots located at DFO offices, marinas and tackle shops. Participating anglers receive information on their marked fish, a Salmonid Head Recovery Program button, and a Recovery summary newsletter. They are also eligible for one of eight prize draws held throughout the year. The depots which issued the winning labels also receive cash prizes.

The heads are dissected at the MRP Head Laboratory to recover the coded-wire tags. The decoded tag information is matched to the recovery data and entered by data processing staff in Vancouver into the MRP database on the VAX computer located at the Pacific Biological Station in Nanaimo.

In addition, the MRP Head Lab processes escapement heads for many of the hatcheries. In 1984, 2,830 escapement heads were processed. Beginning in 1985, historical escapement data will also be entered into the MRP database. Fisheries Research Branch enumeration projects submitted 2,284 smolts for processing by the Head Lab. Heads were also processed from a shaker study and from the troll logbook and observer programs.

In 1984, 1,343,818 salmonids were examined in the commercial catch by samplers stationed at Steveston, Vancouver, Namu, Prince Rupert, Port Hardy, Tofino, Ucluelet, Winter Harbour, and Campbell River. Of the fish sampled, 23,431 were adipose-clipped and 1,573 were multiple fin-clipped. The number sampled was 40 percent higher than the number sampled in 1983, partially due to large coho catches off the west coast of Vancouver Island. The addition of samplers stationed in Winter Harbour and Masset increased the sampling rate on northwest Vancouver Island and northern catches. An increase in the tag incidence of northern catches was also noted. This increase has been noted in recent years, as more northern hatcheries begin production.

The program expects to receive about 8,800 heads from sport-caught salmonids for 1984. This is down 21 percent from 1983 and is similar to the number of recoveries received in 1982. Five depots set up in 1984 on the Queen Charlotte Islands increased participation in the program for the northern region.

MRP has begun using the VAX computer located at the Pacific Biological Station to process the data and generate reports. Historic data (1974-1983) is being converted to a standard format in the database, with computations consistent for all recovery years. At present, data for 1979-1983 recovery years are available.

Preliminary data for 1984 can also be accessed. The 1982 Annual Report (Canadian Data Report 454), published in 1984, is the final report of its kind to be published by the MRP. Facilities to directly access the data will be made possible by the new data base via report generation programs. Standard interim reports are now available while the proposed user reports are being completed. These reports have made MRP data both timely and accessible to users as well as tailored to meet individual needs.

The MRP also coordinates information from Petersen disc and Floy tagging programs and keeps a record of each tagging project. Fishermen returning tags receive a letter detailing the project to which their tags were applied.

The third year of the International Salmon Tagging Program took place in 1984. The program, under the direction of the Fisheries Research Branch, is designed to estimate interception rates by Canadian and U.S. fisheries on salmonid stocks originating from northern British Columbia and southeastern Alaska. Approximately 52,000 pink

International Tag Program: recovery of Floy Tag in Yukon.

salmon in Canadian waters were tagged with bright orange Floy spaghetti tie-on tags. Incidental catches of 1,200 chum and 200 chinook were also tagged. Similar numbers of each species were tagged in Alaskan waters. Voluntary returns of tags by sport and commercial fishermen, plus recovery of tags during sampling of the catch and escapement in Canadian waters exceeded 10,000.

Other tagging projects included Petersen disc tagging of coho at Birkenhead River, of chum and coho at Chilliwack River, of chinook on the upper Fraser River, and of coho at Lang Creek. Several projects app i unnumbered Petersen baffles, for which returns are not required.

The MRP office stores an inventory of Petersen discs and coded-wire tags. All requests for tags should be made to the program. Addressed postage-paid envelopes are also available for the return of Petersen discs and Floy tags.

Contact: Margaret Birch,
A/Chief, Salmon Services Unit.

Regional Fish Morphology Lab

To assist fisheries management and enhancement programs, the ageing of all five species of salmon is conducted in the morphology laboratory. In addition to scale samples from both adults and juveniles, the otoliths (ear bones) and pectoral fins are also analysed for ageing spawning sockeye and chum which have resorbed their scales.

An extensive scale bank has developed over the past years due to large requests made by the Field Services Branch and the Salmonid Enhancement Program. during 1984, a total of approximately 360,000 scale samples were received by the lab for processing and analysing.

During the year, there were a number of requests for samples of acetate impressions. The lab has maintained an ongoing exchange of data between ageing labs in other countries for several years. For example, 163 books were prepared for major British Columbia coho runs for Japan's Far Seas Fisheries Research Laboratory. This research group was studying the continental origin of coho salmon distribu'ed in offshore waters of the Pacific Ocean using scale pattern analysis. Alaska's fisheries labs also obtained a number of scale impressions (65) for Nass and Skeena sockeye. There were requests from the University of Washington for chinook (168) and for Shuswap scales.

The service to provide expert witness testimony enables the Department to obtain clear evidence to charges that have been laid. The lab was involved in preparing detailed analyses and reports for presentation of evidence at 19 court cases, of which 10 cases resulted in court appearances. One particular case, held in Matsqui in December, involved illegally caught pink salmon. Scales taken by fishery officers from the seized fish were compared with scales from fresh caught pinks (Steveston) and lower river caught pinks (Whonnock). Results, showing varying degrees of resorption, were presented as evidence and the case was won by the Department.

Public displays of scale, otolith and fin analysis were also undertaken. Though the number of displays in which the lab was involved were cut back as a result of staff shortages, four events were attended. These were the Campbell River Salmon Days in June, the Whistler Wildlife Conference in August, and open houses for Capilano and Chilliwack hatcheries in November. An International Salmon Ageing Workshop held in October at the Pacific Biological Station also involved participation by this lab. The senior ageing technician presented a paper on validation of chinook criteria as well as demonstrated and instructed participants on the ageing techniques for chinook and coho scale samples.

Contact: Yvonne Yole,
Senior Ageing Technician,
Regional Fish Morphology Lab.

Chinook and Coho Biology

The Chinook and Coho Biology Unit was established to put a regional focus on chinook and coho stocks and specifically to ensure that the needs of different stocks were taken into consideration.

Chinook and coho usually spend their entire lives along the continental shelf. There is considerable intermixing of stocks from California to Alaska. Management of chinook and coho stocks is much more complex than the net species because the stocks are vulnerable to fishing mortality for a much longer period during their life history and because they migrate much more widely up and down the coast.

1984 Chinook Fishery

The quota for the 1984 troll chinook fishery was 200,000 chinook in the North Coast and 380,000 on the West Coast of Vancouver Island. The quota for hook and line fisheries in the Strait of Georgia was 225,000. These quotas were based on a requirement to rebuild Canadian chinook stocks. These resulted in a fishery from May 23 to June 3 and from July 1 to September 19 in the North Coast. On the West Coast of Vancouver Island the fishery was from April 15 to June 14 and from July 1 to September 19.

The commercial troll fishery in the Strait of Georgia was reduced to July 1 to August 31 from the 1983 date of April 15 to September 30. Management action in net fisheries in the Fraser River, Johnstone Strait and in the North Coast was taken to reduce the catch by 25 percent from 1978-82 levels.

The resulting troll catch in 1984 was 246,000 in the North Coast, 461,000 on the West Coast of Vancouver Island and 94,000 in the Strait of Georgia. The total chinook catch in the Strait of Georgia hook and line fisheries was 449,000. The Strait of Georgia recreational catch was increased to 369,000.

In all cases the final catches were well above the target levels set, even though fishing times were reduced. This was partly because of increased abundance or vulnerability of stocks in 1984 and intensified fishing effort. In the offshore troll fisheries, this could have been due to a carry over of stocks from the El Nino year of 1983 when stocks were not vulnerable to troll gear. Other reasons for exceeding the quotas included computer program problems and no new restrictions to slow down the sport fishery. Net catch for the chinook in non-directed fisheries was reduced to about 50 percent from 1978 to 1982 levels due primarily to reduced fishing time and closure of some areas.

Catch Monitoring

The catch monitoring program to estimate catch in the troll fisheries on an in-season basis began in 1983 and improved in 1984. The program uses accumulative sales slips interview information that measures catch/boat day (CPUE) on a time/area basis, and aerial counts of gear on the fishing grounds to estimate the final sales slips total. In 1984, the system was transferred to a mainframe computer from microcomputers and new software was developed. Problems were experienced in the past year because of the implementations to new hardware: programming errors caused an approximate 10 percent underestimate of the chinook catch up to early September, and difficulties in the tape transfer of data from one mainframe computer to another, resulting in a 10 percent underestimate in the chinook catch right up to the end of the season. If these hardware and software problems had not been experienced, the total program would

have given accurate in-season estimates of the troll catch in B.C.

1984 Escapements

Escapement assessment of chinook stocks is difficult to measure due to the number of spawning streams, their remote nature and the variability of effort expended to enumerate spawning stocks. This variability extends between geographic areas and between years. It is difficult to set realistic targets for stock rebuilding and a provisional target of 334,000 natural chinook has been set for B.C. streams. This is double the average escapements for the 1979-1982 period.

In 1984 spring and early summer chinook stocks, the predominant type in the North Coast, Central Coast and the Upper Fraser River, showed dramatic increases in escapement. This can be attributed, partly, to early troll closures. One year of increased escapements does not indicate the rebuilding job is finished. Later chinook stocks to the West Coast of Vancouver Island, the Strait of Georgia and the Thompson River portion of the Fraser River did not receive the benefits from spring troll closures. They were adversely affected by the more concentrated troll effort later in the year, and the increased catch in the Georgia Strait recreational fishery. The escapements in these areas were the same as or below the 1983 escapement levels. Lower Fraser stocks appeared not to have been adversely affected by these fisheries and were increased above 1983 levels. On a coastwide basis, the escapement levels were increased over 1983 levels and were 57 percent of the target compared to 44 percent of the target in 1983.

Biosampling and Age Composition

The biosampling program to obtain age composition of chinook salmon in troll and net fisheries continued in 1984. Scales were collected from 33,435 troll-caught chinook and 21,652 net-caught chinook. The final age compositions will not be available until 1984 commercial catches are finalized. The age composition in the West Coat of Vancouver Island troll fishery has varied in the past three years. The percentage age-three chinook has been low for the past two years; however, the age-four component of the catch in 1984 appears to be considerably higher than expected given the number of three-year-olds in 1983. This could be explained by delayed maturity and/or reduced vulnerability of some three year old chinook in 1983.

The North and Central coast troll fishery showed a decrease in stream-type chinook in 1984. This indicates that the early closure in the North could have allowed spring chinook, largely stream-type juveniles, to escape major exploitation in the troll fishery. The catch of ocean-type fall chinook (juveniles which migrate in their first year of freshwater life) was greater in 1984 as the catch came late in the summer when most mature spring and summer chinook have migrated into freshwater.

Key Chinook Stream Program

In 1984, a chinook key stream program was initiated to obtain more comprehensive information from representative B.C. chinook systems. These systems were chosen on the following criteria that:

- there was a historic base of accurate enumeration
- there was presence of coded-wire tag groups
- they were typical in terms of timing and life history of other systems in the area
- they had an opportunity to integrate with existing chinook programs.

The systems chosen were the Kalum, Atnarko, Bowron, Shuswap-Eagle, Harrison, Big Qualicum, Quinsam-Campbell, Somass-Robertson and Devereux. The program required obtaining accurate escapement estimates by sex, age composition by sex, and number of coded-wire tags by code number from natural spawners in adjacent rivers and from hatchery racks.

Table 76

Results of 1984 Key Stream Chinook Programs

	Method	Estimate	±	Male	Female	No Tags
Kalum	Peterson	12,000	2,780	8,090	4,610	
Atnarko	Seber-Jolly	9,270	1,373			
Harrison	Peterson	87,409		41,109	46,283 ± 12,705	
Shuswap	Peterson	10,080	1,840	5,970	4,110	
Bowron	Count + Peterson	4,110	1,400	1,850	2,260	
Somass	Count + Peterson	76,000		32,220	43,780	315
Robertson Hatchery		10,873		7,533	3,340	
Quinsam	Carcass Enumeration	1,012		500	512	
Campbell	Carcass Enumeration	1,297		545	752	
Quinsam Hatchery		1,459		747	712	
Eagle River Hatchery		677		323	354	
Big Qualicum Hatchery						

Funding for these programs was obtained from Field Services, SEP manageability and through job creation programs and studies were conducted by both divisional and contract personnel in the Fraser River and South Coast divisions, and by contract only in the North Coast.

Detailed reports on each program will be prepared by the different divisions who conducted the programs. The methods used were actual counts, Peterson estimates using tag and recovery, Seber Jolly using a method of tagging and recovering carcasses, counting carcasses and adjusting for percentage seen and total counts.

The programs were reasonably successful but there were unexpected problems endemic to each system and other problems caused by extreme environmental conditions. The Devereux River Program failed because of collapsed contractual arrangements. The greatest problems occurred in the Kalum and Somass systems where environmental conditions made the estimates difficult and decreased accuracy. Estimates of escapements and the methods of enumeration are found in the accompanying table. The estimates in the Kalum, Harrison and Somass were considerably larger than anticipated using normal visual estimates. Peterson estimates are inclined to overestimate numbers because of tagging mortalities and loss of tags. The estimates have been adjusted for these factors and are the best available for these systems.

Estimates using carcass enumeration and rack counts were more accurate than would have been made by the normal visual estimates. Detailed information on marks, age composition and statistical analysis will be published in individual technical reports.

Through the use of information gained from these programs, the rebuilding of natural chinook stocks will be possible and the management of enhanced chinook will be more compatible with that of natural chinook.

Canada/U.S. Negotiations

Chinook salmon conservation was an extremely important factor in achieving a Canada/U.S. agreement. The Canada/U.S. treaty will allow for rebuilding of chinook stocks by 1998. Chinook quotas in B.C. waters in both 1985 and 1986 will be 263,000 chinook in all fisheries in the North Coast, 275,000 in the Strait of Georgia hook and line fisheries, and 360,000 in the West

Coast of Vancouver Island commercial troll fishery.

Coho salmon was an issue for the first time in the 1984 negotiations. The Canada/U.S. agreement limited the catch on the West Coast of Vancouver Island to 1.75 million coho in both 1985 and 1986.

Canadian 1985 fishing plans will reflect the quotas agreed on in the Canada/U.S. treaty.

Contact: Ken Pitre,
Regional Chinook and Coho Biologist.

Recreational Fisheries Advisor

The position of recreational (sport) fisheries advisor was established early in 1979 to assess trends in sport fishing, which has become a mushrooming activity-industry, and to act as a liaison or ombudsman between the angler and the Department.

Trends in sport fishing and the proportional allocation of a share of the resource to the angler and tourist are noted and assessed. Each year, the sport fish advisor has been involved in the discussions over proposed fishery regulations and has worked with the Communications Branch and the Operations Centre, through which most fishing reports are funnelled.

In addition to attending management and other discussion meetings, the sport fish advisor has been consulted by other Department employees on various sport fishing concerns. These range from allocation of salmon fisheries between sport and commercial fishing to angler regulations and even angler attitudes.

Close contact is maintained with organized groups of anglers, such as the B.C. Wildlife Federation, the Steelhead Society of B.C., the Pacific Salmon Society, the B.C. Federation of Flyfishers and the charter-boat organizations.

Requests for public appearances continue to be accepted from angling clubs, service clubs, fishing guides' meetings, public protest meetings, conventions, Sport Fishing Advisory Board meetings, and radio and television talk shows.

Regional conferences of sporting groups and fishery and resource agents are attended.

General sea-angling success for chinook and coho improved in B.C. in 1984.

Significant numbers of chinook and coho continued to be caught by commercial fishermen targeting on sockeye, pink and chum salmon in the mixed stock fisheries of Johnstone and Juan de Fuca Straits.

Contact: Bill Otway,
Recreational Fisheries Advisor.

Other Branches

The Bajo Reef, the newest addition to the inshore patrol vessel fleet, is over 18 metres long and more than 5 metres wide.

Ship Division

Ship Division, one of seven divisions within the Support Services Branch, is responsible for providing vessels, crews and repair facilities necessary for the effective and efficient management of the Pacific coast fisheries.

The fleet consists of 29 patrol vessels, ranging from 10 to 55 metres. The two headquarters' vessels, FPVs (Fisheries Protection Vessels) Tanu and James Sinclair, are assigned to coast-wide patrols. The remainder of the fleet is assigned to various districts and subdistricts as required.

In addition to managing the patrol fleet, Ship Division is responsible for the management and operation of the Fisheries Research Vessels (FRV) G.B. Reed and Caligus based at the Pacific Biological Station, Nanaimo.

Patrol Vessel Replacements

In November 1984, the newest addition to the inshore patrol vessel fleet, FPV Bajo Reef was commissioned and in mid-December assumed full operation status in the Campbell River area. It is intended that the vessel will be evaluated over an eight to 10 month period at various coastal locations. The vessel has exhibited excellent sea-keeping capabilities and has attained her designed speed of 12 knots at full power.

Table 77

1984 Fisheries Patrol Vessels

Vessel	Operational Port	Masters
Double-crewed Vessels - Multi-tasked		
Arrow Post	Queen Charlotte City	J. Robinson R. Paziuk
Chilco Post	Alert Bay	R. Mason R. Maratos
Tanu	Victoria	A. Preston A. Nilssen
Double-crewed Vessels - Single-tasked		
James Sinclair	Victoria	R. Myerscough H. Connor
Single-crewed Vessels		
Anchor Rock	Victoria	J. Forgie
Atlin Post	Nanaimo	J. Bumpus
Babine Post	Kitimat	C. Fralic
Bajo Reef	Campbell River	R. E. Davis
Beaver Rock	Prince Rupert	J. Christie
Bonilla Rock	Campbell River	R. Davis
Brama	Westview	J. Zitzewitz
Caligus	Nanaimo (Research)	R. McLaughlin
Comox Post	Port Alberni	K. Widsten
Cutter Rock	Prince Rupert	M. Calli
F.D. 202	Tofino	E. Arnet
Falcon Rock	Dawsons Landing	R. Skog
G.B. Reed	Nanaimo (Research)	A. Fletcher
Gale Rock	Bella Coola	L. Malo
Heron Rock	Tahsis	C. Reider
Kitimat II	Prince Rupert	W. Wylie
North Rock	Kitimat	B. Taipalus
Petrel Rock	Prince Rupert	K. Gale
Pillar Rock	Masset	J. Swain
Seal Rock	Port Hardy	J. Scott
Sooke Post	Queen Charlotte City	K. Harley
Star Rock	Steveston	C. Forbes
Stuart Post	Steveston	R. Harris
Surge Rock	Bella Bella	S. Hills
Temple Rock	Bella Coola	-----
Vedder Rock	Vancouver	L. Helsing
Warrior Rock	Vancouver	-----
H.Q. Relief	Victoria	-----
South Relief	New Westminster	K. Widsten
South Relief	New Westminster	R. Alton
North Relief	Prince Rupert	Vacant
Supervisor	Prince Rupert Marine Station	P. Lloyd
Supervisor	New Westminster Marine Depot	A. Zanatta
Supervisor	Nanaimo Marine Station	J. Brennan

Research Vessels

The specifications for converting W.E. Ricker (ex Callistratus) to a fisheries research vessel were finalized in October. Bids for the conversion and refit work will close in March 1985. This vessel should be operational late in 1985.

Prince Rupert Marine Station

The completion date on construction of the new marine station is scheduled for mid-March 1985. A 60-ton "Travelift" was assembled on site.

FPV Bonilla Rock

Bonilla Rock underwent a complete electrical rewiring and twin 3412 caterpillar engines, including new exhaust systems, have been installed resulting in an increase in speed and a decrease in fuel consumption.

FPV Tanu

Specifications for the midlife refit of Tanu in 1985 were developed. Unfortunately, this was deferred as a cost restraint measure until the fall of 1986.

Search and Rescue (SAR)

In addition to their fisheries management duties, three patrol vessels (Tanu, Chilco Post and Arrow Post) were multi-tasked to a Fisheries/search and rescue (SAR) role. These vessels participated in 64 SAR incidents while 67 other incidents were handled by the remainder of the fleet.

Surveillance Duties - Headquarters Vessels

FPV Tanu steamed 24,175 nautical miles, conducted 89 foreign and 325 (+ 74 hails) domestic boardings, initiated 17 violations and was fully operational for 250 days.

FPV James Sinclair steamed 25,099 nautical miles, conducted 31 foreign and 310 domestic boardings, initiated 40 violations and was fully operational for 254 days.

Table 78

1984 SAR Incidents Responded to by Fisheries Patrol Vessels

	Multi-tasked Vessels	Single-tasked Vessels
Fire	1	5
Grounding	7	9
Sinking	14	5
Medical	1	3
Disabled	23	33
Overboard	2	2
Miscellaneous	13	8
Collisions	3	2
Total	64	67

1984 Total - 131
1983 Total - 135
1982 Total - 147
1981 Total - 167
1980 Total - 217
1979 Total - 228
1978 Total - 141

Contact: Captain B. Gordon Irving,
Chief,
Ship Division.

Native Affairs

Native Affairs Branch began its second year of operation with a staff of seven and an ongoing commitment to plan and coordinate policies and initiatives related to Native fisheries issues.

Extension Officers

A significant aspect of the Native Affairs Branch (NAB) structure is its decentralized approach. A team of three extension officers provides a community-based link between the Department and the Native people of B.C. The extension officers travel to Native communities within their respective areas (offices located in Prince Rupert, Nanaimo and New Westminster), providing information, assistance and expertise as liaison between the Department and Native communities. Their work has, for example, led to the establishment of a consultative process in the Fraser Division between Division and NAB staff and approximately 90 bands along the Fraser River. The process has seen the formation of a representative group called the Interior Indian Fisheries Commission and consultative discussions have included comanagement.

Departmental Awareness

The Branch director and program coordinator concentrated on increasing Departmental awareness and responsiveness regarding Native fisheries concerns. NAB organized a one-day seminar in the summer called Native Relations and Resource Development for Department managers to enhance and develop their knowledge of local and international activities, concerns and political movements of Indian people.

Comanagement

Another major area of involvement was the working towards development of a cooperative management concept. This management approach is a process of fishery management which combines existing authority with the capabilities of Native fishermen.

A beginning point could involve bands identifying their requirements and working with the Department in assessing current and future local stocks and enhancement to meet those identified needs. Cooperative management is another step towards the recommendations of the 1982 Commission on Pacific Fisheries Policy.

SEP/CEDP

The Community Economic Development Unit of the Salmonid Enhancement Program has a significant impact on the 20 Native communities involved in various SEP/CEDP projects. Activities such as adult/fry enumeration, stream rehabilitation and reconnaissance and small hatchery facility operations provided local Native employment, enhanced local stocks and improved habitat.

NAB's Native biologist continued to be involved in much of this activity as well as assisting the B.C. Indian Aquaculture Task Force in developing a discussion paper on Indian participation in aquaculture. Other areas of activity include consultation with bands and Indian communities to discuss diversifying their livelihood by exploring the commercial viability of under-utilized species of fish and shellfish.

Consultative Initiatives

The Nimpkish Guardian Program was facilitated through Branch activity, and involves a continuing contractual arrangement between the Department and the Nimpkish Band. In 1984, four guardians--an increase of two from the previous year--were selected by the Band as fishery guardians to monitor and protect the fisheries resource in the Nimpkish Valley. The guardians acted in cooperation with the local fishery officers.

Following the success of the 1983 pilot fishery of surplus stocks by the Qualicum Band of Indians, the Band

invested in a small processing facility and equipment. The fishery provided real economic benefits, including employment for the band and the community at-large. It enabled the band to increase their participation in the management of their local fishery.

Another NAB activity involved meeting the optimum sockeye escapement level in the early Stuart run, set under the terms of the International Pacific Salmon Fisheries Commission. The Carrier-Sekani Tribal Council appointed five people to explain in Carrier, Sekani and English languages, the needs for closures and limited openings throughout the run. This was done in all Indian communities where members fished the early Stuart run. As a result of this effort, optimum escapement of 50,000 was achieved.

The Branch has also initiated and coordinated several meetings during the year between the Minister and Indian bands, tribal councils and other groups; for discussion on items such as the CNR twin tracking project, and Departmental concerns related to allocation, licencing, spawn-on-kelp expansion and comanagement. These Ministerial meetings have been a critical element in the Branch's credibility and visibility within the Native community of B.C.

The second year of Native Affairs Branch activities featured a continuation of strategic discussions, within and between the Department and the Native community, and focussed on the challenge of developing a cooperative fisheries management scheme. The next challenge, perhaps, will be a pilot implementation.

Contact: Lonnie Hindle,
Director,
Native Affairs Branch.

Fisheries Development

Based in Vancouver, the Fisheries Development Division is a component of the Fisheries Research Branch.

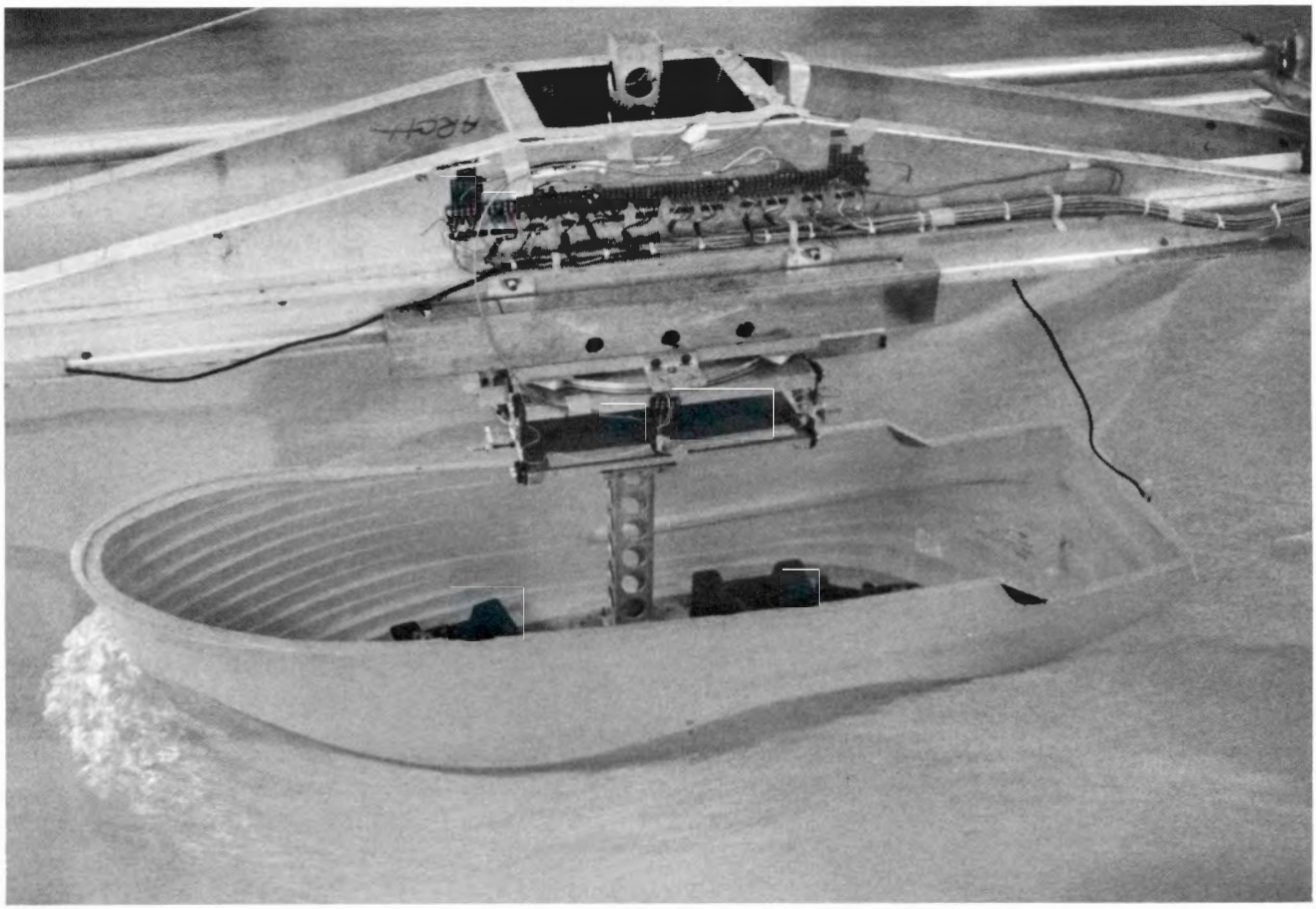
The Division works closely with industry and other divisions of the Research Branch and the Field Services Branch to carry out projects for further development of the commercial fisheries. Projects undertaken relate to all components of the industry but are normally more specifically directed to:

- the more efficient exploitation of fishery resources
- the exploration for and development of new fishery resources and new fisheries
- the introduction and demonstration to fishermen of new types of fishing equipment and new fishing techniques
- the development of new fishery products and for the improvement of the handling, processing and quality of fish and fishery products
- technology transfer.

a) Gear Development

Work in fishing gear technology has changed direction in recent years from developing more productive gears to ones which are more selective and energy efficient. During 1984 a project to develop gillnets which would be more selective in the capture of chinook salmon was continued with a study of varied hanging ratios. The results were very promising and are ready for publication.

The development of a beam trawl design for plankton was completed and tested with good results in commercial application. With a view to improving fishing technology associated with fish-stock inventory, an underwater observation study of midwater trawls was started.



Part of the vessel hull model testing program to develop more energy efficient hulls. The program is being carried out at the B.C. Research Ocean Engineering Center at the University of British Columbia.

Of particular note was the completion of a pilot production of three dimensional fishing charts. This type of chart will be of particular value in exploratory fishing as well as being a useful tool for normal fishing operations. Further development is taking place in the Atlantic and commercial production is expected to follow.

b) Vessel Development

Vessel work has been confined mainly to reducing fuel costs. The computer program (FISH), developed by the Mechanical Engineering Department at the University of British Columbia is ready for evaluation and application in the industry. The program is directed at analysing operations of individual vessels, estimating fuel consumption and making specific recommendations for the reduction of fuel requirements.

A fishing vessel hull model testing program is continuing with the UBC Mechanical Engineering Department and the B.C. Research Ocean Engineering Centre to develop design criteria for more energy efficient hulls.

c) Handling and Processing Improvement

In the area of fish handling and processing improvement, assistance was provided to the Fisheries Council of B.C. for the publication of a manual on quality processing practices for Pacific groundfish.

d) Mariculture and Impoundment

An area of development gaining considerable interest and attention is mariculture and impoundment. In 1984 work continued on improving the techniques for impounding herring. In the spawn-on-kelp fishery, a demonstration

project showed that attachment of the kelp to a special device increased productivity.

In addition to conducting its own projects the Fisheries Development Division maintains an ongoing liaison with other government departments and programs related to fisheries work, such as the Department of Energy, Mines and Resources, the Department of Supply and Services Unsolicited Proposal Programs and the National Research Council.

Contact: Bob McIlwaine,
Chief, Fisheries Development Division.
Fisheries Research Branch

Fishing Vessel Insurance Plan

The Fishing Vessel Insurance Plan provides coverage for insurable commercial vessels under 23 metres in overall length. When vessels are appraised for insurance, applicants are advised on ways to improve safety practices and equipment. They are given information on fire prevention equipment, fuel storage, life-saving equipment, pumping systems, safety alarm systems, installation of heating and cooking units, heat dissipation, proper wiring, and communication devices.

In 1984, 1,267 vessels were insured for a total insured value of $55,349,660. Revenue from premiums totalled $1,576,669. Refunds (for cancellations and overpayments) totalling $42,014 were made. One hundred and seven claims were investigated and 105 claims totalling $2,290,355 were paid. Thirty-five claims were for total losses ($1,655,434) and 70 claims were for partial losses ($634,921). The claims involved 18 explosions and fires, 16 strandings, 15 deadheads, 11 thefts and 45 others due to miscellaneous causes (collisions, ranging, etc).

At the end of the calendar year, there were 62 unsettled claims estimated to total $348,600.

Contact: Vancouver - Audley Tingling, Regional Manager.
Steveston - David Dyck and Mac Chettle, District Managers.
Nanaimo - Neil McAra and Dave Hayes, District Managers.
Prince Rupert - Rob Newton, District Manager.

Statistics

The Statistics Division compiles and provides catch and effort information from the commercial, sport and Native food fisheries.

Commercial Statistics Unit

The objective of the Unit is to compile and provide commercial catch and economic information. The three main activities within the Unit are the compilation and publication of information from sales slips, compilation and publication of the B.C. Fish Marketing Report, and compilation and reporting of fish exports.

a) Sales Slip System

A sales slip is a record of the sale of a commercial catch and lists the weight, species, catch area, landing date, gear, days fishing, company and value of the catch and sale. Approximately 130,000 sales slips are received and processed in a typical year. The sales slip data are entered on-line onto a database organized into files that present the sales slip data in different levels of detail. The 1984 database can be accessed on-line through a database management program. Reports from the sales slip data can be produced relatively quickly.

The following publications based on sales slip data are produced annually:

- Annual Summary of British Columbia Catch Statistics

- British Columbia Catch Statistics
- Interesting Facts About B.C.'s Commercial Fishing Industry.

b) B.C. Fish Marketing Report

The B.C. Fish Marketing Report provides in-season catch and price information. During 1984, information from approximately 120 companies was collected, compiled and published on a weekly basis during the salmon season and every three weeks during the rest of the year.

This report will be revised in 1985 and renamed "The British Columbia Commercial Catch Report." Totals from all sales slips processed by Statistics during each reporting period will be published monthly from December through March and twice per month during the rest of the year. The total amount purchased by each fish buyer and processor will be determined quarterly by mail or telephone. This quarterly report will be used to monitor the sales slip returns from the companies.

c) Export Statistics System

Copies of export declaration forms are forwarded to DFO by Canada Customs. The forms provide the following export information: date, species, product type, weight, destination, company, value and currency. Approximately 14,000 export declarations are processed in a typical year. The export data are coded, keypunched and printouts of the data are produced for each month. The data are summarized and published annually in Fish Product Exports of British Columbia.

Contact: Maureen Kostner,
Supervisor,
Commercial Statistics Unit.

Sport Fishing Statistics Unit

The Sport Fishing Statistics Unit compiles and provides recreational catch and effort information from B.C. tidal waters. Recreational statistics obtained through various sources (Georgia Strait creel survey, visitor sportfishing survey) are distributed by the Unit. The Unit also conducts a continuing mail survey of B.C. resident licenced anglers, the "Tidal Sport Fishing Diary Program." As part of the 1984 program, postcard questionnaires were sent to a sample of 14,000 B.C. licenced anglers. One purpose of the questionnaire was to elicit volunteers to keep fishing diaries. Approximately 5,000 anglers volunteered to keep daily fishing records. The data available from the diary program include licence data (licenced angler demographics), questionnaire data (annual days fishing, annual bags) and diary data (catch and effort by month and area). The annual program results have been published as Manuscript Reports of Fisheries and Aquatic since the 1981 program. The diary program will be revised in 1985 in order to produce more reliable in-season estimates.

Preliminary steps toward a historical recreational database were undertaken during 1984. Data sources were identified and evaluated; content, format and storage media of the database were recommended. Historical statistics are currently being compiled in preparation for review and data entry during 1985.

This Unit was responsible for the Native food fishery database in 1984. Historical food fishery statistics were compiled by a student working for the recreational and Native economic analyst. The statistics have been distributed throughout the Region for review and have been edited.

Contact: Lia Bijsterveld,
Supervisor,
Sport Fishing Statistics Unit.

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Appendix B: Key Field Services Branch Staff

DIRECTOR'S OFFICE, FIELD SERVICES BRANCH, 1090 W. Pender St., Vancouver V6E 2P1

Director	Garnet Jones	666-0751
Program Coordinator	Frances Dickson	666-0519
Administration Officer	Gillian Trushel	666-3284
Herring Coordinator	Lloyd Webb	666-0207
Recreational Fishing Advisor	Bill Otway	666-2768
Salmon Coordinator	Dave Schutz	666-0497
Regional Chinook and Coho Biologist	Ken Pitre	666-3512
Chief, Salmon Services	Margaret Birch	666-2796
Shellfish and Aquaculture Coordinator	Frances Dickson	666-0519

MANAGEMENT SERVICES DIVISION

Division Chief	Alan Gibson	666-0589
Recreational Fisheries Coordinator	Bob Wowchuk	666-0419
Regulations and Investigations	C.C.(Tinker) Young	666-2185
Regulations	Mel Hart	666-2185
Commercial Fisheries Licence Manager	Dick Carson	666-2076
Licencing Unit Administrator	Eileen Brady	666-3160

SOUTH COAST DIVISION, 3225 Stephenson Pt. Rd., Nanaimo V9T 1K3

Area Manager	Dennis Brock	756-7280
Administration Officer	Tracy Malmer	756-7281
Senior Management Biologist	Don Anderson	756-7283
Senior Habitat Biologist	Rick Higgins	756-7284
Native Extension Officer	Bob Warren	756-7297
Chief Enforcement Officer	Ed Lochbaum	756-7263
District Supervisors		
Port Alberni	Don McCulloch	724-0195
Nanaimo	Kip Slater	754-0204
Campbell River	Norm Lemmen	287-2102
Victoria	Larry Duke	566-3252

FRASER RIVER, NORTHERN B.C. AND YUKON DIVISION, 80-6th St., New Westminster V3L 5B3

Division Chief	Fred Fraser	666-6478
Assistant Area Manager	Bob Humphreys	666-6509
Administration Officer	Louise McFall	666-8426
Senior Management Biologist	Robin Harrison	666-2417
Senior Habitat Biologist	Otto Langer	666-0315
Native Extension Officer	Ernie Crey	666-3429
Chief Enforcement Officer	Robert Martinolich	666-8729
District Supervisors		
New Westminster	Don Aurel	666-2618
Kamloops	Grant Scott	374-4322
Whitehorse	Gordon Zealand	403-667-2235

NORTHERN OPERATIONS BRANCH, Room 112, 417 2nd Ave. W., Prince Rupert V8J 1G8

Director	Eric Kremer	624-8729
Area Operations Manager	Tom Perry	624-8729
Administration Officer	Bev Pilfold	627-8753
Senior Management Biologist	Paul Sprout	627-8730
Senior Habitat Biologist	Denis Rowse	624-9385
Native Extension Officer	--	627-1961
Chief Enforcement Officer	Rick Marken	627-8313
District Supervisors		
Prince Rupert	Laurie Gordon	624-9137
Kitimat - District 7*	Gus Jaltema	624-9408
Queen Charlotte	Chris Dragseth	559-4413

OFFSHORE DIVISION

Division Chief	Ed Zyblut	666-3167
Offshore Management Operations	Keni Lorette	666-0511
Special Programs and Management	Barry Ackerman	666-3991
Offshore Surveillance and Enforcement	Gary Buechler	666-0912
Operations Center	Vilma Miller	666-0583
Sport Fishing Information		666-0383
Commercial Openings and Closures (24-hour recording)		669-2828
Sport Fishing (24-hour recording)		666-3169

* District 7 office located in Prince Rupert - Room 116

INSPECTION DIVISION, 2250 S. Boundary Rd., Burnaby

Division Chief	David Bevan	298-4114
Operations Manager	Charles Campbell	298-4114
Engineering	Ian Devlin	298-4114
Shellfish Coordinator	Rudy Chiang	298-4114
Boat Inspection	Klaus Schallie	298-4114
Vancouver Laboratory		
326 Howe St.		
Bacteriological Unit	Nick Neufeld	298-4114
Chemistry	Gin Farn	298-4114
Product Inspection - Head	Dom Di Palma	298-2812
- Canned Fish	Susan Thomas	298-2812
- Fresh & Frozen Fish	Ron Lucas	298-2653
- Fish Quality & Label Evaluation	Jane Uchida	298-2812
Northern Inspection District, Prince Rupert	Vance McEachern	627-1375
Fraser River, Northern B.C. & Yukon District, Burnaby	Dale Paterson	298-6424
South Coast Inspection District, Victoria	Wayne Holmes	388-3455

FISHING VESSEL INSURANCE PROGRAM

Regional Manager	Audley Tinglin	666-3719
Assistant Regional Manager	Jock Embleton	666-3165
District Managers		
Prince Rupert	Rob Newton	624-9137
Steveston	Mac Chettle	274-7217
Nanaimo	Neil McAra	754-0234
Nanaimo	David Hayes	754-0234
Fraser Valley (Steveston office)	David Dyck	274-7217
Vancouver - Sunshine Coast	William Lowe	666-8537
Claims Officer	William Guerin	666-2867

HABITAT MANAGEMENT

Division Head	Forbes Boyd	666-3282
Chief, Planning & Coordination	Tom Bird	666-0017
Chief, Land Use Unit	John Payne	666-0356
Chief, Water Quality Unit	Mike Nassichuk	666-0209
Chief, Water Use Unit	Rod Bell-Irving	666-8667

STATISTICS DIVISION

Division Chief	Jim Bjerring	666-2630
Commercial Fisheries Statistics	Maureen Kostner	666-3810
Recreation Fisheries Statistics	Lia Bijsterveld	666-6501

Appendix C: Advisory Committees

The following advisory groups provide for a consultative process on the various types of fisheries which occur on the coast. These groups play a very important role in ensuring industry's participation in important decisions which shape the conduct and future of the fisheries. As management problems grow more complex, the importance of these groups becomes more significant. Industry's involvement is valued and appreciated.

Minister's Advisory Council

Fisheries Council of B.C.
Prince Rupert Fishermen's Co-op Association
Fishing Vessel Owners Association of B.C.
Pacific Trollers Association*
Pacific Gillnetters Association
Pacific Coast Fishing Vessel Owners Guild
B.C. Fishermen's Independent Co-op Association
Prince Rupert Fishing Vessel Owners Association
Cooperative Fishermen's Guild
Northern Trollers Association
Native Brotherhood of B.C.*
Alert Bay
United Fishermen and Allied Workers Union
Sportfish Advisory Board
Deep Sea Trawlers Association of B.C.*
Gulf Trollers Association of B.C.

Terms of reference: advises the Minister on developing and maintaining policies and plans for long-term management of the resource. The council also provides practical insights for dealing with a wide range of major fisheries management issues as they emerge.

Members are appointed for an indeterminate period by organizations identified by the Minister.

* These organizations have withdrawn their membership from MAC.

Chairman: Jack Nichol,
United Fishermen and Allied Workers' Union

Central Coast Advisory Committee

	Members
Bella Coola Band Council	4
Oweekeno Band Council	1
Kitasoo Band Council	2
U.F.A.W.U. Bella Coola local	2
U.F.A.W.U.	1
Fishing Vessel Owners Association	1
Pacific Salmon Seiners' Association	1
Industry	1
Industry/Seine	1
Sports Fish	1
Hartley Bay Band Council	1
Kitimat Village	1

Terms of reference: to advise on all fisheries matters related to the Central Coast area.

Chairman: Eric Kremer,
Director, Northern Operations Branch.

Fraser River Advisory Committee

U.F.A.W.U.
Pacific Gillnetters Association
Native Indian Commercial Fishermen
Sport Fishermen
Processing Industry
Independent Fishermen

Terms of reference: advises on conservation and exploitation of salmon stocks in the Fraser River and Area 29.

Chairman: Fred Fraser,
Area Manager, Fraser River, Northern B.C. and Yukon Division.

Groundfish Advisory Committee

B.C. Packers
J.S. McMillan Fisheries Ltd.
m/v Sunnfjord
m/v Blue Waters
P.R.F.C.A. Prince Rupert
m/v Deliverance
B.C.F.I. Co-op
Deep Sea Trawlers Association
m/v Arctic Ocean
m/v Pacific Eagle
J.S. McMillan Fisheries Ltd.
Province of B.C.

Terms of reference: provides non-partisan advice on management strategies for all groundfish stocks.

Chairman: Ed Zyblut,
Manager, Offshore Division.

Sablefish Advisory Committee

m/v Ocean Pearl
m/v Pacific Leader
m/v Victor F
m/v Pacific Titan
m/v Lorenda Lynn
m/v Zapora
m/v Northern Princess No. I
m/v Jeanna Marie
Offshore Trading Company

Terms of reference: an advisory unit providing recommendations on management strategies pertaining to the sablefish fishery. Members include invidiuals from both the fishing and processing sectors.

Chairman: Ed Zyblut,
Manager, Offshore Division.

Herring Industry Advisory Board

West Coast Herring Gillnetters Association
U.F.A.W.U.
Sport Fishing Advisory Board
Prince Rupert Fishing Vessel Owner's Association
Prince Rupert Co-op Fishermen's Guild
Prince Rupert Fishermen's Co-op
Pacific Trollers Association
Fisheries Council of B.C.
B.C. Wildlife Federation
B.C. Ministry of Economic Analysis and Research
B.C. Fishermen's Independent Co-op
Native Brotherhood of B.C.
B.C. Seafood Exporters' Association
Fishing Vessel Owners' Association
B.C. Ministry of Environment, Marine Resources Branch
Pacific Gillnetters' Association
Pacific Coast Fishing Vessel Owners' Guild
Spawn-on-Kelp Licence Holders Committee
Prince Rupert Fish Wholesalers Association

Terms of reference: provides a broad base of advice on the management of Pacific herring. Pre-fishing plans and past fishery results are reviewed annually for the herring roe and food and bait fisheries.

Chairman: Lloyd Webb,
A/Regional Herring Coordinator, Field Services Branch.

Herring Spawn-On-Kelp Licence-Holders

Licence Holders

Terms of reference: to advise on the planning and development of the herring spawn-on-kelp fishery.

Chairman: Lloyd Webb,
Regional Herring Coordinator, Vancouver.

Johnstone Strait and Fraser River Chum Advisory Committee*

Eleven members appointed to voice concerns of the seine and gillnet fishermen.

Terms of reference: advises on chum salmon management in Johnstone Strait, Georgia Strait and Fraser River.

* This Committee has been replaced by the South Coast Advisory Committee which has the same chairmen.

Chairmen: Dennis Brock,
Area Manager, South Coast and Vancouver Island Division, and
Fred Fraser,
Area Manger, Fraser River, Northern B.C. and Yukon Division.

Queen Charlotte Islands Advisory Committee

B.C. Packers*
Q.C. City, B.C.*
Pacific Coast Salmon Seiner's Association, Prince Rupert*
Prince Rupert Fishermen's Co-op*
Resident vessel owners' groups

* Commercial fishermen resident on Queen Charlotte Islands

Terms of reference: advises on all fisheries matters relating to the Queen Charlotte Islands.

Chairman: Eric Kremer,
Director, Northern Operations.

Skeena River Advisory Committee	Members
Gitksan Carrier	1
Nishga Tribal Council	1
Fisheries Council of B.C.	2
U.F.A.W.U.	2
Northern Trollers	1
Prince Rupert Vessel Owners	1
Pacific Salmon Seiners Association	1
North Coast Tribal Council	1
Prince Rupert Fishermen's Co-op Association	1
B.C. Fish and Wildlife	1
Pacific Gillnetters Association	1
Native Brotherhood	1
Sports fish Advisor	1

Terms of reference: advises on development of the fishery in the area and management of runs to the Skeena River.

Chairman: Eric Kremer,
Director, Northern Operations.

Sport Fishing Advisory Board

	Members
Amalgamated Conservation Society, Victoria	1
B.C. Wildlife Federation Directorate	1
B.C. Wildlife Federation, Lower Mainland	2
B.C. Wildlife Federation, Northern Interior	1
B.C. Wildlife Federation, Southern Vancouver Island	1
B.C. Wildlife Federation, Mid to Northern Vancouver Island	1
B.C. Wildlife Federation, Southern Interior	1
B.C. Wildlife Federation, North and Central Coast	1
Independent Anglers	6
B.C. Motel, Resorts and Trailer Parks Association	1
Marina Operators	1
Charter Boat Operators	1
Sport Fishing Institute of B.C.	1
Amalgamated Chambers of Commerce of Vancouver Island	1
Campbell River Sport Fishing Advisory Council	1
Marine Trades Association	1

Terms of reference: advises on tidal and non-tidal sport fish management and on the dissemination of information about these fisheries to the public.

Chairman: Dan Sewell,
c/o Sewell's Landing, 6695 Nelson Avenue, West, Vancouver, B.C. V7W 2B2

Stikine River Advisory Committee

Membership open to fishermen and processors.

Terms of reference: this committee, which represents the fishermen and processors of the Stikine River, advises on development of the fishery and management of the runs. The committee also advises on international matters.

Chairman: Fred Fraser,
Area Manager, Fraser River, Northern B.C. and Yukon Division.

Yukon River Advisory Committee

Membership open to fishermen and processors.

Terms of reference: the Yukon River Advisory Committee represents the fishermen and processors of the Yukon River and advises on development of the fishery and management of the runs, particularly in the Dawson area. The committee also advises on international matters.

Chairman: Gordon Zealand,
District Supervisor, Whitehorse, Fraser River, Northern B.C. and Yukon Division.

Appendix D: Publications List

Bailey, D.; et al. 1984. Basic Data for the 1982 Canadian Salmonid Catch Sampling and Mark Recovery Program. Can. Data Rept. Fish. Aquat. Sci. 454, five volumes.

Bates, K.T. 1984. Review of the 1982 Commercial Abalone Fishery in British Columbia. Can. Man. Rept. Fish. Aquat. Sci. 1749, 22 pp.

Bijsterveld, L.; Moore, B. 1984. The B.C. Tidal Sportfishing Diary Program 1982. Can. MS. Rept. Fish. Aquat. Sci. 1759, v + 40 pp.

Boutillier, J.A.; Carolsfeld, W.; Breen, P.A.; Bates, K. 1984. Abalone Survey in the Estevan Group and Aristazabal Island May, 1983. Can. Man. Rept. Fish. Aquat. Sci. 1747, 60 pp.

Brand, D.G.; Farrell, M.A.; Reid, B.J. 1984. Preliminary histological assessment of heavy metal accumulation in the bivalve Yoldia thraciaeformis collected from Alice Arm, Hastings Arm and Satellite Channel, B.C. Can. MS. Rept. Fish. Aquat. Sci. 1770, 32 pp.

Brownlee, M.J.; Levings, C.D.; Mattice, E.R. 1984 The Campbell River Estuary: A Report on the Design, Construction and Preliminary Follow-up Study Findings of Intertidal Marsh Islands Created for Purposes of Estuarine Rehabilitation. Can. Man. Rept. Fish. Aquat. Sci. 1789, 200 pp., available from Land Use Unit.

Byers, S.C.; Farrell, M.A.; Reid, B.J. 1984. Stomach contents of crabs and bottomfish from Alice Arm, Hastings Arm, Observatory Inlet and Nass River, B.C. October 1983. Can. Man. Rept. Fish. Aquat. Sci. 1771, 65 pp.

Carruthers, S.; et al. 1984. Salmonid Head Recovery Program - 1983 Annual Sport Bulletin. 33 pp.

Farrell, M.A.; Nassichuk, M.D. 1984. Trace Metal Levels in Bivalves and Crabs from Alice Arm, Hastings Arm and Observatory Inlet, B.C. Can. Data Rept. Fish. Aquat. Sci. 467, 42 pp.

Kadowaki, R.; Jantz, L.; Sprout, P.E. 1984. A Review of the 1983 Commercial Salmon Net Fisheries in Northern B.C. (Areas 3, 4, and 5): Catch, Escapement and Management Strategies. Can. Man. Rept. Fish. Aquat. Sci. 1765, 47 pp.

McLeay, D.J.; Konasewich, D.; Lanz, H.; Munday, D. 1984. Bioaccumulation studies with bivalves exposed to Alice Arm sediment contaminated with Amax/Kitsault mine tailings. D. McLeay and Associates Ltd., 113 pp.

Nassichuk, M.D.; Futer, P.G.; Patterson, J.H.; Birtwell, I.K. 1984. Water and sediment chemistry characteristics of the Tilbury and Deas Slough regions of the Fraser River. Can. Data Rept. Fish. Aquat. Sci. 492, 72 pp.

Orman, L.; Sprout, P.E. 1984. A Review of the 1983 Commercial Salmon Fisheries on the Queen Charlotte Islands (Areas 1, 2W and 2E): Catch, Escapement and Management Strategies. Can. Man. Rept. Fish. Aquat. Sci. 1764, 34 pp.

Palermo, V. 1984. Micro-Computer Implementation of the Recursive Least Squares Parameter Estimation Algorithm with an Example Solution of the Deterministic Schaefer Equation. Can. Tech. Rept. Fish. Aquat. Sci. 1251.

Palermo, V. 1984. Determination of Sample Size Requirements to Analysze the Age Structure of the B.C. Chinook Catch. Can. Tech. Rept. Fish. Aquat. Sci. 1335.

Peacock, D.; Goruk, R.; Sprout, P.E. 1984. A Review of the 1983 Commercial Salmon Net Fisheries in the Central Coast Area of British Columbia (Areas 6, 7, 8, 9, 10): Catch, Escapement and Management Strategies. Can. Man. Rept. Fish Aquat. Sci. 1766, 54 pp.

Reid, B.J.; Baumann, J. 1984. Preliminary laboratory study of the effects of burial by Amax/Kitsault mine tailings on marine invertebrates. Can. MS. Rept. Fish. Aquat. Sci. 1781, 45 pp.

Schubert, N.D. 1984. A comparison of wild and cultured Salween Creek coho salmon: 1982 tagging summary. Can. MS. Rept. Fish. Aquat. Sci. 1739, vii + 22 pp.

Schubert, N.D. 1984. The Indian food fishery at the Fraser River: 1983 summary. Can. Data Rept. Fish. Aquat. Sci. 479: v + 67 pp.

Wilson, K.H.; Pearce, B.C. 1984. The relative selection of three mesh sizes of Fraser River sockeye gillnets for chinook salmon. Can. Tech. Rept. Fish. Aquat. Sci. 1250: ix + 71 pp.

Yole, F.Y.E. 1984. Validation of Scale Ageing Criteria for Chinook Salmon Oncorhynchus tschawytscha sampled in the Pacific Region. Unpublished.

Appendix E: Field Services Offices