

CANADA DEPARTMENT OF ENVIRONMENT

Fisheries and Marine Service

Pacific Region



ANNUAL REPORT 1972

NORTHERN OPERATIONS AND INSPECTION BRANCHES

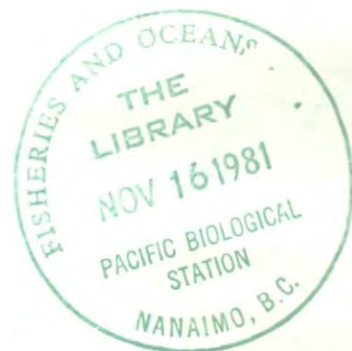
Vancouver, B.C.

May, 1973

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I. INTRODUCTION

This report is the first annual report of the Northern Operations Branch and northern Inspection Branch, Pacific Region, Fisheries and Marine Service, Department of the Environment. The report is a means of reviewing the events of the year gone by. It is a vehicle for explaining to our customers just what it is that we have been doing over the past year. It is aimed at the general public, commercial and sports fishermen, fish processors, environmentalists and other special groups, and, for that matter, all those who interact in any way with the Fisheries and Marine Service.

The Northern Operations Branch was formed in June, 1971, as a result of a major reorganization within the Fisheries Service, Pacific Region. Mr. W. R. Hourston, Director, Pacific Region, created the Branch in order to focus special attention on the fisheries resources and aquatic environments of the north coast and northern interior of British Columbia, and the Yukon Territory (Figure 1). For administrative purposes the Northern Operations Branch has been divided into three divisions: Northern British Columbia and Yukon; North Coastal; and Central Coastal. These divisions are supported by several service units: Technical Support; Environmental Quality; Economics and Sociology; and Administration.

Staff of the Branch are scattered over a broad expanse of land and sea (Figures 2 and 3). There are, for example, several thousand miles of shoreline and over 400,000 square miles of land mass incorporated in the Branch area of jurisdiction. There are approximately 200 Branch people to serve this vast territory (Appendix Table I). Some are headquartered in Vancouver, but most are located in field and district offices ranging from Dawson's Landing at the southern extremity to Whitehorse in the north, and, during seasonal activities, in field camps from the Docee River in Smith Inlet to Herschel Island on the Arctic Ocean. Mariners, biologists, technicians, economists, fishery officers, engineers, general labourers, clerical and stenographic personnel, engine-fitters and shipwrights make up the Branch complement.

The purpose of the regional administration of fisheries is to produce maximum public benefits through use of aquatic resources. Branch objectives relate to increasing the yield of commercial fisheries, increasing recreational opportunities, and preserving and restoring aquatic environments. With these general goals in mind, Branch activities are, at this stage, aimed at determining the extent and potential of aquatic resources, the use-demands which reasonably may be anticipated over the next decade, and the stresses and impacts implicit in specific kinds of economic development. As will be indicated in the body of the report, staff are engaged in a diversity of functions. Enforcement, regulation of fishing activities, monitoring industrial projects, carrying out various kinds of studies related to

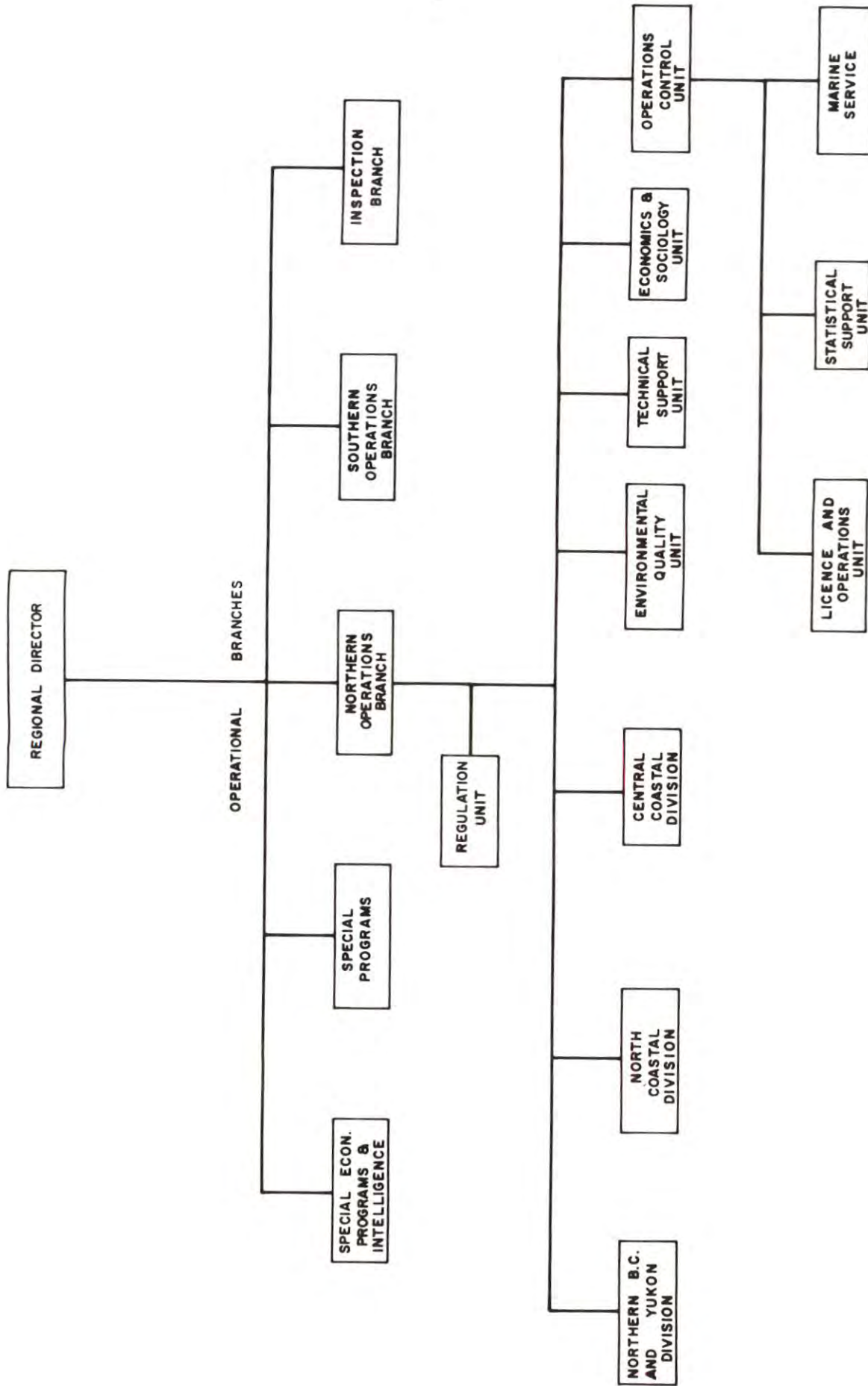


Figure 1. Fisheries Service, Pacific Region, organization outline.

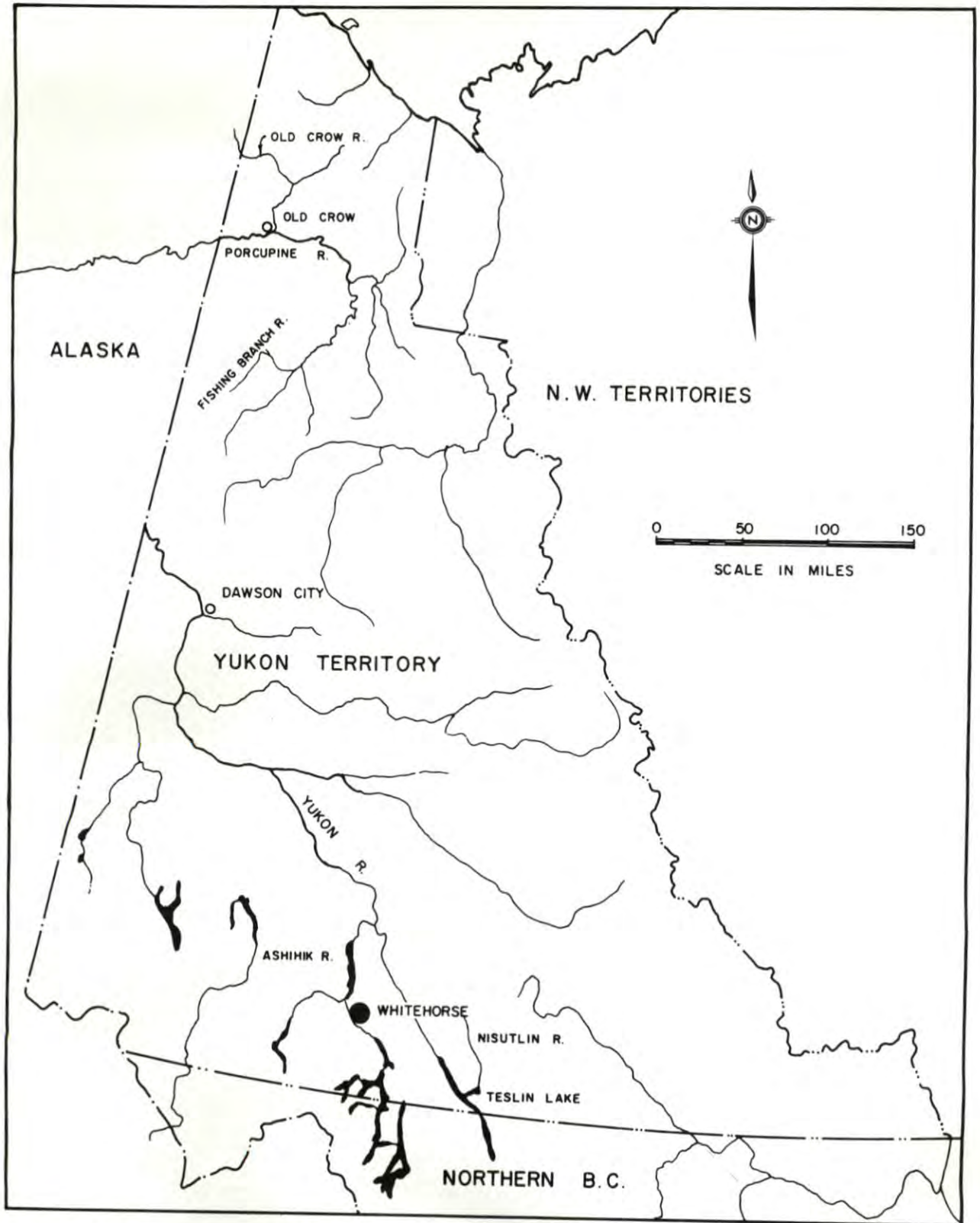


Figure 3. Northern British Columbia and Yukon Division location map.

protection of aquatic environments and specific habitats, engineering design and construction, give some indication of the range of our interest and involvement.

The Inspection Branch of the Pacific Region carries out a very important function within the geographic territory of the Northern Operations Branch (Appendix Table II). The primary responsibility of the Inspection Branch is to ensure that fish products entering the market-place are of good quality and safe for human consumption. The functions of the two Branches complement each other. The Inspection Branch has kindly consented to participate in this report so that, indeed, the report reaches beyond a single jurisdiction.

The future offers an unparalleled opportunity to ensure that growth and change in northern British Columbia and Yukon are not necessarily incompatible with maintenance of the renewable resources. The opportunity to promote the multiple use concept of resource management is an exciting prospect.

J. R. MacLeod, Manager,
Northern Operations Branch.

II. FISHERY RESOURCE MANAGEMENT

Management of the fishery resource in northern British Columbia and the Yukon is vested in Division Chiefs and their staffs of Fishery Officers, Biologists and Technicians under the direction of the Manager, Northern Operations Branch, and the Regional Director, Pacific Region. Commercial, recreational and Indian food fish fisheries for salmon, herring, shellfish and other species are managed for sustained annual yields; industrial operations such as mining and logging are monitored to ensure protection for the fishery resource; and public information programs are instituted. Biological projects are conducted to ascertain the status of fish stocks and to acquire further information so that fishery management can be improved. Biological personnel are headquartered in the Vancouver regional office but are assigned to the various areas for field work.

The Northern Operations Branch provides field services in northern British Columbia through three divisions further subdivided into five districts each staffed with a District Supervisor and supporting staffs of Fishery Officers and office personnel. Patrolmen and Guardians are also employed throughout the salmon fishing and spawning season. District offices are located in Dawson's Landing, Kitimat, Prince Rupert, Queen Charlotte City and Whitehorse, and sub-district offices are also maintained in some districts. District Supervisors are responsible to Division Chiefs headquartered in Vancouver. In addition to management of fisheries and environmental protection work, Fishery Officers are responsible for enforcing the Fisheries Act and British Columbia Fishery Regulations, as well as a number of related acts and regulations.

The Northern Marine Services Section with its complement of 12 patrol vessels is a vital unit essential to the successful functioning of the Fisheries Service in northern British Columbia. The Marine Section is administered from Prince Rupert but patrol vessels are based from Masset, Queen Charlotte Islands, in the north to Dawson's Landing, Rivers Inlet, in the south.

Salmon Management

At present, a major portion of fisheries work undertaken in the North Coastal and Central Coastal Divisions is salmon oriented and includes the management of commercial, recreational and Indian food fisheries, and monitoring users of other resources to ensure protection for the salmon resource and the environment. Fishery Officers are heavily involved with salmon management; biologists conduct studies of abundance, migration behaviour and productivity of salmon; and engineers direct studies towards the benefit of salmon production or improvement and/or restoration of salmon stream habitats.

In 1972, 68 percent of salmon landed in British Columbia were commercially harvested from northern coastal waters (Tables I and II). Pink salmon constituted 41 percent of salmon landings in northern British Columbia followed by chum landings at 31 percent. Coho and sockeye salmon were the next highest landings.

The Central Coastal Division (Statistical Areas 6 to 10) accounted for 56 percent of northern landings and 31 percent of total British Columbia landings due to heavy pink and chum landings in 1972.

Herring Management

A total of 48,000 tons of herring was harvested throughout British Columbia in 1972, 22,612 tons being harvested in northern British Columbia primarily for the roe fishery (Figure 4).

During the 25 year period 1940-1964, the amount of herring spawn deposited along the northern British Columbia coast (Areas 1 to 10) has averaged 96.5 miles. In 1972, a total of 119.6 miles of spawn was deposited in northern waters (Table III).

Halibut Management

In 1972, the north Pacific halibut catch totaled 41.5 million pounds compared to 46.6 million pounds in 1971. A quota of 15 million pounds had been established for Area 2, and a combined catch quota for Areas 3A and 3B was set at 25 million pounds (Figure 5). Both quotas were exceeded slightly as well as some 200,000 pounds being taken in the Bering Sea, bringing the final aggregate north Pacific catch to 41.5 million pounds of which Canadian vessels took 22.1 million pounds. A total of 20.6 million pounds was taken by Canadians in waters north of Cape Caution. The catch per unit of effort continued to decline and the average age of the fish, also, was relatively low. Highlight of the year, however, was that increased prices largely compensated for the declining catches in terms of dollar value. In 1972 prices reached the highest level in history with chicken halibut selling for as much as 30¢ per pound, and medium and large halibut going for over 80¢ a pound.

The Fisheries Service patrol vessel "Tanu" carried out the annual early season Bering Sea patrol. Weather was reported as being fairly normal except for unusual ice conditions causing some fishing vessels to lose some gear, and a severe storm in the Gulf of Alaska early in April required assistance to be given one of our fishing boats.

TABLE I. Total number of salmon caught in 1972 by area.

Area	Thousands of Fish							Total
	Chinook	Sockeye	Coho	Pink	Chum	Steelhead		
North Coast								
Alaska								
1	1.0	-	2.2	.2	-	-	3.4	
2 East	60.5	66.7	271.9	316.3	51.0	.9	767.3	
2 West	40.8	.6	177.7	400.6	281.8	-	901.5	
3	13.7	4.6	14.9	653.1	121.8	-	808.1	
4	32.7	230.1	117.5	1,080.7	353.3	2.0	1,816.3	
5	52.2	674.5	148.9	689.4	119.9	7.7	1,692.6	
6	68.2	76.0	199.0	1,283.3	114.8	.9	1,742.2	
7	66.5	102.0	233.2	5,612.3	473.6	.3	6,487.9	
8	54.0	69.0	226.1	1,373.4	635.1	.5	2,358.1	
9	31.1	85.9	134.5	1,104.7	233.7	1.1	1,591.0	
10	18.2	379.0	48.0	826.8	27.5	.7	1,300.2	
30	9.7	59.5	25.6	14.9	33.7	.1	143.5	
	4.2	-	13.9	3.1	-	-	21.2	
Total	452.8	1,747.9	1,613.4	13,358.8	2,446.2	14.2	19,633.3	
South Coast								
Total	974.5	1,297.8	1,662.5	857.9	3,371.8	3.6	8,168.1	
Fraser Area								
Total	123.0	527.0	80.9	.1	256.2	1.6	988.8	
B. C. Total	1,550.3	3,572.7	3,356.8	14,216.8	6,074.2	19.4	28,790.2	

TABLE II. Total weight of salmon caught in 1972 by area.

Area	Thousands of Pounds						Total
	Chinook	Sockeye	Coho	Pink	Chum	Steelhead	
North Coast							
Alaska	13.0	-	9.2	1.0	-	-	23.2
1	700.8	417.3	1,678.5	850.2	474.8	7.5	4,129.1
2 East	474.0	4.1	1,142.9	1,189.2	2,613.1	.2	5,423.5
2 West	193.2	25.8	102.7	2,176.9	1,187.4	.3	3,686.3
3	400.4	1,450.1	856.9	2,783.7	3,950.6	21.2	9,462.9
4	449.3	4,438.8	1,005.1	2,229.8	1,456.7	85.0	9,664.7
5	699.1	473.9	1,196.1	3,468.1	1,408.0	8.5	7,253.7
6	590.2	575.9	1,477.1	14,910.0	6,047.5	3.4	23,604.1
7	671.5	368.8	1,492.7	3,826.1	6,808.6	5.3	13,173.0
8	398.7	376.1	865.4	3,165.4	3,134.9	13.1	7,953.6
9	146.6	1,873.2	356.9	2,454.3	361.7	7.3	5,200.0
10	89.6	321.4	177.3	52.9	358.5	1.0	1,000.7
30	58.8	.1	89.4	11.0	.4	-	159.7
Total	4,885.2	10,325.5	10,450.2	37,118.6	27,802.2	152.8	90,734.5
South Coast							
Total	9,143.5	7,483.3	9,807.6	2,416.3	35,807.8	36.3	64,694.8
Fraser Area							
Total	2,280.8	3,134.8	585.9	1.0	2,933.6	20.9	8,957.0
B. C. Total	16,309.5	20,943.6	20,843.7	39,535.9	66,543.6	210.0	164,386.3

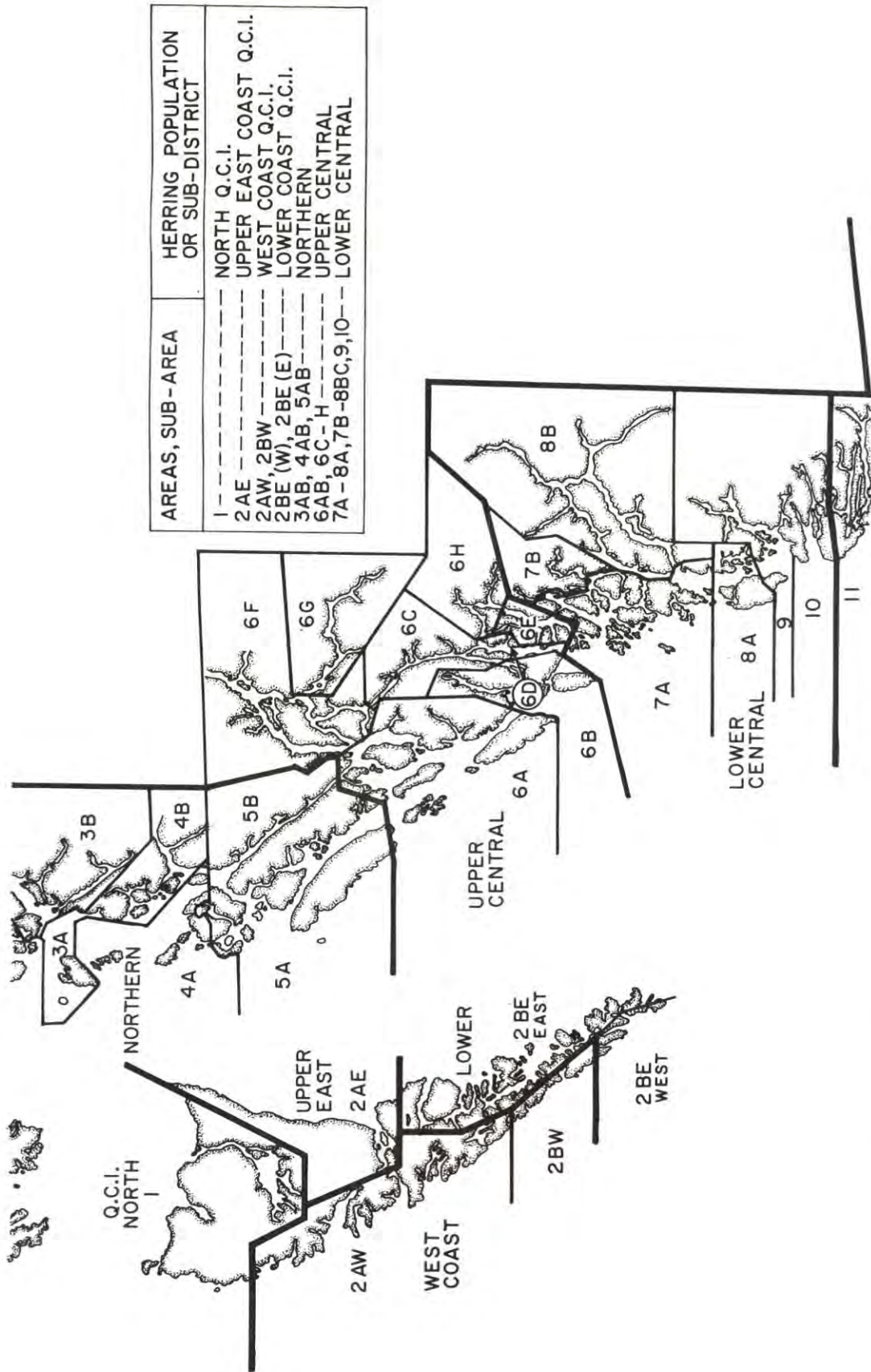


Figure 4. Northern British Columbia herring areas and sub-areas.

TABLE III. Herring spawn (statute miles) deposited in northern British Columbia waters by statistical area and sub-area, 1972.

Area	Sub-Area	1972 Area Mileage	Sub-District	1972 Population Mileage	Above or Below 1971 Level (in brackets)	Above or Below 25 Year (1940-64) Average (in brackets)	Mileage by Geographical Region
1		0.0	Graham Island North - Queen Charlotte Islands	0.0	- (0.0)		
2	AE	5.4	Upper East Coast - Queen Charlotte Islands	5.4	+200% (1.8)	Above (2.2)	27.8 Q.C.I.
2	AW	5.1	West Coast - Queen Charlotte Islands	5.1	+104% (2.5)	Above (3.9)	
2	BE(E) BE(W)	12.4 4.9	Lower East Coast - Queen Charlotte Islands	17.3	-8% (18.8)	Above (14.7)	
3		4.8	Northern	15.7	-17% (18.9)	Below (25.9)	91.8 Northern B.C.
4		7.6					
5		3.3					
6	A	0.8	Upper Central - Major	4.0	-32% (5.9)	Below (17.7)	
6	B C-H	3.0 0.2	Upper Central - Minor				
7		9.6	Lower Central - Major				
8	A	2.1	Lower Central - Minor	72.1	-14% (83.4)	Above (32.1)	
8	B	21.4					
9	C	13.0 19.4					
10		6.6					

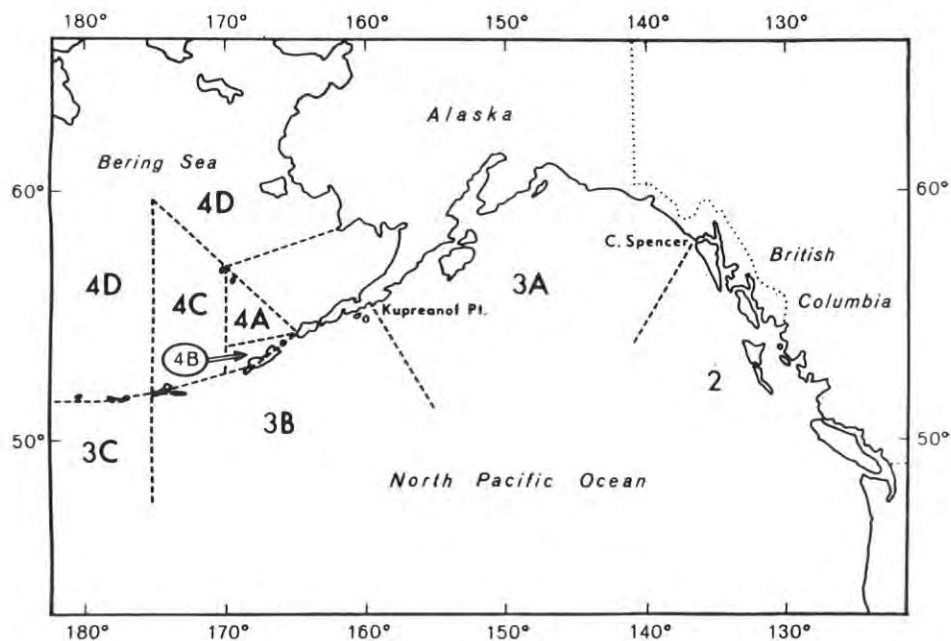


Figure 5. International Pacific Halibut Commission regulatory areas.

North Coast Groundfish and Shellfish Landings

Groundfish and shellfish landings for 1972 are summarized in Table IV.

TABLE IV. North coast groundfish and shellfish landings, 1972.

Species	Landings (thousand pounds)	Species	Landings (thousand pounds)
Soles	5,152	Ocean Perch	3,511
Red & Rock Cod	2,439	Tuna	4,537
Ling Cod	854	Octopus	25
Grey Cod	5,369	Smelt	4
Black Cod	535	Other Fish	319
Non-Food Fish	762	Shrimps	34
Flounder	408	Clams	322
Skate	123	Crabs	486

A. North Coastal Division

1. Queen Charlotte Islands District

This District is headquartered at Queen Charlotte City, 80 miles west of Prince Rupert and 400 miles north of Vancouver. It is a coastal district composed of a group of islands including two main islands, and numerous smaller ones encompassing a total length of 150 miles with 1500 miles of coast line. The Area 2W (west coast) Sub-District Fishery Officer is located at Queen Charlotte City, and Sub-District offices are located in Masset (Area 1) and Sandspit (Area 2E - east coast). The Queen Charlotte District is responsible for managing commercial salmon, herring and shellfish fisheries, Indian food fisheries, and recreational fisheries, monitoring logging operations and maintaining a public relations program.

a. Salmon management

(i) Area 1, northern Queen Charlotte Islands

The major local fisheries in Area 1 during 1972 were for pink and chum salmon. In the outside waters of Area 1, however, there is a substantial troll and net interception fishery on stocks of chinook, coho, sockeye and pink salmon destined for other areas. A fleet averaging 60 gillnetters and 3 seiners operated in 1972.

Sockeye salmon

The 1972 sockeye catch of 66,700 fish in Area 1 was well above average. This catch consisted mainly of fish destined for other areas.

Coho salmon

The 1972 coho catch in Area 1 totalled 271,900 and was about average for the Area. The troll fishery catch totalled 169,000 pieces.

Pink salmon

Based on escapement levels in 1970 a below average return of pink salmon was expected in 1972, and some restrictions of the net fishery were imposed. Due to a poor escapement of 35,000 to Naden River in 1970, and a low return to the other Naden Harbour streams, the

Harbour was closed to all net fishing during the pink salmon migration. As a result of the closure a substantial degree of rehabilitation was achieved and the four streams in Naden Harbour received a very good total escapement of 235,000. The Davidson Creek return of approximately 100,000 came as a surprise since the usual return to that stream varies between 3,500 and 7,500. A counting fence was operated on the Naden River during the pink salmon migration and 100,000 pinks were counted.

Based on the escapement recorded in 1970 to the Yakoun River and other Masset Inlet streams, the Inlet should have supported an average pink salmon fishery in 1972. The Masset Inlet pink salmon return was a failure however, and by August 19 only 10,000 pinks had been counted through the counting fence on the Yakoun River. Due to this failure the Inlet was closed to all net fishing effective August 20, and did not re-open until September 10 when the fall chum salmon net fishery commenced. Although the Inlet was open prior to August 20 no net fishing took place due to the lack of pink salmon. The total escapement to the Yakoun River was 64,000 pinks, the lowest recorded since 1962. Other pink salmon producers in Masset Inlet showed a comparable low return.

The outside waters of Area 1 were open on a four day per week basis prior to July 30. On July 30 a three day week was instituted and on August 20 the Area was closed for three weeks for conservation of pink salmon. The pink salmon catch in Area 1 totalled 316,300 and came entirely from the outside waters of the Area. This was the largest pink salmon catch on record for the outside waters and consisted largely of fish destined for other areas. The gillnet fleet took 22,000, purse seiners 146,000, and trollers 148,000 pieces.

Chum salmon

With the exception of a small native food fishery, Masset Inlet streams have never supported a significant chum salmon net fishery. The largest catch in recent years was 7,042 pieces taken by gillnet in 1969 with little taken since. Naden Harbour has during the past few years supported a small fall chum fishery. This year's catch of 3,156 was low but was comparable with the brood year catch of 2,375 chums. As in past years, only local gillnet vessels participated, averaging six in number. The 1972 chum escapement of 8,600 was the lowest since 1959.

Chinook salmon

An average catch of 60,500 chinook salmon was recorded in Area 1 in 1972. The catch was taken almost entirely by the troll fishery and was based mainly on stocks destined for other areas.

(ii) Area 2E, east coast Queen Charlotte Islands

The major fisheries in Area 2E in 1972 were for pink and chum salmon but substantial numbers of chinook and coho were also taken in the troll fishery.

Coho salmon

The coho catch in Area 2E totalled 177,700 in 1972. The majority of these fish were caught in the troll fishery.

Pink salmon

The main pink salmon fishery began on August 9, was open three days per week for three weeks, and closed on August 29. An average of 30 seines and 30 gillnets operated during this fishery, and a total of 400,600 pinks were landed. The pink escapement to Area 2E streams totalled 765,200 fish.

Chum salmon

The chum fishery opened September 10 on a two day per week basis and closed on September 27. During the last week three days fishing was permitted and there was, therefore, seven days fishing during the chum salmon season. The gear reached a high of 42 seines and 264 gillnets. Boundaries were located to provide large sanctuary areas for protection of early run chums especially for streams in the Darwin Sound - Juan Perez Sound area. The total catch of 281,800 chums in Area 2E in 1972 compares favourably with the ten year average catch of 234,000. However, the escapement of 187,400 chums to Area 2E streams was below escapement requirements for the Area. Streams south of Selwyn Inlet are still receiving lower escapements than required.

Chinook salmon

A total of 40,800 chinook salmon were caught in Area 2E in 1972. Almost the entire catch was taken in the troll fishery.

(iii) Area 2W, west coast Queen Charlotte Islands

The major fisheries in Area 2W in 1972 were pink and chum salmon seine fisheries. However, a small sockeye fishery occurred at Athlow Bay where five gillnets and one seine landed 4,200 sockeye, more than triple the six year catch average for this Area. A small troll fleet landed a few chinook and coho from Area 2W.

Pink salmon

The 1972 catch of 653,100 pink salmon was the largest since 1954 (Plate 1). It was an unpredictable fishery as 61 percent of the total production came from the Rennell Sound and Athlow Bay areas instead of the normally more productive Kaisun Harbour and Security Inlet areas. Fishing was permitted for nine days during a three week period. The peak gear count totalled 31 seines and 5 gillnets. The major production areas were: Port Louis; Athlow Bay; Tartu Inlet, Bonanza Creek and Riley Creek in Pennell Sound; Government Creek in west Skidegate Channel; Kaisun Harbour and Security Inlet in Englefield Bay; and Kano Inlet.



Plate 1.
Pink salmon being
landed on seiner,
Englefield Bay,
Queen Charlotte
Islands.

Although streams were subject to low water conditions during most of the spawning period, the escapements to streams were excellent with a total of 382,000 fish. Streams in Tasu Sound, Port Louis, and Athlow Bay, however, had lower pink escapements in 1972 than in 1970.

Chum salmon

The chum production of 121,800 pieces was considerably better than the five year average catch of 86,600 pieces. As usual, the major fishing effort occurred in Tasu Sound and Englefield Bay areas. A total of 31 seines and 20 gillnets fished for chums in Area 2W and the seines accounted for 85 percent of the catch. The 1972 escapement of 74,500 chum salmon was below the five year average of 97,000 chums. The Tasu Sound and Athlow Bay - Port Louis areas were under-spawned.

b. Herring management

(i) Catch

The herring fishery began on March 25 on the Queen Charlotte Islands (Areas 1 and 2) when seiners began scouting for fish. A total of 5110 tons of herring was harvested from Louscoone Inlet, Skincuttle Inlet and Cumshewa Inlet. No herring were harvested in Area 1.

(ii) Spawn deposition

Area 1 is not a major spawning area and in the past has received only light spawnings, less than a mile on three occasions. There was no herring spawning in Area 1 in 1972. A total of 27.8 statute miles of spawn were deposited on the east and west coasts of the Queen Charlottes (Areas 2E and 2W), an increase of 4.7 miles over the 1971 spawn deposition and well over the twenty year average. Spawn mortality was considered average.

c. Crab fishery

Crab landings on the Queen Charlotte Islands totalled 346,400 pounds in 1972, the majority being landed in Area 1. Hecate Strait, Area 2E, has traditionally yielded the highest crab landings in northern British Columbia with landings exceeding 2.5 million pounds from this area alone. Crab

landings from the Queen Charlotte Islands area have been steadily decreasing since 1966 as part of an overall Pacific decline in crab stocks apparently caused by environmental conditions. Hecate Strait crab landings of 27,000 pounds in 1972 represents an all-time low at least since 1951 for this area.

d. Indian food fisheries

The Indian salmon food fisheries are confined to Masset Inlet in Area 1, and Copper River, Skidegate Inlet and Mathers Creek in Area 2E. Catch figures for Area 2E are summarized in Table V.

TABLE V. Area 2E Indian food fishery catches.

Number of Fish Taken					No. Permits	No. Families	No. People
Sockeye	Coho	Pink	Chum	Steelhead			
Copper River							
	1800			35	24	24	115
Skidegate Inlet							
	90		45		6	6	32
Mathers Creek							
	no fish taken				3		

e. Tidal sport fisheries

The tidal sport fishery on the west coast of Queen Charlotte Islands (Area 2W) is confined largely to Tasu Sound. A total of 33 chinooks and 136 coho were caught in Area 2W in 1972.

The east coast of Queen Charlotte Islands (Area 2E) is becoming well known for its tidal sport fishing on rivers such as the Copper, Deena and Tlell, and Yakoun in the north (Area 1). Effort increased in 1972 especially with regard to tourists who came to fish these rivers.

A predicted heavy run of coho to the Copper River failed to materialize in 1972, and returns to other rivers were only average. A total of 1,123 pinks and 1,380 coho were landed in Area 2E. Catches for the Yakoun River and other northern streams were not available at time of printing.

f. Logging

Logging, together with fishing, forms the main industrial concern of the Queen Charlotte Islands. As the majority of logging is carried out under the tree farm licence program, each year sees further activity.

MacMillan Bloedel Company operates in the watershed area surrounding Masset Inlet with their main camp located at Juskatla. This area was formerly logged by the Powell River Company Limited which operated during the late 1930's and early 1940's cutting and supplying spruce for airplane construction for the war effort.

Crown Zellerbach operates on the islands with their main camp located in Sandspit. The main area of operation is the watersheds of Skidegate Inlet.

Rayonier operates out of Sewell Inlet and maintains a settlement of 230 people with 130 persons employed.

A number of smaller companies operate at other locations on the islands including Naden Harbour, Rennell Sound and Thurston Inlet.

A portable sawmill constructed in a converted three hundred foot deepsea freighter is proposed for Naden Harbour and could be operational by mid-summer of 1973. The vessel will be modified to house a regular sawmill on the upper deck with a lower deck used for processing pulp chips and sawdust. This vessel will be located in Naden Harbour and will be grounded in a channel dredged in the mud shoreline. Approximately 120 employees will be required for this operation and 60 percent will be Indians from the area. They will be hired not only for general labour but also for training to upgrade their skills. Aspects of this project were developed in close consultation with the Fisheries Service as well as the B. C. Forest Service to ensure that no environmental problems are caused.

g. Canada-USSR Fisheries Agreement, Tasu Sound, Moresby Island

Under the Canada-USSR fishing agreement the Russian fishing fleet has access to Tasu Sound for transfer of cargo. During the year a total of 40 vessels entered the harbour during the period September 22 to November 21. The harbour was used by this fishing fleet on a regular basis throughout the fall, with the last vessel departing November 21. Special meetings were held with the fleet Commander on September 23, and again on November 9 when the Regional Director met with the fleet Commander to discuss the incidental catch of herring by USSR fishing vessels operating off south western Vancouver Island.

2. Biological Programs - Queen Charlotte Islands

a. Herring spawn on kelp studies

Herring spawn during late winter and spring in inshore waters depositing adhesive eggs on marine plants. In a number of areas, including the east coast of the Queen Charlotte Islands, herring spawn extensively on kelps. Recently considerable interest has developed in the harvest and export of herring spawn on kelp to Japan where it is greatly prized as a traditional food particularly during New Year festivities. At present this product is restricted to Indians' personal use only and commercial harvest and sale is prohibited. The Fisheries Service undertook a program commencing in April, 1972, to study the feasibility of harvesting spawn on kelp from the beach in Cumshewa Inlet and in an impoundment in Skidegate Inlet.

(i) Natural beach harvest

Herring spawn on kelp was harvested in Cumshewa Inlet using pike poles or herring drags operated from skiffs. Considerable damage was caused both to plants and herring spawn by this harvest method. A total of 450 pounds of spawn on kelp was harvested from the beach.

(ii) Propagation in an impoundment

An impoundment was constructed in Skidegate Inlet using primarily logs and poultry mesh. A section 30 feet by 47 feet by 9 feet deep was used for the study. Kelp fronds (leaves) were individually picked and strung across the impoundment in rows, each row of fronds being one to three feet below the water surface (Plate 2). Herring were purchased from local bait fishermen who seined the fish and placed them in the impoundment where they then spawned upon the strung kelp fronds (Plate 3). The herring were released from the impoundment after they had completed spawning. The major problem in using the impoundment was that of obtaining mature herring that were ready to spawn. The spawn covered kelp fronds were left in the impoundment for several days and then removed from the water and salted down in fir stave barrels. Generally, the ratio of herring spawn to kelp was in the order of 80 percent by weight. A total of 823 pounds of spawn on kelp was produced in the impoundment.

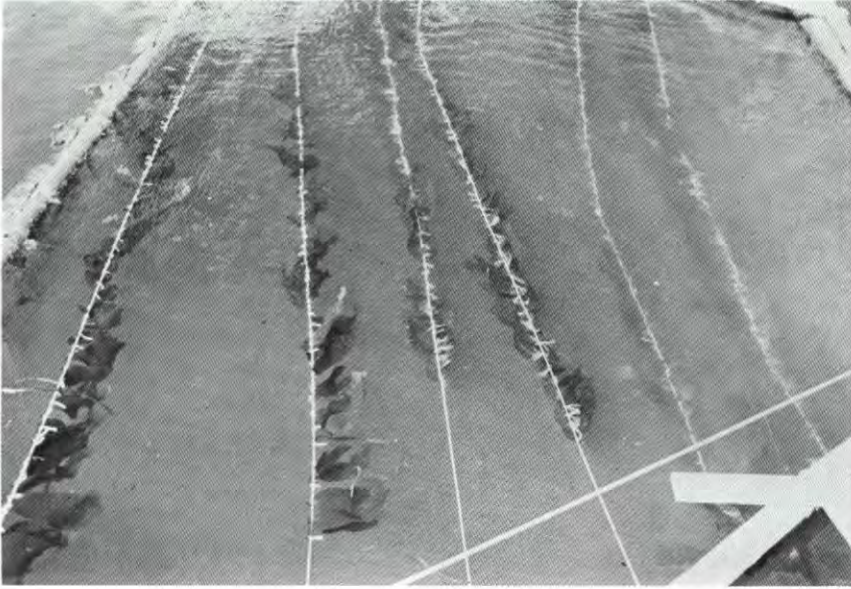


Plate 2.
Kelp fronds strung in
herring impoundment.



Plate 3.
Herring being seined
prior to placement
in impoundment.

(iii) Comparison of products

The herring impoundment produced a superior product of spawn on kelp as compared to that harvested naturally from the beach. Kelp fronds placed in the impoundment had a much more even and thicker coverage of herring spawn than the natural product. Kelp fronds from the beach often had one side much more heavily spawned than the other side, and the herring spawn was often dirty. The natural beach harvest is also considered to be a less

desirable operation because of the extensive damage caused to both kelp plants and herring spawn. The spawn on kelp product was auctioned and the average price received for it was \$3.71 per pound. The better quality of the impoundment product was reflected by the top price of \$4.25 per pound.

b. Seaweed inventory

An inventory of kelps by species, location and abundance was completed in Skidegate and Cumshewa Inlets, Queen Charlotte Islands, in May, June and July, 1972 (Plates 4 and 5). The survey consisted of noting and photographing the geographic location of kelp beds, determining the area, density and distribution of specific kelps and observing, recording and photographing the associated seaweeds and invertebrates within the beds.

Two diving biologists conducted the survey from a vessel and used aerial overflights to locate and photograph the kelp beds. Considerable scuba diving was done by both biologists to complete the inventory.

The major kelps inventoried were Macrocystis spp. and Laminaria spp. The standing crop of Macrocystis spp. in Skidegate Inlet was 140.6 tons while Cumshewa Inlet had 241,000 tons. The calculated standing crop of Laminaria spp. in Skidegate Inlet was 36.2 tons as compared to 5,450 tons in Cumshewa Inlet.



Plate 4. Kelp bed area determination using an optical range-finder.



Plate 5. Example of typical kelp bed.

c. Mechanical razor clam digger

A self-propelled mechanical razor clam dredging machine was designed and constructed to facilitate harvest of an estimated sustained yield of one million pounds of clams per year from North Beach near Masset on the Queen Charlotte Islands (Plate 6). The mechanical digger harvests clams from a section of beach 400 feet wide, 200 feet above and 200 feet below the low water surf line. At least 50 percent of this area is inaccessible to hand diggers at all times throughout the year. Harvest of razor clams by hand diggers averaged only 82,000 pounds annually during the period 1964 to 1971. The maximum annual harvest by hand diggers was 272,000 pounds but it has become increasingly difficult to interest people in digging for razor clams by hand, and thus a mechanical digger was put on the beach to harvest the available clam stock. However, the beach is closed to the machine during the period June 16 to September 30 inclusive to afford protection to spawning razor clams and resultant sets.

The mechanical razor clam digger operated from October, 1971, to May 8, 1972. The machine operated only on a part time basis due to frequent mechanical and operational difficulties. In 1971 the machine harvested 7100 pounds of razor clams, and in 1972 it harvested 22,480 pounds of razor clams in a total of 15 digging days. The machine usually operated only 2 to 4 hours per day. A Fisheries Service observer was aboard the machine much of the time monitoring its progress and carrying out a sampling program. The machine harvests all legal size razor clams, 3.5 inches in length or greater, and returns

undersize clams to the water where they dig themselves back into the sand. A major problem with the mechanical digger, in addition to mechanical difficulties, has been breakage to both legal and undersize razor clams. It is expected that breakage can be reduced through modifications to the machine.



Plate 6. Mechanical razor clam digger
at North Beach,
Queen Charlotte Islands.

The future of the mechanical clam digger is uncertain. The machine has been transferred to Vancouver awaiting modifications designed both to improve its operations and to reduce damage to undersize razor clams. Whether these modifications will be performed and the machine returned to the Queen Charlotte Islands is not known at this time.

3. Skeena District

The Skeena District includes Statistical Areas 3, 4 and 5, and is managed from Prince Rupert. Coastal sub-district officers for the Nass (Area 3), Skeena (Area 4) and Grenville-Principe (Area 5) areas are headquartered in Prince Rupert. Sub-district offices are located at Smithers and Terrace where Fishery Officers for Babine-Morice and Terrace-Lakelse areas are situated. The Skeena District is responsible for managing major commercial salmon, herring, marine fish and shellfish fisheries, monitoring tidal and non-tidal recreational fisheries, monitoring industrial and logging operations, and maintaining a public relations program.

a. Salmon management

(i) Area 3, Nass Sub-District

The first salmon landings from Area 3 in 1972 were recorded in early May when a few chinook salmon were landed by trollers and gillnetters working from Port Simpson. Prior to June 25 gillnets were restricted to an 8 1/2" minimum mesh size and a three day per week fishery was permitted. From June 25 to September 17 small mesh nets were permitted and a two day per week fishery was maintained except in Portland Canal where a four day per week fishery was maintained. The upstream boundary line on the Nass River was located from Arrandale to Kincolith on June 25 but was later relocated slightly to a line from Kincolith to Stevens Point. Khutzeymateen Inlet and Work Channel were closed to salmon fishing for the season on June 25, and Observatory Inlet was closed on July 23. Further temporary closures were implemented in Sub-area 3Z during July and August for conservation of pink and chum salmon.

Sockeye salmon

The 1972 sockeye catch totalled 230,000, just slightly lower than the five year average of 244,000. The gillnet fleet took 82 percent of the catch and seines 18 percent. The Nass River sockeye escapement totalled 180,000 fish in 1972.

A test-fishing operation was conducted on the Nass River to provide a daily index of sockeye escapement from the commercial fishing area. This was used to assist in the management of the Nass River sockeye stocks.

A total of 129,500 sockeye were counted through the Meziadin River fishway. Escapements to other major sockeye areas on the Nass River were: Bowser Lake - 29,300 spawners; Damdochax River - 12,000 spawners; and Kwinageese River - 5,000 spawners.

Coho salmon

The coho catch of 118,000 slightly exceeded the five year average of 102,000. Trollers took 44 percent of the catch, gillnets 48 percent and seines 8 percent. Due to bad weather conditions with very high water, only a few of the coho streams were inspected, and only an estimated 20,000 spawners were observed. The five year average is 49,000 for the total area.

Pink salmon

The commercial catch of pink salmon amounted to 1,080,000 pieces, and was above the five year (even year) average of 829,000, and the 1970 catch of 834,000. The run was composed of primarily small fish with an average weight below three pounds. The seine fleet took 88 percent of the total catch, the gillnets 10 percent, and trollers 2 percent. The gillnet catch was lower mainly due to the small fish passing through the nets. The high production period for seines was the last two weeks in July when they took an estimated 463,000 pinks. An estimated 238,000 pinks reached the streams of Area 3, and this is below the five year (even year) average of 291,000. An additional 85,000 pinks entered United States streams in Portland Canal and Pearse Canal.

Chum salmon

The 1972 chum catch of 353,000 pieces is the highest since 1956 and is well above the five year average of 135,000. The peak production weeks for the gillnets, which took 86 percent of the total catch, were the third week of July for summer chums, and the second and third weeks of August for fall chums. Seines took 14 percent of the catch and these were caught mainly during the last two weeks in July. The Portland Canal area was the prime producer in 1972, and remained open throughout the fishing season. The estimated escapement for the area was 82,000, which is double the five year average of 40,000 and is the highest since 1964. An additional estimated 80,000 chums entered the United States streams in Portland Canal.

Chinook salmon

The 1972 chinook salmon catch in Area 3 totalled 33,000 pieces which compares favourably with the five year average of 33,000. A total of 19,000 were taken in the net fishery, and 14,000 in the troll fishery. The peak landings were made during June. The estimated escapement which totalled 17,000 fish was below the five year average of 25,000 fish.

(ii) Area 4, Skeena Sub-District

Management of Skeena River salmon stocks in Area 4 is conducted under the direction of the Skeena River Salmon Management Committee. The Committee includes

Mr. W. R. Hourston, Director of Fisheries, Pacific Region and Dr. W. E. Johnson, Senior Director (Fisheries R & D), Pacific Region. A seven man Advisory Board provides representation from the various facets of the fishing industry. The Committee establishes policy for management and investigation of Skeena River salmon stocks. The implementation of the policy is the responsibility of staff in the Northern Operations Branch and the Pacific Biological Station.

The main Area 4 commercial salmon net fishery commenced on June 25 in 1972 with effort and landings prior to that date being restricted almost entirely to early chinooks. Prior to June 25 an 8 1/2" mesh size restriction was in effect. Commencing the first week in June, salmon net fishing was reduced to 1 1/2 days per week from 3 days as a conservation measure to increase the escapement of early Skeena River chinooks.

The fishery opened for a two day week on June 25 and approximately 256 gillnet vessels were in the Area at that time.

Gillnet gear concentration in Area 4 reached a peak of 664 vessels on August 2. This figure is about 75 vessels less than the peak gear concentration in 1971.

A total of 31 net fishing days were permitted during the prime migration period, June 25 to September 13. Gillnets operated in Area 4 throughout this period while seines were restricted to six fishing days during the period July 16 until August 4.

In order to benefit from the expenditure of public funds on the Babine Development Project, salmon purse seines were permitted to operate for a three week period in that portion of Area 4 seaward of a line from Hunt Point on Porcher Island to Lima Point on Digby Island. This includes all the waters of Area 4 referred to as Sub-areas 4-1, 4-2, 4-3 and 4-4. The peak seine gear concentration of 61 vessels was recorded when the fishery opened on July 16. It was apparent almost immediately that the seines were inefficient on sockeye in Area 4, and about half the vessels left the area within twenty-four hours. The seine gear effort stabilized at between 25 and 35 boats for the remaining five fishing days of the three week period, and the vessels spread out and operated mainly in the Ede Pass, Qlawdzeet Anchorage (Squadaree), Hudson Bay Pass and Finlayson Island areas. Although the seines managed to catch only 27,700 sockeye, they did much better catching 178,400 pinks migrating to the Skeena.

Sockeye salmon

The 1972 sockeye return to Area 4 totalled 1,507,079 fish consisting of approximately 382,000 4₂'s, 1,057,000 5₂'s and 67,000 other ages. As a result of the poor return of age 4 fish the actual stock was below the expected return of 1.9 million fish. The catch totalled 758,917 of which 674,254 were taken in Area 4, and 84,663 in Sub-areas 3X and 3Y. The Indian food catch totalled 45,666. Escapement to the Skeena system was 703,284 of which 663,000 spawned in the Babine system. In addition, 258,000 jack sockeye returned to Babine. These fish were not included in the above totals.

Test-fishing was conducted on the Skeena River to provide a daily index of sockeye salmon escapement from the commercial fishing area. This test fishery provides a major tool for managing the Area 4 sockeye and pink fisheries.

Fish were counted in the Babine River through the Babine Fence from August 3 to September 20 (Plates 7 and 8). Fish first appeared at the fence site in the week commencing July 16, and 20,000 sockeye entered the system before all fence panels were installed. The counting operation was delayed due to unusually high water conditions in the Babine Lake and River. High water velocities and heavy log-drift from June 12 to July 7 caused damage to the fence which had to be repaired before operations began.

Spawners in the Nanika River were estimated with a tag and recovery program, and totalled only 1,139 fish, the lowest escapement since 1963.

Coho salmon

The 1972 coho salmon catch in Area 4 totalled 148,900 pieces by all types of gear. The catch was divided almost equally between the gillnet and troll fisheries. The estimated coho escapement to the Skeena River and other Area 4 streams totalled approximately 83,500 fish in 1972.

Pink salmon

The 1972 pink salmon return to the Skeena River totalled 3,558,300 fish, and considerably exceeded the expected return of 2.4 million. The fish were very small in 1972, however, and averaged less than three pounds. The Area 4 catch totalled 669,300 fish and, in addition, approximately 625,000 were caught in Ogden Channel. The

escapement totalled 2,264,000 and included 2,153,000 spawners in the Skeena River system, and 111,000 in the Area 4 coastal streams. There was an exceptionally large escapement to the mainstem Skeena of 1,000,000 fish but the spawn of an estimated 50 percent of the population was lost when water levels dropped shortly after the spawning season. A counting fence was operated on the Lakelse River and 850,000 pinks spawned in that system. The escapement to the Kispiox River was estimated visually by aircraft at 20,000 spawners, up from the brood year escapement of 8,000. The Kitwanga River pink spawning escapement was enumerated by the strip count method to be 175,000. The Babine River escapement was 32,000, down from 166,000 in the brood year.

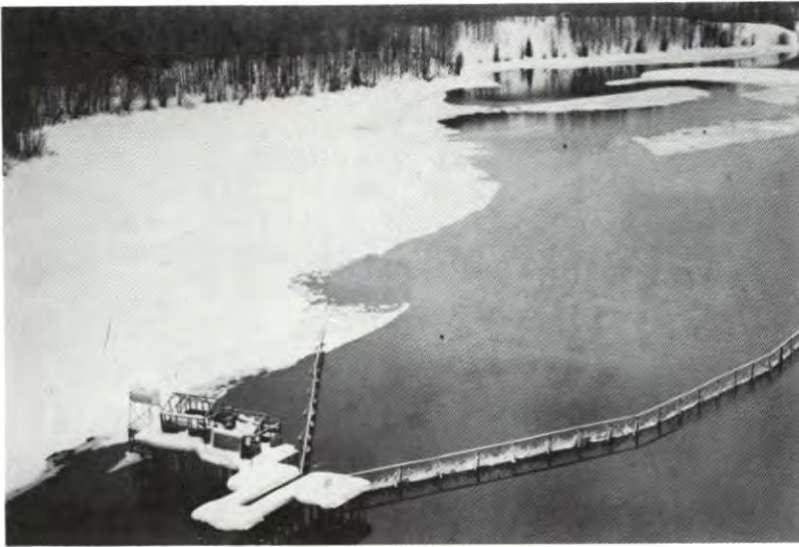


Plate 7.
Babine smolt
trapping weir.

Plate 8.
Babine adult
enumeration fence.



Chum salmon

A total of 120,000 chums were caught by the commercial fishery in Area 4, a dramatic increase in catch. The escapement level showed a corresponding increase.

Chinook salmon

Chinook salmon commercial catch by all types of gear totalled 49,690 pieces in 1972. The escapement of 20,000 chinooks in 1972 parallels the critically low spawnings which occurred in 1968 and 1969 brood years of 17,700 and 30,400 respectively.

(iii) Area 5, Grenville-Principe Sub-District

The major Area 5 salmon net fishery opened June 19 and continued to September 9 with an average of 28 fishing days for the five sub-areas. Effort for the season totalled 2,277 gillnet days and 447 seine days.

Sockeye salmon

The area catch of 76,000 came close to the expectations of 80,000. Gillnets took 63,000 and seines 13,000. The Browning Entrance portion of Sub-area 5-2 contributed most of the gillnet catch.

Escapement to Principe Channel and the west coast of Banks Island were weak and a total area escapement of 25,000 was achieved compared to the 20 year average of 46,000.

Coho salmon

Coho stocks were better than anticipated, and the 1972 troll catch of 151,546 was fifth highest on the coast, and tripled production from most recent years, but fell short of the record catch of 258,350 in 1968. The net fishery contributed 44,429 pieces, slightly better than the 30,000 forecast in the 1972 expectations. The escapement was fair at 18,500 with some improvement in stocks to the west coast of Banks Island and Principe Channel, but was still short of the recent five year average escapement of 24,000, and far below the ten year average of 40,000 spawners.

Pink salmon

A total area pink catch of 1,283,300 was taken by all types of gear. The pink salmon fishery in 1972 was dominated by the Ogden Channel seine fishery which took 950,000 pinks during the period July 24 to August 29. Sub-area 5-5 produced 163,000 pieces, somewhat less than normal due to better fishing in Area 6. Sub-areas 5-1, 5-3 and 5-4 totalled only about 10,000 pieces each. Average weights remained under three pounds throughout the season and as a result the gillnet fleet was ineffective on pinks in 1972. If the pinks had returned at normal size, the total catch would probably have reached at least 1.5 million as the gillnet catch in Browning Entrance was only 10,000 in 1972, as compared to 335,000 in 1970.

Pink escapements to Area 5 totalled 290,000 as compared to the brood year escapement of 150,000. This is above the average even year escapement of 218,000, and is surpassed only by the 1962 escapement of 488,000. Drought conditions in late August and early September delayed arrival on the spawning grounds, and the area was closed September 3 due to lack of water in the streams. Local boundary extensions were put into effect in several locations August 27 to protect local stocks.

Chum salmon

Chum catches were consistently good throughout the season as passing stocks were available in all sub-areas. The total catch of chums in Area 5 of 115,000 pieces exceeded the anticipated catch of 60,000 and was far above the five year average of 58,000. Gillnet catches of 87,000 and seine catches of 25,000 were of mostly non-local stocks.

The chum escapement for the 1972 season totalled 17,000 as compared with a medium escapement of 15,100 in 1968, and light escapement of 4,000 in 1969. This was also above the five year average escapement of 14,000.

Chinook salmon

The troll catch of 61,373 pieces was the highest on record, and over double that of the previous fifteen year average of 27,800. Most of the troll catch came from the offshore fishing grounds in Hecate Strait, as favourable weather during August saw an average of 50 boats per day participating in the fishery. The net fishery took 5,200 pieces of non-local stocks, 50 percent of which were jacks.

b. Herring management, northern sub-district

(i) Catch

A herring roe fishery was conducted in the northern sub-district (Statistical Areas 3, 4 and 5) from March 26 to March 31, and 5700 tons of herring were landed. Fishing began in Kitkatla Inlet and then moved to the vicinity of Port Simpson.

(ii) Spawn deposition

The 1972 spawn deposition of 15.7 miles in the northern sub-district was 3.2 miles less than in 1971, and 10.2 miles below the 25 year average. Areas 3 and 5 have shown declining spawn depositions since 1970 in contrast to Area 4 whose spawn deposition has been increasing since 1970. Normal spawn mortality occurred in all areas.

c. Shellfish fisheries

(i) Crab

Crab landings were light in 1972 and most of the crabs were sold fresh or frozen. A total of 133,100 pounds of crabs were landed in Areas 3 and 4, an increase over the previous four years' landings but still below historic levels.

(ii) Sea urchin fishery

A local fish plant in Prince Rupert began processing sea urchins for roe extraction in the late fall of 1972 (Plate 9). Scuba divers harvested sea urchins in the Chatham Sound area near Prince Rupert at 10 cents per urchin. This operation lasted a few weeks and then shut down for the Christmas and New Year holidays. A total of 12,000 urchins were harvested in 1972. The operation started again after the New Year, but its viability is still in question. The urchin roe was processed for export to Japan.

Processing sea urchins for roe is quite attractive as it is a labour intensive assembly line operation. At the first step the sea urchin is split in half with a heavy bladed knife. The halves are passed on to women equipped with ordinary tablespoons, and at this point the roe is extracted with the spoons (five sacks per urchin), and the

shell of the sea urchin is discarded. The roe is then cleaned and all foreign materials removed. After cleaning, the roe is placed in an alum-salt brine for a number of hours. After removal from the brine, the roe is graded and packed in one half pound flat wooden boxes. The finished product is shipped direct to the Japanese market by air from Prince Rupert.

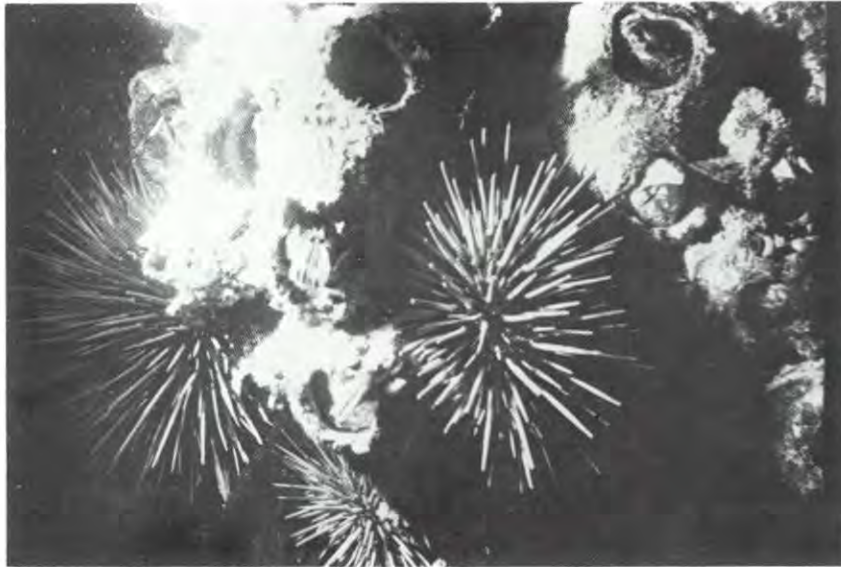


Plate 9. Underwater view of giant red sea urchins.

(iii) Abalone fishery

Abalone were harvested in the Prince Rupert area by scuba divers in conjunction with the sea urchin harvest but landings were very light in 1972. This species does not sustain a regular commercial fishery in the Skeena District.

d. Indian food fisheries

Substantial Indian food fisheries occur throughout the Skeena District and require considerable management effort.

(i) Salmon food fisheries

Indian food fish salmon catches in the Skeena District in 1972 are summarized in Table VI, and the distribution of permits and the Indian people utilizing the catches are summarized in Table VII. The total catch of 79,400 salmon is within the normal range for the District although catches of chinook salmon were below average.

TABLE VI. Indian food fishery catches of salmon and steelhead in the Skeena District by species in 1972.

Location	Number of Fish					
	Sockeye	Coho	Pink	Chum	Chinook	Steelhead
Nass	8,535	1602	583	555	241	-
Skeena	7,732	718	1691	157	508	65
Terrace-Lakelse	19,175	1050	4900	400	900	725
Babine-Morice	24,936	532	215	0	733	428
Grenville-Principe	2,350	225	300	100	45	-
Total						
Skeena District	62,728	4127	7689	1212	2427	1218

TABLE VII. Summary of numbers of Indian families and numbers of permits issued for Skeena District food fisheries in 1972.

Area	Number of Families	Number of People	Number of Permits Issued
Nass	112	695	73
Skeena	257	1533	171
Terrace-Lakelse	121	654	121
Babine-Morice	102	683	90
Grenville-Principe	67	340	25
Total			
Skeena District	659	3905	480

(ii) Eulachon food fisheries

Approximately 300 tons of eulachons were taken from the Nass River by Indians in 1972. There was also a fairly active fishery on the lower Skeena by local residents operating in the vicinity of Kwinitza. Fifteen to twenty small cartop and trailer boats were observed in this area one Sunday. These people were using dip nets to get a few fish for personal use.

e. Sport fisheries

(i) Tidal sport fishery

The tidal sport fishery in the Skeena District is confined primarily to Chatham Sound and the Skeena River estuary. Very few fish are taken outside these areas. A total of 273 coho, 951 chinooks and 23 pinks were landed in tidal waters for a total of 2449 boat days. The catch per boat day was 0.5 fish compared to 0.74 in 1971.

(ii) Non-tidal sport fishery

The largest non-tidal sport fisheries are in the Terrace-Lakelse and Babine-Morice areas. A few fish are also taken in the lower Skeena River, Ecstall River and Kloiya Creek. Sport fishing was hampered in the early season by higher than normal water levels but was fairly good during the fall.

Terrace-Lakelse Sub-District

A total of 500 chinooks including 300 jacks were landed from the main stem Skeena and tributaries from Kwinitza to Kispiox. The 1972 catch of this species was less than 50 percent of the average catch. This was due mainly to the extremely unfavourable water conditions that prevailed on the Skeena River during July and early August.

A total of 2000 coho were landed from the main stem Skeena and tributaries from Kwinitza to Kispiox. The catch of this species was higher than normal. This was due mainly to heavy fishing effort combined with favourable water conditions during late September and early October, and the consequent large catches on the Lakelse and Gitnadoix Rivers. An estimated 900 coho were taken from the Lakelse River during the period September 20 till November 15. On other streams such as the Kasiks and Kispiox Rivers, both the return and the catch of this species were below normal.

Babine-Morice Sub-District

High flood waters prevailed during June to late August hampering most sport fishing for chinooks and early coho particularly on the Bulkley system and Morice River. High water also effected catches of summer run steelhead up to mid August. By that time water conditions had reached good

fishing levels and catches of coho and steelhead increased especially in the Bulkley-Morice system.

In the upper Skeena above the Kispiox River chinook and steelhead fishing was reported fairly good particularly on the lower Babine River near Kisgegas. The Sustut and Bear Rivers were fished by fly-in parties but only very rough estimates of catches from these remote areas are available (Table VIII).

TABLE VIII. Estimated sport fish catches of salmon and steelhead in the Babine-Morice Sub-District.

Location	Chinook	Jack Chinook	Coho	Jack Coho	Steelhead
Upper Skeena	450	-	600	-	500
Lower Bulkley	35	50	50	60	30
Moricetown	65	120	91	145	75
Upper Bulkley	150	200	250	175	250
Morice River	50	100	175	50	200
Upper Copper	-	-	75	-	75
Babine River	150	-	300	-	150
Totals	900	470	1,541	430	1,280

f. Canneries

The Port Simpson Cannery project requested by the Native North Coast Council remains unsettled. A recent promise of provincial assistance has helped to keep this issue alive.

Canadian Fishing Company Cannery, Oceanside in Prince Rupert, was completely destroyed by fire prior to the 1972 salmon season (Plate 10). Plans for rebuilding are going ahead. North Pacific Cannery was re-opened to take care of some of the Canadian Fishing Company salmon pack with the balance of the catch taken south for canning.

g. Environment, multiple water use

(i) Pollution

A large fish kill occurred when Canadian Cellulose Company red liquor discharge equipment broke down. The Company was charged under Section 33 (2) of the Fisheries Act, pled guilty and was fined \$1,500. The

same Company had paid a fine of \$3,000 for a previous and similar offence.



Plate 10. Canadian Fishing Company Cannery fire.

There were six instances of oil spills investigated during the year. One oil spill occurred when the M.V. "Taxila" hit a rock in Porpoise Harbour and ruptured a fuel tank. Bunker fuel from this spill was broken up and washed out to sea by strong winds.

About 2000 gallons of diesel fuel leaked from a Riv-Tow barge in Hecate Strait. Aircraft survey showed that this broke up quickly and went out through Dixon Entrance.

A minor spill occurred near bunker tanks in Stewart. This was during the winter and oil soaked snow was cleaned up before the oil could get into the water.

A fairly large oil spill occurred from Bulkley Valley Forest Products storage tanks at Babine Lake. This oil soaked into gravel and some eventually seeped into the lake. Steps were taken to prevent further occurrences of this kind.

Other spills were minor ones in Prince Rupert harbour, diesel fuels that broke up or evaporated quickly and caused no apparent damage.

Pacific Inland Resources at Telkwa and Bulkley Valley Forest Products at Houston were warned for allowing saw-dust and flyash to escape to the Bulkley and Morice Rivers. Installation of better burners appears to have minimized this problem.

(ii) Logging

Logging was active in the Skeena District in 1972, and the cut was at least equal to last year's on the Nass River. Forty-five timber sales and thirty-five cutting permit applications were reviewed by officers in the District. Twinriver Timber Company logging plans are reviewed annually by Fisheries and Company officers. B. C. Forest Service completed a bridge on the Babine River near the outlet of Babine Lake. This gives them access to a large burned area for tree planting.

(iii) Multiple water uses

Forty-one applications for water rights were processed in 1972. Most of these were for domestic purposes and did not entail dams. Intake screenings were recommended in several instances.

(iv) Port development

Further investigations were carried out on Flora Bank and adjacent waters at the mouth of the Skeena River in regard to possible environmental damage that could occur if port development were to go ahead. No report on this investigation will be available until April, 1973.

(v) Highway and railway construction

The bridge over the Nass River in the Meziadin area opened up the road from Terrace as far as Stewart. The uncompleted portion of the Stewart to Dease Lake road was finished this year allowing traffic to proceed through to the Alaska highway. This road has given the public access to a large number of tributary streams for which salmon populations are largely unknown.

B. C. Railways right-of-way construction caused two slides on Bear River. A trip was made to Bear Lake by the Regional Director and Northern Operations Branch Manager to discuss the railroad construction program with railroad president and his engineers. Corrective measures were developed and implemented. Construction plans and practices were modified to avoid future incidents. A Guardian was established on Bear River for the fall and winter to patrol railroad construction operations. It is obvious that on-site supervision will be needed for this railroad construction on a continuous basis.

(vi) Public information

Fishery Officers in the Skeena District are required to perform various public relations duties as a normal part of their function. In addition, they attend meetings of the various Regional District organizations, advising on problems related to the fisheries resource. Meetings are also held regularly with logging companies, and B. C. Forest Service officials and staff. Meetings of the Nishga Tribal Council and North Coast Native Council are also attended.

4. Biological Projects - Skeena District

a. Nass River and Skeena River salmon studies

The biological studies conducted in the Skeena District are largely salmon management oriented. Such studies included: gillnet test fishing on the Nass and Skeena Rivers; operation of counting fences on the Lakelse River and in the Meziadin River fishway; tag and recapture enumeration of Nanika River sockeye; visual enumeration and distribution studies in several other streams; and sampling of Nass and Skeena sockeye stocks for age, length and racial characteristics. The results of some of these studies have been presented previously in the review of Skeena District salmon management. In addition, a study was initiated in 1972 to measure the productivity of Meziadin Lake. This study included temperature, turbidity, oxygen and nutrient measurements; zooplankton sampling; and tow netting for sockeye juveniles.

b. Babine Lake salmon development project

Babine Lake is the third largest sockeye salmon producer in British Columbia and currently provides half a million fish annually to the Skeena River commercial fishery. However, biological studies conducted by Fisheries Research Board scientists revealed that nearly 90 percent (the main lake basin) of this 100 mile long lake was underutilized as a rearing area for sockeye juveniles. Further studies indicated that this underutilization was due to the limited capacity of the tributary streams to provide sufficient fry to utilize the food producing capacity (zooplankton) of the main lake basin and that increased sockeye production could best be realized through some fish cultural technique such as spawning channels (man-made rivers) and controlled flow schemes.

In 1965 an eight million dollar development program was initiated whereby two of the principle tributary streams,

Fulton River (Plate 11) and Pinkut Creek (Plate 12), would be extended and improved by the construction of artificial spawning channels and a combination of dams, tunnels and pipelines to provide partially controlled water flow to the two pre-selected natural streams.

In 1971 there were three spawning channels completed totalling six miles in length which together provided space for an additional 225,000 spawning sockeye. These channels plus the two partial flow controlled streams are designed to produce an additional 125 million sockeye fry for rearing in Babine Lake. At a one percent fry to adult survival rate, the project's primary objective by 1976 is to produce an additional one and a quarter million sockeye annually with one million fish being harvested by the Skeena River commercial fishery. These fish are currently worth \$2.50 per fish which means an extra two and a half million dollars will be available to the Skeena River fishermen by that date. To date results clearly demonstrate a tripling of fry and smolt output, and a tripling of adult returns to Fulton and Pinkut. Although some increased production has already been achieved full returns from the project are not expected until 1976.

(i) Fry production

The fry output from Fulton River and Pinkut Creek increased to a record high of 131 million fry with 102 million arising from the three spawning channels (Figure 6). This high output of fry represents a three fold increase above the average output of 39.1 million during the pre-development years, 1960 to 1966. The overall survival rate for 1972 was 25 percent which is in the same order of magnitude as for the last four years despite wide fluctuations in the survival rates from each of five production facilities during that period (Table IX).

(ii) Fry quality

The fry originating from the newest and largest channel at Fulton were, on the basis of size and development, qualitatively superior to fry from any of the other channels or natural spawning areas at Fulton and Pinkut. Fry from the Pinkut Channel were also superior to those from Pinkut Creek in terms of survival rate, number produced, length and degree of development. It should be noted that the apparent quality of fry from the spawning channels has always been at least comparable to the natural fry from Fulton River and Pinkut Creek.

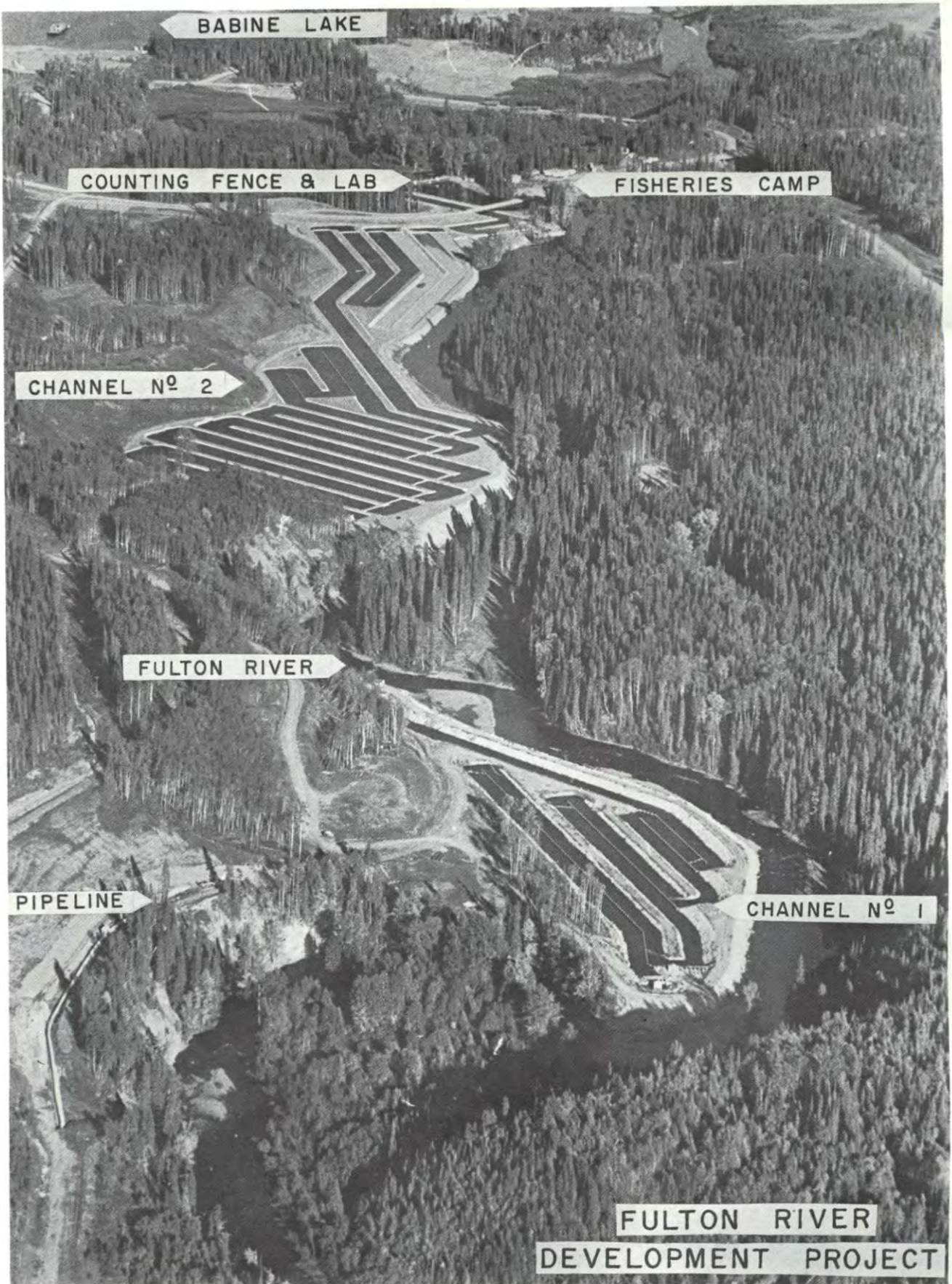


Plate 11. Aerial view of Fulton spawning channels and adjacent river.

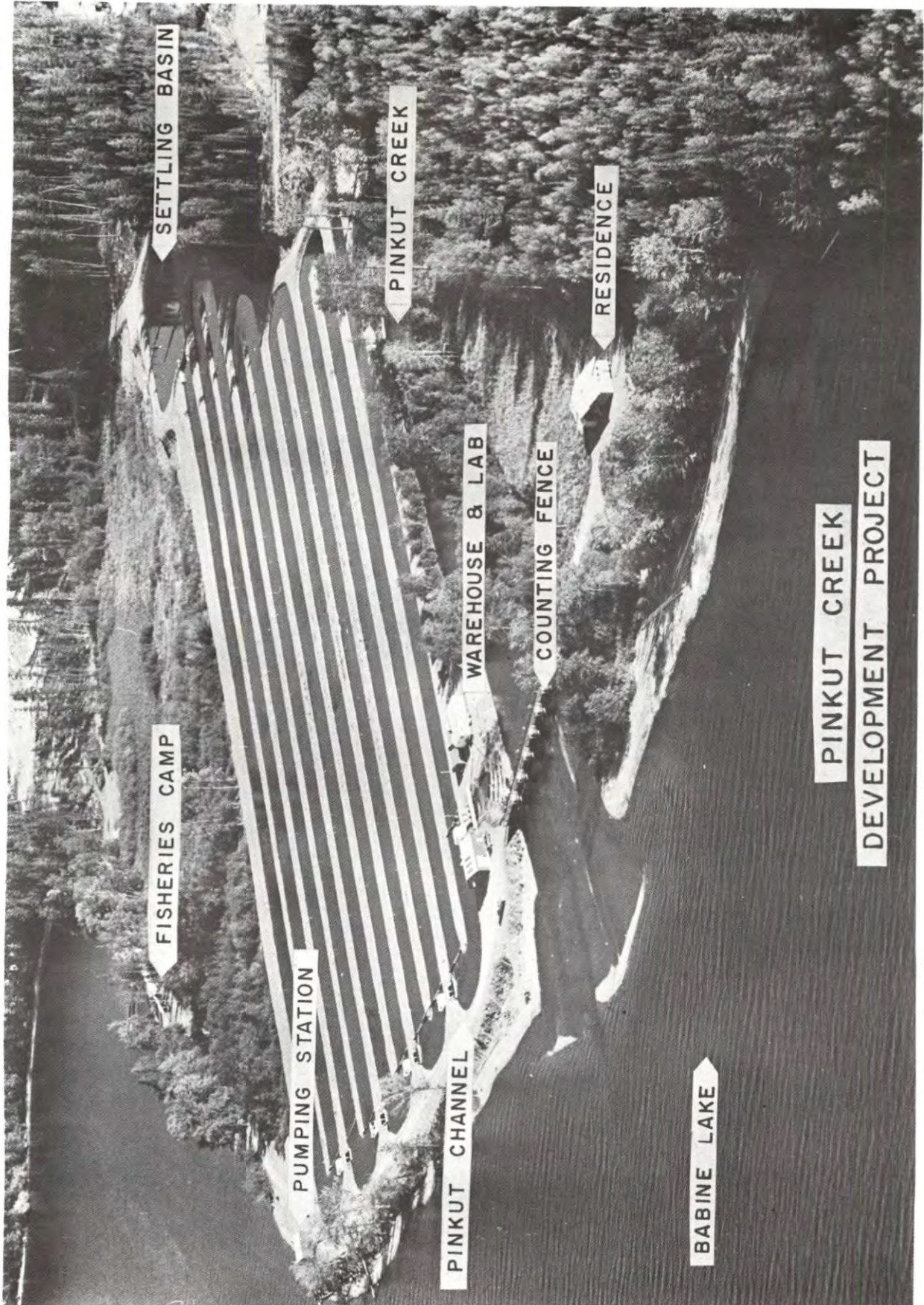


Plate 12. Aerial view of Pinkut channel and Pinkut Creek with dual purpose enumeration fence.

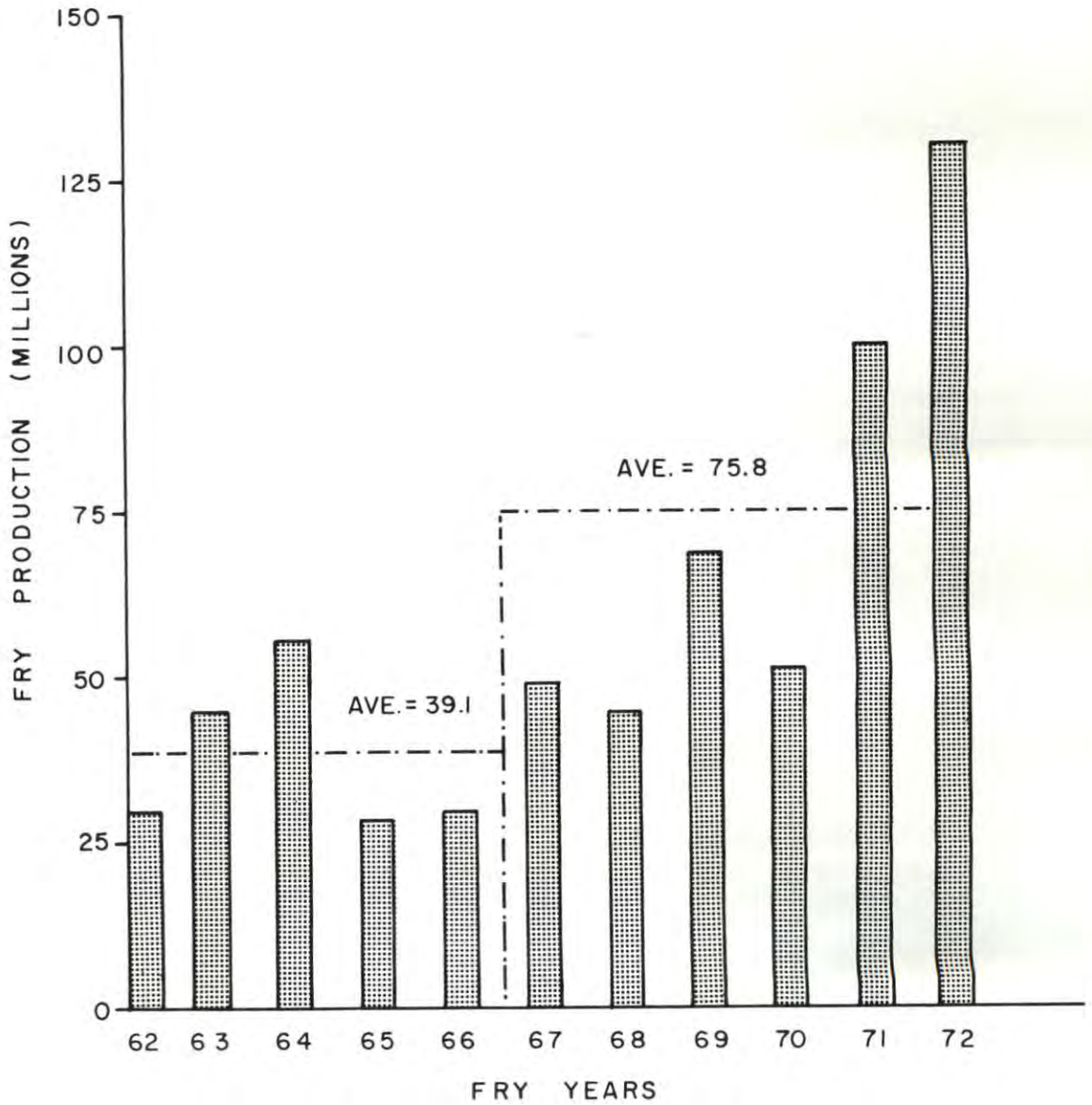


Figure 6. Pre and post sockeye fry production from the Babine Development Project.

TABLE IX. Babine Lake salmon development project fry production, 1972.

Location	No. of Fry (millions)	Percent Survival
Fulton River	27.2	11.6
Fulton Channel No. 1	20.0	47.0
Fulton Channel No. 2	66.4	34.2
Fulton Total	113.6	
Pinkut Creek	2.2	16.1
Pinkut Channel	15.5	47.0
Pinkut Total	17.7	
Project Total	131.3	25.3

(iii) Smolt output

The overall smolt output from Babine Lake, as measured at Babine Fence, has increased from an average of 25 million in the pre-development years, 1960 to 1966, to 54 million in 1972. Approximately 45 million smolts, 80 percent of the total, came from the main lake basin which historically has produced an average of only 15 million smolts per year.

87 million smolts in 1973.

(iv) Adult sockeye escapements

The adult sockeye escapement to Fulton and Pinkut totalled 209,000 and 74,000 respectively (Figure 7). The Pinkut Channel was utilized to almost full capacity for the first time in 1972.

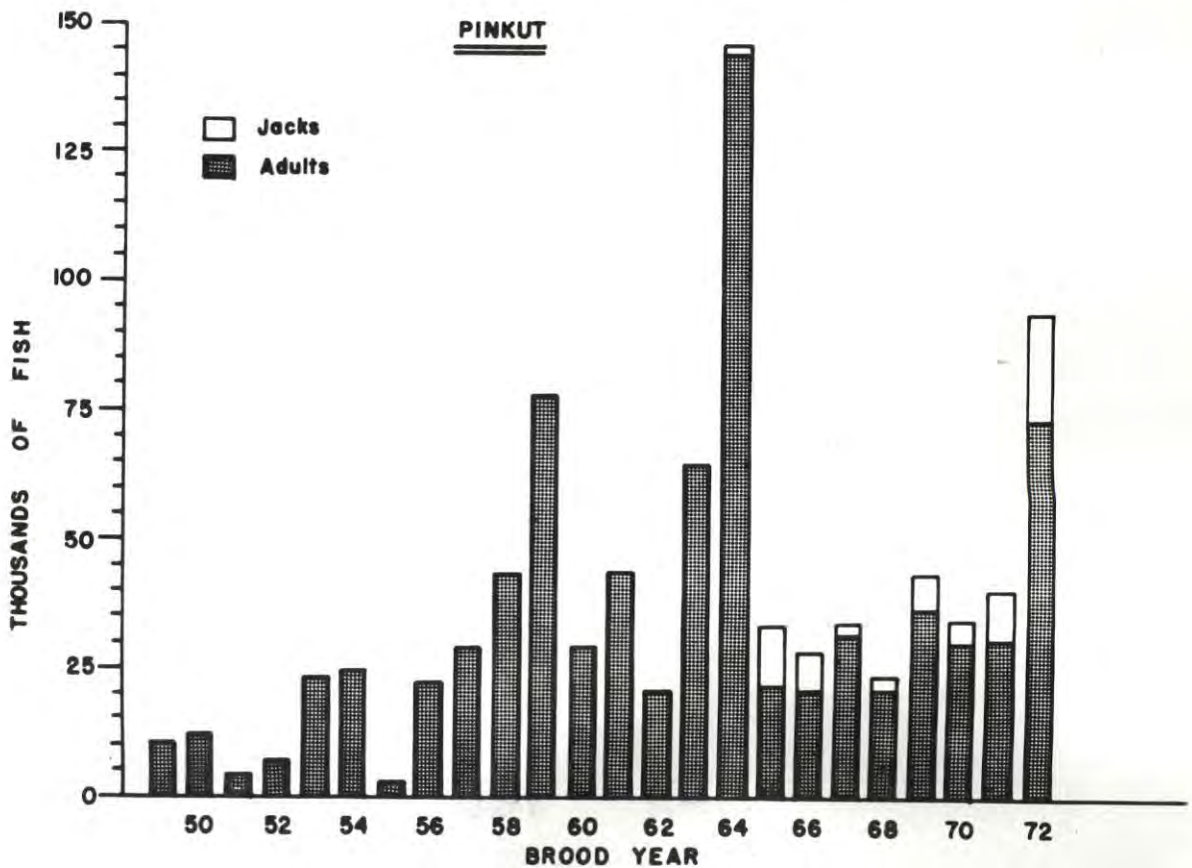
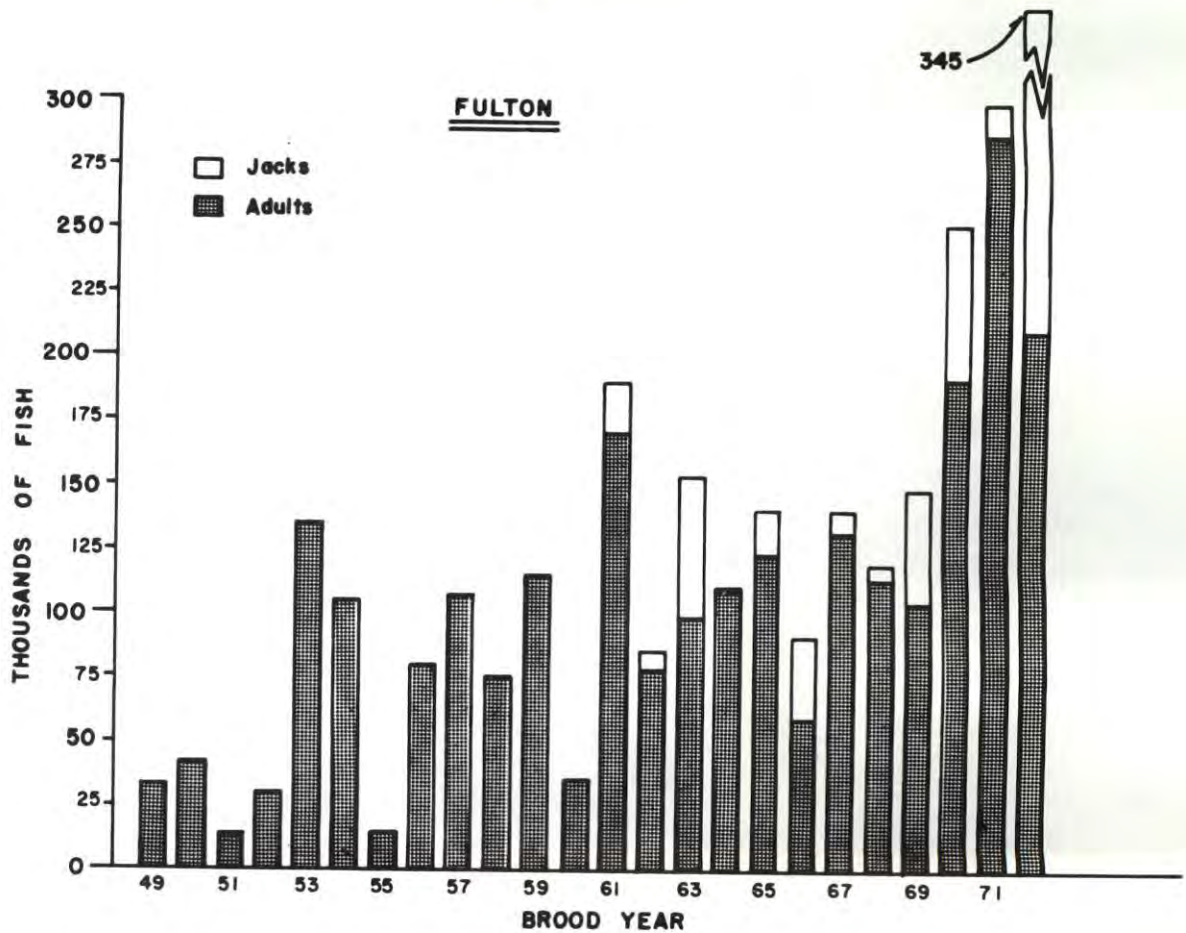


Figure 7. Annual Babine project adult sockeye escapements, 1949-72.

B. Central Coastal Division

1. Kitimat District

This district, headquartered at Kitimat, is a coastal district encompassing the tidal waters and watersheds of Statistical Areas 6, 7 and 8. Sub-District offices are located at Bella Coola and Bella Bella with the Butedale Sub-District Fishery Officer based at Kitimat. The Kitimat District has several major responsibilities including management of salmon and herring commercial fisheries, spawning ground surveys, monitoring recreational fisheries, environmental quality work monitoring logging and industrial operations, and public information responsibilities.

a. Salmon management

(i) Area 6 - Butedale

Area 6, Butedale, had the largest salmon fishery in British Columbia in 1972. A total of 6,487,900 salmon were landed in 36 days fishing in Area 6; a total of 23,604,100 pounds of salmon, mostly pinks. It was the best season on record for Area 6 with record pink and chinook catches. Seine vessels reached a maximum of 130 during the pink salmon fishery. Gillnet effort was light as the pink salmon were too small to be handled by their nets. Gillnet effort was down for 1972 with 3934 gillnet days compared to 6641 for the brood year 1970. A total of 3279 seine days for 1972 was an increase over 2912 days for 1970. Troll effort of 4917 days is a reduction from 5696 days in 1970. (Trollers inside the surf line were restricted to the same fishing times as net gear in 1972.) Chinooks and sockeye were overfished as the fishery had to be managed for the large pink return. Spawning conditions were considered good except for low water in small streams in the latter half of August and first half of September. Very serious flood conditions in January, 1973, on the Kitimat River will definitely adversely affect returns from this river.

A limited outside portion of Area 6 was opened to commercial net fishing on June 18 for interception of migrating pinks through outside waters. However, it was not as successful as anticipated with 50 seines landing only 20,000 pink salmon.

Sockeye salmon

As a result of the heavy pink fishery sockeye salmon were overfished in Area 6 with 102,000 sockeye being landed, an exploitation rate of 85 percent, thus permitting only a light escapement. A total of 9,000 sockeye spawned in Area 6 compared to 65,000 in the 1968 brood. The Kitlope River received 3,500 sockeye compared to 35,000 in 1968.

Coho salmon

A total of 233,200 coho were landed in Area 6, the highest catch since 1965. A medium escapement was received in Area 6 streams.

Pink salmon

The commercial catch of 5,612,300 pinks is the highest catch on record for Area 6.

The escapement of just under one million pinks was slightly better than the 1970 brood. The Kitimat and Kemano Rivers received about 200,000 spawners each while the Quaal River had an escapement of 125,000 pinks.

Chum salmon

The commercial chum catch of 473,600 fish is the best since 1958. The escapement of 270,000 chums is better than the 20 year average of 180,000 fish but still below the desired escapement of 500,000 fish. The best escapement was received at the Kemano River where 100,000 chums spawned. The Kitimat River had 65,000 spawners while other rivers received light to medium-heavy escapements.

Chinook salmon

The chinook landing of 66,500 fish was again the best on record. However, the escapement of 14,000 is considered light and well below the brood year escapement. The Kitimat and Kemano Rivers each had 3,500 spawners while the Dala and Kitlope Rivers each had escapements of 1,500 fish.

(ii) Area 7 - Bella Bella

Fishing times in Area 7 varied between three and four days per week from the commencement of the fishery until August 27. From August 27 until the close of the

fishery on September 19, net fishing was carried out for two days per week. The gillnet fleet varied from 53 at the start of the season, to a high of 399 during the week ending September 2. During the peak week of the pink fishery, an average of 35 seines and 328 gillnets operated. From spawning ground surveys, it appears that Area 7 was overfished particularly on inside waters, where escapements of pinks and chums were less than desired levels.

Sockeye salmon

A total of 226,100 sockeye were landed in Area 7. Sockeye fishing throughout the area was light, with the best catches in Milbanke Sound and Seaforth Channel. The sockeye fishery commenced on June 26 and continued until the end of July, when catches started dropping. While the peak sockeye catch occurred on the week ending July 29, this total appears to be largely a result of interception of passing stocks. The peak catch on local stocks was the week ending July 15, when 9,377 were taken.

The 1972 sockeye escapement of 10,000 fish compares favourably to the brood year escapement of 11,000.

Pink salmon

Pink salmon fishing was excellent for the 1972 season with a total of 1,373,400 pinks being landed. Because of the small size (average weight was 2 1/2 pounds), gillnets did not concentrate on pinks, but switched to fall nets early in the season. The early pinks were cropped heavily by seines in Milbanke Sound and lower Finlayson Channel. From spawning ground surveys, this fishery appears to have largely affected the Bear River stocks.

From July 31 until August 24, a concentrated seine fishery took place in Mathieson Channel. An average of 16 to 18 seines worked the Channel daily. On August 21 the boundary in Kynoch Inlet was moved inward approximately 5 1/2 miles, attracting about 75 seines to the area but fishing was very poor. This four week fishery in Mathieson Channel produced a catch of 301,000 pink salmon.

Pink fishing in other parts of Area 7 was concentrated on Price Island and lower Finlayson Channel, with limited fishing in inside waters.

The boundary changes, with respect to pink salmon fishing, were for the main part those which are effected annually.

The Area 7 pink escapement of 269,000 fish was less than the brood year escapement of 323,000 pinks. The early seine fishery in Milbanke Sound and lower Finlayson Channel appears to have severely depleted the pink stocks to the Bear River. Due to the length of the fishery in Mathieson Channel, Nameless Creek received only a light seeding of pinks, while Salmon Bay could have taken a few more.

Chum salmon

The chum catch in Area 7 was the highest in northern British Columbia this season with 635,100 fish being caught. Because of the small size of the pinks, the gillnet fleet, from as early as July 20, was concentrating on chum salmon. The fleet was most active in Milbanke Sound, with heavy concentration occurring outside McInnes Island. Toward the end of the season excellent chum fishing was experienced off the mouths of Mathieson and Finlayson Channels. The weight of the chums varied from an average of over 15 pounds in July, to an average of 9 1/2 pounds at the close of the season. Some chums as large as 35 pounds were taken by seines early in the season.

The age composition of chums taken in Area 7 over the duration of the season was as follows: 22 percent three-year-olds, 74 percent four-year-olds, and 4 percent five-year-olds.

The 1972 escapement of 266,000 chums is lower than the 1968 brood of 310,000 but higher than the 200,000 spawners of 1967. The intensive chum fishery in Milbanke Sound resulted in the Bear River only receiving about half its spawning requirements. Also, Nameless Creek and the Kainet River could have taken more spawners.

(iii) Area 8 - Bella Coola

Salmon net fishing opened by regulation on February 1 but there was no effort until May 14 when a chinook fishery began. The chief fisheries in Area 8 during 1972 were for pinks and chums. In 1972 there were a total of 52.2 net fishing days in the Bella Coola gillnet area, 43.5 days in the Dean Channel gillnet area, 49.5 days in Fisher-Fitz Hugh north of Widbey-Kelpie line, and 55.5 days south of Widbey-Kelpie line.

Sockeye salmon

Severe conservation restrictions were imposed on the sockeye fishery in 1972. A total of 75,315 sockeye were landed by the fishery compared to 199,754 in 1968, and 232,210 in 1967. The peak week of the fishery, week ending July 22, saw 90 seines and 24 gillnets operating.

An escapement of 45,000 sockeye was received, 65 percent being jacks. In 1968, the escapement was only 11,000 sockeye with 50,700 in 1967.

Pink salmon

A total of 1,015,061 pinks were landed by the commercial net fishery down from the catch of 2,052,282 pinks in 1970 and 5,435,438 pinks in 1968. The peak week, week ending August 5, saw 79 seines and 138 gillnets operating.

The 1972 escapement of 1,355,000 pinks is considered medium heavy. In the 1970 brood year, only 700,000 fish comprised the escapement.

Chum salmon

The commercial net catch of 212,274 chums was 99 percent four-year-old fish. The peak week for chum landings was the same as for pink landings, week ending August 5. In this week, 64 gillnets landed 34,000 chums in Dean Channel.

A heavy escapement of 224,000 chums compares favourably with the 172,000 escapement in 1968.

Coho salmon

Coho salmon landings totalled 51,565 fish in 1972, double the brood year catch. The escapement of 35,000 coho is considered very light but was again greater than the escapement of the brood year.

Chinook salmon

Net fishing for chinook salmon commenced on May 14, 1972, and finished June 24 with 10,367 chinooks being landed in this period. The peak week was the week ending June 17 when 55 gillnetters landed 1,638 fish. The run was composed of 45 percent four year olds, 45 percent

five year olds and 10 percent six year old fish. The escapement of 21,000 chinooks is classed as medium, and compares to 27,000 fish in 1968 and 29,200 fish in 1967.

b. Butedale Sub-District, Area 6

(i) Sport fishing - non tidal

Sport fishing for chinook and coho salmon has become a very popular and successful form of recreation in the Kitimat area. Most of the activity is concentrated on four main rivers -- the Kitimat, Dala, Kildala and Kemano Rivers. Limited fishing activity also takes place on the Indian, Weewanie, Gilttoyes and Kitlope Rivers.

Evidence to the popularity of angling as a recreational activity in the Kitimat Area can be seen when as many as 200 or more anglers may be observed on the Kitimat River at one time. Because of the general conditions of work at Kitimat (most people work on a shift basis) the river is fished for up to 18 hours a day in the summer months.

Ever increasing fishing activity is apparent on the Dala and Kildala Rivers as ardent fishermen acquire better boats to make the short trip to Kildala Arm. The Kemano River continues to be fished heavily by Alcan and Eurocan employees stationed there.

Increasing numbers of tourists partake in the fishery as word of the success here becomes known. Many tourists come to Kitimat with the express purpose of catching a tyee-size chinook salmon.

With each successive year, it is apparent that increasing pressure is being placed on the existing stocks of chinook and coho salmon native to the Kitimat River and surrounding areas. Portions of the area that were virtually inaccessible only a few years ago have now been made available to the angler by using the network of logging roads now in existence. It is expected that within the next ten years, angling as a recreation will increase tremendously in the Kitimat area and provide much enjoyment and relaxation to the public.

Tidal

Almost all of the tidal sport fishing in the Butedale Sub-District takes place in Kitimat Arm, Douglas Channel and the Kemano Bay area, with the largest effort being put forth at the head of Kitimat Arm by residents of Kitimat and Terrace.

(ii) Industrial development

There were no new industrial developments in Area 6 during 1972. However, Eurocan Pulp and Paper Company Limited made a total of approximately 17 million dollars worth of modifications to their existing pulpmill at Kitimat.

The pulpmill was originally constructed to produce a maximum of 950 tons a day. Due to problems in the mill, the highest production obtained until the summer of 1972 was 480 to 500 tons a day. During 1972, modifications were made to the lime handling equipment which increased the ability to make cooking liquor. Modifications were also made to the dip screening system for speeding up the rate of filling the digesters. This helped screen out lumps and rocks which used to plug up the screening system. These modifications allowed the production to be brought up to over 700 tons a day.

Modifications have also been made to Eurocan's hog fuel burning system which now allows burning of 300 to 500 units a day (this was previously piled in a waste stock pile).

(iii) Logging

One of the prime resource users in Area 6 is the logging industry. With three major logging companies operating in this Sub-District a great deal of time is spent by Department staff patrolling logging operations in an attempt to protect fish and their habitats. In 1972, the usual logging problems were encountered, with most being resolved without causing detrimental effects to the fishery resource.

The three major logging companies operating in Area 6 are Crown Zellerbach Canada Limited, Eurocan Pulp and Paper Company Limited, and MacMillan Bloedel Limited. In 1972, these companies logged a total of 415,521 cunits from the Kitimat River drainage, and built a total of 48 miles of road.

Eurocan encountered many problems in logging steep areas along the upper tributaries of salmon streams in the Kitimat Valley. Several combined inspections and meetings were made with B. C. Forest Service and Eurocan in these areas. Problems encountered were resolved in a manner satisfactory to all concerned.

MacMillan Bloedel sub-contracts its logging operations in the Kitimat Area. Some communication breakdowns between management, contractors, and the

working logger have resulted. As a result the Fisheries Service found it necessary to prosecute one sub-contractor for poor logging practices in respect of protection of salmon streams. MacMillan Bloedel is endeavouring to co-operate with the Fisheries Service, and a fairly good relationship is being maintained.

Few problems were encountered with Crown Zellerbach's logging practices, and a good co-operative relationship was maintained with this Company in 1972.

(iv) Marine animals

An average number of sea lions and hair seals were sighted this year in Area 6. Sightings of porpoises increased, however, and the number present was considered heavy. Killer whales are seen in this area most often in late fall and spring. There were no killer whale sightings by Fisheries Service staff in Area 6 on Killer Whale Census Days August 1, 2 and 3.

(v) Information, education and public relations

Field officers in Area 6, in a broad sense, are involved in public relations each day they are on duty, and in contact with the many levels of government, industry and the public.

Some highlights for 1972 were education talks and films shown by Fishery Officers to the Kitimat Sea Cadets, the R.C.M.P. Youth Group, and school children at Cormorant Elementary School in Kitimat.

c. Bella Bella Sub-District, Area 7

Major activities in the Bella Bella Sub-District in 1972 were the herring and salmon fisheries. Black cod, prawn and clam fisheries were also conducted in the area.

(i) Black cod fishery

The "Chimo #1" fished by means of baited traps for black cod in April and March, concentrating activities in Milbanke Sound and Finlayson Channel. Little success was found in Mathieson Channel, Spiller Channel and Roscoe Inlet. In Milbanke Sound 120 traps were used, set at a depth of 275 to 400 fathoms. It was found that from 40 percent to 50 percent of the cod were too small to keep. The average catch, dressed weight, per set per trap was 50 to 70 pounds.

(ii) Prawn fishery

Between January and May the M.V. "Stryder King" made several trips into Area 7 fishing prawns. The best catches were realized in Roscoe Inlet. Minor success was found in Spiller Channel, Briggs Inlet and Mathieson Channel.

(iii) Clam fishery

During early March several hundred pounds of clams were collected by the local native Indians for shipment to Port Hardy for processing.

d. Bella Coola Sub-District, Area 8

(i) Closing of Namu Cannery

The last two canning lines were taken out of Namu Cannery this season, leaving the facility for use as a net loft, cold storage plant, and service center for the fishing fleet. This marked the end of what was, in 1963, the most modern cannery on the coast.

In 1893 Robert Draney formed the Namu Canning Company Limited. A sawmill was built here in 1909 to furnish lumber for the cannery and shipping boxes. A new cannery was built in 1911 when the original building was converted into an addition to the sawmill. In the next few years the cannery changed hands many times and finally was incorporated into British Columbia Packers Limited when it was formed in 1928. Over the years the plant, dwellings, and facilities for employees were enlarged by the Company. The cannery was practically rebuilt in 1946. In 1962 the cannery and most of the other buildings were destroyed by fire. This led to the building of the most modern cannery on the coast, however, it only produced until 1970. In 1971 the canning lines remained dormant and in 1972 the lines were taken out completely. This reflects the movement of most industries in Canada to centralized locations, especially on the British Columbia coast where it is having a profound effect on small coastal communities.

Plans for the future are not known. The cold storage facilities, net loft, store, etc., will continue to operate during the season to service the fishing fleet. There is, however, some speculation that a shrimping operation may be started if stocks in Queen Charlotte Sound are found to be adequate.

(ii) Flood protection in the Bella Coola Valley

Flooding in the Bella Coola Valley has always been a problem to the fisheries resource and the local land owners. In 1972 there was a continuation of projects designed to protect property from flood damage. The major project this year dealt with rip rapping the river banks adjacent to the airstrip at Hagensborg. This project was conducted in the spring. A base of gravel was placed along the river bank and then covered with rip rap material that had been blasted from a nearby mountain.

A public meeting was called by the Fisheries Service in September, 1972, to discuss the matter of flood control in relation to protection of fish and their habitats. Several methods of flood protection were reviewed, and analyzed in terms of their impact on fish and their habitats. Over the past ten years more than \$600,000 has been spent on flood control in the Bella Coola Valley, and this rate of expenditure is increasing. The Fisheries Service is promoting the development of a long-range flood control program that will not be inimical to fisheries interests. A planned approach of this kind, under the general direction of the Bella Coola Regional District, would replace the adhoc piecemeal project approach of the present. The joint participation of the several levels of government -- regional, provincial and federal -- could develop the means to protect property while preserving natural resources.

(iii) Proposed diversion of the Dean River

In 1972 the Fisheries Service came out with a study plan to look at the entire Phase II Alcan Power proposal. One of the aspects of the proposal being studied is the diversion of the Dean River into the Kemano Power system. In the spring, Fisheries Service personnel installed a water recorder on the Dean just below the Takia River junction. Studies were carried out in the fall on the lower portions of the river, mainly concerned with chinook salmon spawning grounds. This proposed partial diversion of the upper Dean could have a profound effect on the Dean River as a fish producer.

2. Biological Programs - Kitimat District

Hair seal study

In 1972, Kitimat District Fishery Officers and staff conducted a study into the effects of the hair seal population on the chinook salmon gillnet fishery in the Bella Coola and Dean Channel gillnet areas. Fishermen in these areas, as elsewhere on the British Columbia coast, are reporting considerable losses of fish from their nets due to seal predation. The chinook fishery in the Bella Coola - Dean Channel gillnet areas involves local gillnetters and these vessels were monitored continuously throughout the fishery.

Studies revealed that in inlets where there was no commercial fishery there was a high percentage of immature seals (up to three years of age) while the heavily adult seal population was concentrated in commercial fishing areas. The main area of seal predation is in the North Bentinck Arm area, and fishermen will not fish in upper Dean Channel as the seals take virtually all of their catch. The total seal population was estimated at 510. A healthy population for this area is estimated to be 200 seals.

Observations revealed that two or three seals may 'team-up' to drive a salmon into a net.

Based on field records the monetary loss to the fisherman was one third of his income for this period -- an additional loss of 10 percent was estimated for fish loss that could only be recorded as 'hits' on the net.

3. Rivers and Smith Inlets District

The District office located at Dawson's Landing in Rivers Inlet is responsible for all waters north of Cape Caution to the southern boundary of Area 8, and westward to the "surf line"¹ in Queen Charlotte Sound, and includes Statistical Areas 9 and 10, Rivers and Smith Inlets. Area 11 is administered by District 6 until the end of July, i.e. until sockeye salmon runs originating in Rivers and Smith Inlets have passed through the area. The major duties in this District are management of commercial and recreational salmon fisheries, spawning ground surveys and monitoring of the forest industry.

¹The "surf line" is a line seaward of which fishing for salmon by means of nets is prohibited.

a. Salmon management

(i) Area 9 - Rivers Inlet

Sockeye salmon

The 1972 return of sockeye to Rivers Inlet was predicted to be below average due to poor smolt production from the 1967 brood, and an anticipated low percentage of age four fish returning from the very large brood stock in 1968.

The sockeye fishery opened June 25, 1972, and continued through the week ending July 22, 1972, for three days per week with the following boundaries in effect. For gillnets the inside boundary ran from McAllister Point to Scandinavia Bay Point and the outside boundary from Cranstown Point to Dugout Rocks to Clark Point on Calvert Island. Seines were permitted in those waters of Fitz Hugh Sound lying easterly and northerly of a straight line between Addenbroke Point and South Point. Trollers were permitted inside the surf line during only the periods that the gillnet fishery operated inside the Cranstown Point to Clark Point line. There were no restrictions on retention of sockeye by trollers.

Fishing time in Area 9 was reduced to two days in the week of July 23-29, with the inside boundary moved seaward to Stone Point - Wannock Cove, and the outside boundary moved to the surf line. Trollers continued to be restricted to the same time period as nets. The next week, July 30 - August 5, opened on three days with no change in boundaries. It became obvious after the first day's fishing that the sockeye were finished, but pinks were very abundant, so on August 2 at 6:00 A.M. management of sockeye ended, and Rivers Inlet was opened to seines with fishing time extended to four days. Boundaries remained static. Trollers were permitted to fish seven days a week.

A total of 379,000 sockeye were caught by the commercial fishery in the 19 day fishery.

Echo sounding enumeration of sockeye behind the commercial fishing boundary was conducted for the sixth consecutive year, and results were relied on heavily in management of the fishery. An escapement of over 400,000 was anticipated on the basis of sounder results. However, spawning ground observations in the fall accounted for only 250,000 sockeye. Two likely factors contributing to this discrepancy are: (1) a large number of pink salmon

in the inlet during the latter part of the sockeye run; (2) non-visible spawners in the lake and large glacial rivers.

Pink salmon

A total of 827,000 pink salmon were landed by all gear in Area 9 in 1972. Pinks returned two weeks early to Rivers Inlet this year. Despite extensive seine exploitation, a record escapement of 500,000 fish was achieved.

(ii) Area 10 - Smith Inlet

On the basis of spawning escapements Smith Inlet returns were predicted to be above average.

Sockeye salmon

The sockeye fishery opened on a three day fishery commencing June 25 with the following boundaries in effect. For gillnets, the inside boundary ran from Cape Anne to Adelaide Point, and the outside boundary from Milthorp Point to Table Island to Ann Island to Extended Point. Trolling regulations were similar to those in Area 9. Trollers were permitted to fish inside the surf line in Area 11 whenever a net fishery operated in Area 10.

Area 10 fishing time was similar to that in Area 9 for the duration of the sockeye fishery. The outside boundary was moved to the surf line at the same time as this was done in Area 9 (July 23). The inside boundary was moved from Cape Anne to Adelaide Point up inlet to Burnt Island on July 17 following a migration of 23,400 sockeye through the Docee River fence on the same date. The Burnt Island boundary remained in effect until August 6 when it was moved back to Cape Anne.

A total of 59,500 sockeye were caught in 16 days fishing in Area 10 in 1972.

The new Docee River counting fence was in operation for its first season and enabled us, after assuring an adequate escapement, to give the fishing industry the maximum possible catch from what turned out to be a below-average return of sockeye to Smith Inlet. Without the new fence an accurate count would have been impossible due to high water in the Docee River during July. Seventy-six thousand sockeye were counted through the fence. The escapement objective is within the range of 80,000 to 120,000.

Chinook salmon

An excellent return of chinooks to the Docee River was attained in 1972.

(iii) Rivers Inlet chinook sport fishery

The famous Rivers Inlet chinook salmon sport fishery experienced record effort but a poor catch in 1972. Permits were issued by biological staff to 1445 anglers who landed 370 chinooks ranging in size from 3.5 pounds to 69.5 pounds. The average catch per permit holder was 0.26, the lowest recorded since 1960 (Table X).

TABLE X. Rivers Inlet chinook salmon sport fishery catch and effort, 1956 - 1972.

Year	Permits Issued	Chinooks Caught	Average Catch Per Permit Holder	Average Weight	Weight of Heaviest Fish
1956	916	245	.27	43.8 lbs	77.5 lbs
1957	398	278	.70	35.3	71.5
1958	330	157	.48	41.5	69.5
1959	353	84	.24	40.3	74.0
1960	323	67	.21	42.0	71.0
1961	228	65	.29	40.9	76.0
1962	193	139	.72	32.5	63.5
1963	236	74	.31	37.9	77.5
1964	332	390	1.14	37.2	71.0
1965	440	290	.66	36.4	68.0
1966	344	326	.95	32.6	60.0
1967	493	350	.71	34.7	65.0
1968	526	316	.60	34.9	60.0
1969	624	200	.32	31.6	63.5
1970	760	1061	1.40	31.6	62.5
1971	1252	657	.52	40.8	70.0
1972	1445	370	.26	33.1	69.5

The poor catch appeared to be due to a weak return of chinooks to the Wannock River spawning grounds. Weather conditions and killer whales were not significant factors as is the case some years. Sport fishermen missed a chance of catching a tidal water world-record salmon when a commercial vessel fishing near Dawson's Landing caught a chinook reported to weigh 90 pounds.

b. Environmental quality

There has been little or no increase in logging activity in this District during the past year -- the on-going logging activity on the Nekite, Chuckwalla, Kilbella and Sheemahant Rivers requires constant monitoring. However, co-operation with all companies concerned has been good to date.

The B. C. Forest Service engineering division conducted a road survey from Machmell River in Owikeno Lake, Rivers Inlet, to link up with the Old South Bentinck Arm Road. Using such a road, timber harvested in the upper Owikeno Lake watershed would be watered in South Bentinck Arm rather than towed down the lake, dewatered and trucked to tidal water at the head of Rivers Inlet. Cost of the road if built would be in the order of \$6 million.

Crown Zellerbach Company hired Reid Collins and Associates to conduct a logging road survey on the Machmell and Neechanz Rivers. Construction of these roads could possibly start in 1973.

The report "Provisional Environmental Quality Objectives for the Central Coastal Division, Northern Operations Branch, for 1972" was published. This report gives a historical review of logging activities and associated problems, areas of particular concern, an inventory of probable industrial developments and an inventory of present pollution sources and threats.

c. Information

During the commercial sockeye fishing season the Fisheries Service produces an information report to the fishermen and industry. This report describes the Fisheries Service's activities in Rivers and Smith Inlets, catch data with comparisons to brood years and previous catches, recorded escapement, biological projects including Docee River fence counts and age analysis from scale reading, plus any other information which may be available.

Representatives from industry and United Fishermen and Allied Workers' Union spent one week on stream inspection with Fisheries Service personnel covering Owikeno and Long Lakes' sockeye spawning areas. The weather was very good and all streams received a good inspection.

4. Biological Programs - Rivers and Smith Inlets District

a. Owikeno Lake tow-netting

Field work at Owikeno Lake began in late March with the annual project of tow-netting for sockeye pre-smolts. The index of abundance of pre-smolts from the 1970 brood year was 21.9, the third lowest index recorded to date (Figure 8). Echo sounding enumeration of pre-smolts in the lake was tried for the second consecutive year with very encouraging results, using a Ross Fineline Sounder. Both techniques will become a regular part of the spring program until such time as a meaningful relationship is established between them, and the less satisfactory method of enumeration can be dropped.

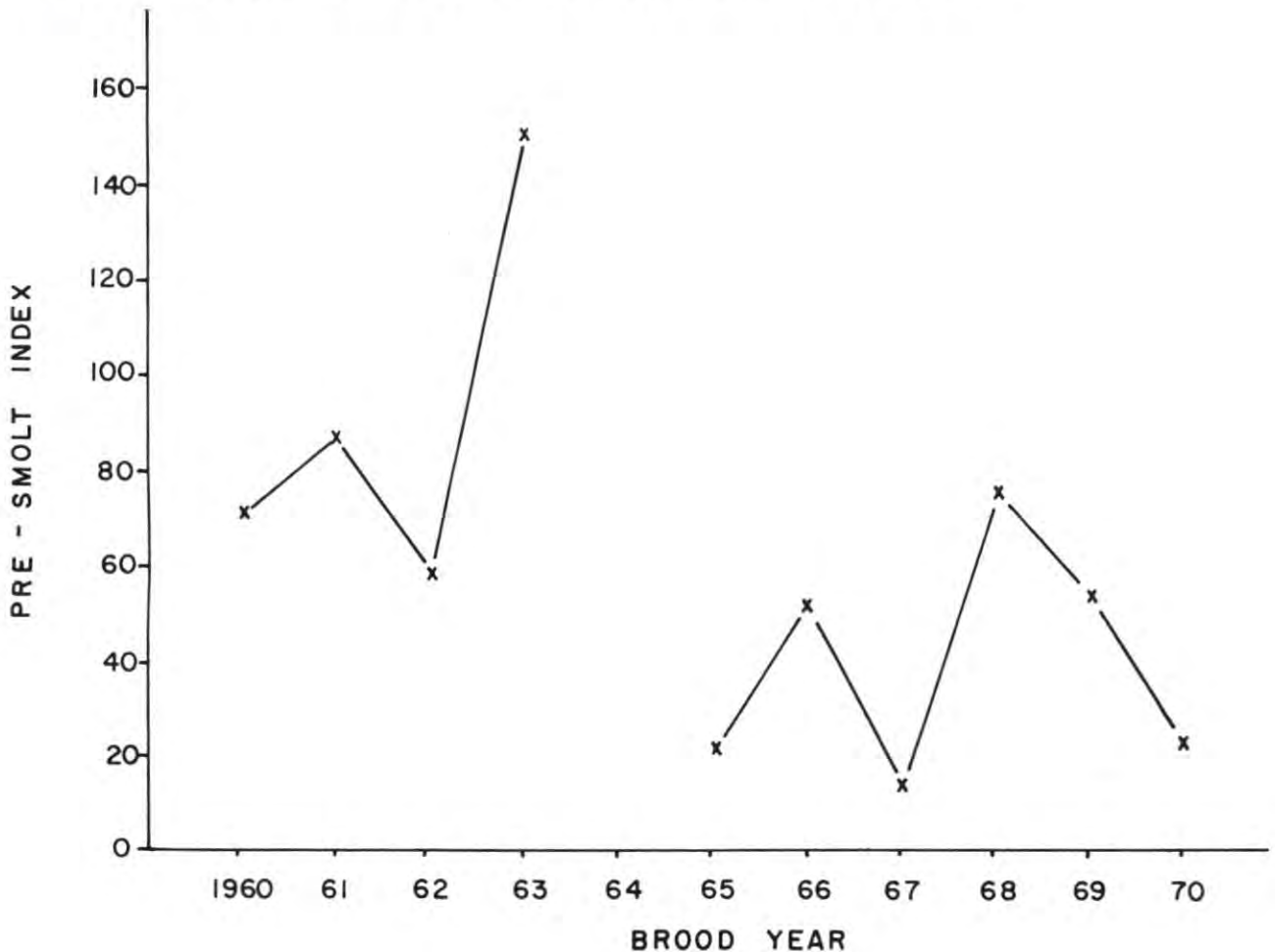


Figure 8. Relative index of abundance, by brood year, of Owikeno Lake sockeye pre-smolts.

Two manuscript reports dealing with Owikeno Lake limnology were written in 1972 and will soon be published.

b. Wannock River chinook egg and sperm take

On October 14, two biologists and an Information Officer from the Washington State Department of Fisheries arrived at Owikeno Lake to take sperm from Wannock River chinooks (Plate 13). For the next two days they were housed and assisted by Fisheries Service field staff. Thirty-five ounces of sperm were taken from eleven male chinook salmon which were then released to spawn naturally.



Plate 13. Beach seining for chinooks,
Wannock River.

Twelve pounds of eggs were also taken from a large (112 cm) female chinook. Washington hatchery personnel estimated this fish could have as many as 15,000 eggs. The Wannock River eggs and sperm were flown to Washington for fertilization and incubation. Initial mortality of the Wannock River eggs was 10 percent, but Washington eggs fertilized with Wannock River sperm suffered up to 46 percent mortality. It is the intention of the Washington biologists to rear young from the Wannock River eggs to maturity in salt water pens in order to maintain a supply of "pure" Rivers Inlet chinook sperm. The Rivers Inlet chinooks are apparently better "biters" and "fighters" than Puget Sound stocks.

c. Sockeye tagging Areas 8 - 10, 1972

In 1972 two drum seines were chartered to catch and tag sockeye in the approaches to Rivers Inlet. Tagging was conducted just south of Rivers Inlet in the entrance to Smith Sound, and to the north of Rivers Inlet in Fitz Hugh Sound. The program was designed to ascertain what proportion of

Rivers Inlet sockeye were passing through these areas prior to entering the Rivers Inlet fishery.

One vessel operated just outside the entrance to Smith Sound. A significant proportion of the tags applied in these waters were recovered in the Rivers Inlet sockeye fishery. Unfortunately, weak runs to both Rivers and Smith Inlets made capture of fish for tagging difficult, and the total number of fish tagged was not great. However the results from the limited number of recoveries indicates that possibly 50 percent or more of the sockeye present in the outside waters of Smith Sound were destined for Rivers Inlet. A continuation of this tagging program in a year of greater sockeye abundance would undoubtedly provide an opportunity to determine quantitatively the numbers of Rivers Inlet sockeye migrating through this area.

The second tagging vessel tagged in the lower portion of Fitz Hugh Sound. Tagging efforts were quite successful, and many tags were recovered in the commercial fisheries in Fitz Hugh Sound, Burke Channel and North Bentinck Arm, and in Rivers Inlet. Very considerable differences in fishing effort between the main recovery locations made it difficult to accurately estimate the real proportion of Rivers Inlet sockeye in Fitz Hugh Sound. It is estimated that only about 10 percent of the fish in the Fitz Hugh Sound area were Rivers Inlet migrants in 1972.

5. Herring Management - Central Coastal Division

a. Catch

The Upper Central Sub-District (Area 6) was closed to commercial herring fishing because of poor stock conditions. A total of 11,802 tons of herring was harvested in the Lower Sub-District (Areas 7, 8, 9 and 10), of which 144 tons were caught by gillnets. In Area 7, Kildidt Sound yielded the highest catch (6,525 tons), followed by Thompson Bay (2,241 tons), Boddy Pass (498 tons) and the Stryker Bay-Codfish Pass area (283 tons). In Area 8, 360 tons were harvested from Fish Egg Inlet and 165 tons from Kwakshua Channel. In Area 9, Goose Bay produced 200 tons, Rivers Inlet (head) produced 140 tons, and Morgan Bay produced 90 tons. A total of 1300 tons came from Takush Harbour in Area 10.

b. Spawn deposition

The 1972 spawn deposition in Upper Central (Area 6) of only 4.0 miles is far below the 25 year average of 17.7 miles.

Spawn deposition in the Lower Central Sub-District (Areas 7, 8, 9 and 10) totalled 72.1 statute miles, more than double the 25 year average of 32.1 miles. Spawn mortality was normal except for possible severe frost damage in Areas 9 and 10.

C. Northern British Columbia and Yukon Division

The Northern British Columbia and Yukon Division is headquartered at Whitehorse. Major duties of this largely interior district include the management of a minor commercial fishery, Indian food fisheries and recreational fisheries, assessment of spawning grounds and monitoring of industrial concerns. Management of the sport fishery which is becoming very popular with the public is shared by the Fisheries Service and the territorial government.

Although to many the Yukon and northern British Columbia has always seemed to be a barren destitute area, to others who know it well it is a place of opportunity where one can still take part in discovery and development of industrial booms.

Since the time of the gold rush in 1898, the Yukon and northern British Columbia has had its share of localized developments. It is only recently that these developments have taken on a wider scope, covering a goodly portion of the territory from the Arctic Sea to the British Columbia border. At present the territory has a little of everything, from pipelines to oil explorations, highway construction, mining, logging, hydro developments, railroads, farms and tourism. The Yukon is in the throes of a boom economy.

1. Indian Food Fishery

There are several food fisheries in the Yukon. A total of 3,900 chinooks were taken from the Pelly River and 30 chinooks from the Yukon River. A total of 6,000 chums was harvested from several rivers, 5,000 from the Porcupine River and the balance from the Pelly and Yukon Rivers.

2. Pipelines

In northern British Columbia and the Yukon there are presently three pipelines in operating condition and one that was abandoned shortly after World War II (Plate 14).



Plate 14. Beaver River - Pointed Mountain Pipeline.

The most important line is in the southeastern Yukon, carrying gas to Beaver River, for the Amoco Oil Company. During construction of this line in 1971-72 studies were carried out by the Fisheries Service to determine whether or not winter pipeline crossings of rivers create environmental instability and in so doing harm the aquatic life in these streams.

The second pipeline, built by the American Army in 1942 and still operating, runs from Skagway, Alaska, to Whitehorse. It is used to transport diesel and fuel oils and is presently owned by the White Pass Company Limited. When the line was constructed, the pipe was placed adjacent to the railroad right of way in a haphazard manner so that it is subject to damage from snowslides, rockslides, train derailments and the effects of weather.

The third operational line runs from Haines, Alaska, to Fairbanks, Alaska, through the western portion of the Yukon. This line was also built by the American Army during the war and has been in operation until recent years. At present all the facilities including pumping stations, lines, etc., are intact, however, a survey was carried out in 1972 to determine the feasibility of re-using the line.

Another line, again constructed by the Army, runs from Whitehorse to Norman Wells in the Northwest Territories. This line operated for only a matter of days and was then shut down because of operational problems. Portions of the line have been removed, however, other portions remain intact. Knowledgeable persons claim that the remaining portions of this line still contain oil.

3. Petroleum Exploration

Petroleum exploration first began in the mid 1950's and has been expanding ever since (Plate 15). Exploration in the northern Yukon now covers about 40,000 square miles or 20 percent of the territory. The principal prospecting areas include the Peel Plateau, Eagle Plain, Arctic Coastal Plain, Kandik Basin, Old Crow Flats and the southeastern corner of the territory.



Plate 15. Seismic line caused by oil exploration, Eagle Plain.

To date 50 wells have been drilled with four more being drilled and two rigs on site. In 1972 alone a total of 2,602 miles of geophysical survey was shot during 21 different operations. Two offshore programs were carried out in the Beaufort Sea as well (Plate 16). One program took place on the ice and another during the summer utilized a hovercraft as the shooting-recording vehicle. Indications are that considerably more work will be done in this area by various companies. Therefore, it is very important that the Fisheries Service determines what damage may be resulting from this activity. Gas and oil has been located in some areas and it is only a matter of time before the area becomes a producer.

4. Highway Construction

Two major highway construction programs were carried out in 1972, one in northern British Columbia and the other in northern Yukon.

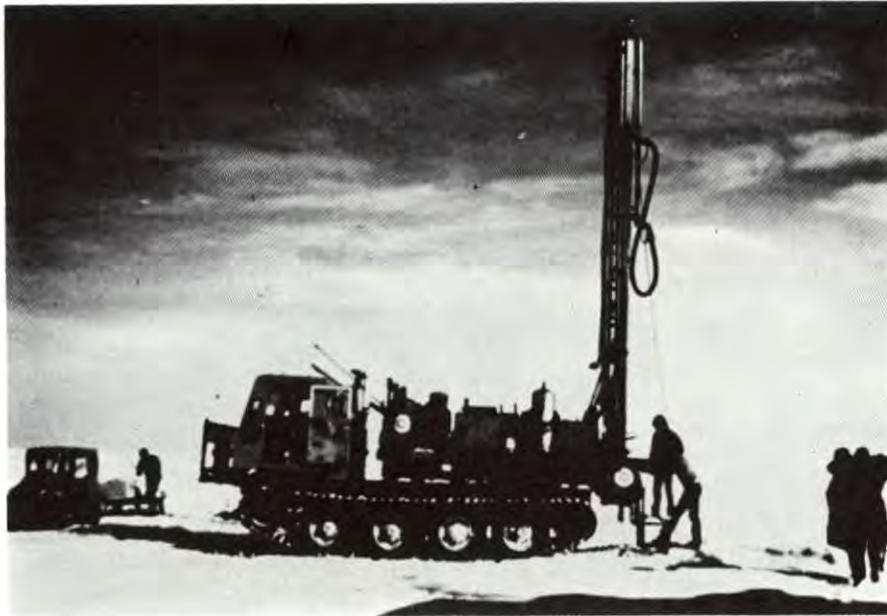


Plate 16. Nodwell mounted drill,
Arctic Ocean.

By the end of 1972 the Stewart-Cassiar Highway was almost complete, however, some traffic did negotiate the entire highway but found portions of it very rugged. The bridge across the Stikine River is to be finished during the winter of 72-73, and will remove the last serious barrier to vehicle traffic. This highway link will enable travel from Watson Lake to Terrace, and will open up vast areas for recreational fishing.

The other highway construction that has caused considerably more problems is that of the Dempster Highway which runs from Dawson City to Inuvik. This highway is scheduled for completion in 1975. It follows several rivers and in places is constructed in old river channels. Mainly because of the lack of understanding of fishery problems when the highway was first started in 1967, many difficulties have been encountered. However, through contact with Department of Public Works, the 1972 construction was designed to prevent fishery problems whenever possible. The main concern this year and in the future will be the removal of gravel from stream channels. One application for 1973 covers removal of 250,000 cubic yards for construction purposes.

Another major undertaking that is proposed for the near future is the construction of a highway from Carcross, Yukon, to Skagway, Alaska. This road will traverse some very rugged country adjacent to the Tagish Lake and tributaries to the White Pass River.

5. Mining

The mining industry has been the Yukon's economic base since before the turn of the century, and today its influence is relatively almost as great.

During 1972 there were eight operating mines in the district. In addition there are two mines under development, numerous worked out claims, and many "sure things" (if you're buying stocks). The producing mines range from coal to lead silver, lead zinc, asbestos, copper and tungsten.

Preliminary figures indicate that 1972 production is up over 1971 productions by approximately 10 percent, following the upward trend started in the sixties. The value of mineral production in the Yukon increased from \$93,111,000.00 in 1971 to \$102,756,000.00 in 1972. These figures do not include the productions from Cassiar Asbestos in northern British Columbia or Canada Tungsten which is just in the Northwest Territories but inspected from the Yukon. Employment from producing mines accounts for 15 percent of the work force in the Yukon. Indirectly the industry accounts for an additional 25 percent in allied industries and services.

The sharp increase in the price of gold resulted in several additional placer mines going into production. All the operations are very small normally, run by one or two men using either sluice boxes or hydraulic heads. These operations center around Atlin in northern British Columbia and Dawson City in the Yukon.

6. Logging

During 1972 there were 15 logging and milling operations in the district. These operations are mainly centered in the Watson Lake and northern British Columbia areas. The value of primary production for the Yukon is estimated at \$619,320.00 with no significant increase expected.

7. Hydro Developments

At present there are two operating hydro dams in this district located at Mayo and Whitehorse, Yukon. Another hydro dam near Dawson City was abandoned shortly after the large dredges stopped working the gold fields.

The Mayo Dam has created considerable problems to the fisheries resource since its construction by blocking the upstream travel to spawning chinook salmon, and forcing them to spawn in less desirable areas below the dam. In addition the dam is generally shut down for an annual inspection during which time all water passage is shut off causing heavy losses to the resource in that portion of the river that dries up.

The Whitehorse Dam has a fish ladder incorporated in its design which passes chinooks and some indigenous species around the obstruction. The operating crown corporation has plans to increase the size of this structure and the water reservoir it produces. This increase in size is to take place around 1975 and will require fisheries input prior to this stage.

During 1972 considerable effort was expended by the Fisheries Service and other agencies in studying the possible effects of the proposed Aishihik power development. This development is scheduled for construction starting 1973. Although not effecting salmon, this proposal will have considerable effect on indigenous species.

8. Railroads

At present there is only one railroad line in the district. It runs from Skagway, Alaska to Whitehorse and carries most products to and from the Yukon. The White Pass Company has proposed to construct a new line from Whitehorse to Carcross to enable the mining industry to load directly onto the railroad instead of hauling the ore 200 miles by road.

9. Tourism

While not necessarily an industrial development, tourism is too important to the economy and its influence on the fishing too great not to be mentioned here. In the past 10 years the numbers of tourists have increased from 40,000 to 280,000, a seven fold increase, and their expenditures have increased 10 times. A 21 percent increase in numbers has been recorded in the past 12 months. This increase is not attributable to significant improvement in transportation so one could expect that these figures will rise even more dramatically over the next five years when a larger portion of the Alaska Highway is paved.

10. Biological Programs - Northern British Columbia and Yukon Division

a. Aishihik Lake

As a result of an application for a water licence on the Aishihik system by Northern Canada Power Commission to produce hydro power, a study of stream populations in this area was undertaken by Northern British Columbia and Yukon Division personnel in 1972 (Plates 17 and 18). The responsibility for study of fish resources in Aishihik Lake is shared with Environmental Quality personnel who examine the lake fishes. The main objectives were to identify the kinds of fish present in the system and measure real or relative abundance; to locate,

measure and describe spawning and feeding populations, and their areas of use; and to measure migrations. Studies were carried out from breakup in mid May to late September. Nine species were identified as present including rainbow trout. The rainbow trout represent one of two so called native populations found in the Yukon Territory and they inhabit 2,000 feet of rocky stream commencing at the base of Otter Falls (formerly printed on the \$5.00 bill). The results of the program are incorporated in a report on fisheries problems associated with hydro power development, and were presented to the Yukon Water Board which has the responsibility to decide on the application made by Northern Canada Power Commission.



Plate 17.
Otter Falls,
spring 1972.



Plate 18.
Otter Falls,
mid summer
1972.

b. Resource inventory

The resource inventory program on the fish stocks within the Northern British Columbia and Yukon Division was carried out on the Teslin drainage in 1972 (Figure 9). The Teslin watershed, an area of approximately 14,000 square miles, is part of the upper Yukon River headwaters and encompasses one large lake and seven major tributary river systems. Fixed wing and helicopter support surveys formed a large part of the methods utilized to collect the data. Nets were operated in some areas. As a part of the program a counting tower was operated on the Nisutlin River, the principal tributary to Teslin Lake. Thirteen species were found in the system. Lake whitefish and lake trout appear to be most important. The whitefish are taken in a commercial fishery and the trout in both commercial and recreational activities. The Pacific salmon are represented by chinook and chum. The distances from the Bering Sea to the uppermost spawning areas for these two species are 1,900 and 1,700 miles respectively. A catalogue on resources is being prepared.

c. Fishing Branch River chum studies

The Fishing Branch River is located on the Arctic Circle and is one of the headwater streams of the Porcupine River which in turn forms a part of the Yukon system. Reports from Loucheux (Vanta Kutchin) Indians at the village of Old Crow indicated that chum salmon spawned in the upper reaches of the Fishing Branch, and the first attempt to quantify the run was made in the fall of 1971 by aerial surveys. The estimate was 200,000 to 250,000 fish.

In September, 1972, a helicopter supported field party installed a counting fence immediately below the spawning grounds. The fence was in continuous operation for a period of one month, and the total spawning population of chum salmon was estimated at 35,000. Daily mean water temperature was 41°F at commencement of the program and dropped to 37°F with the first heavy freeze. Recoveries of fish tagged in the period September 16 - 21 suggest a stream residence of one month.

The river in the area of the spawning grounds is spring fed and remains ice free all winter. Dead and dying salmon attract a wide variety of fur-bearing carnivores, notably grizzly bears and wolves, and for this reason the area was recently designated a wildlife preserve.

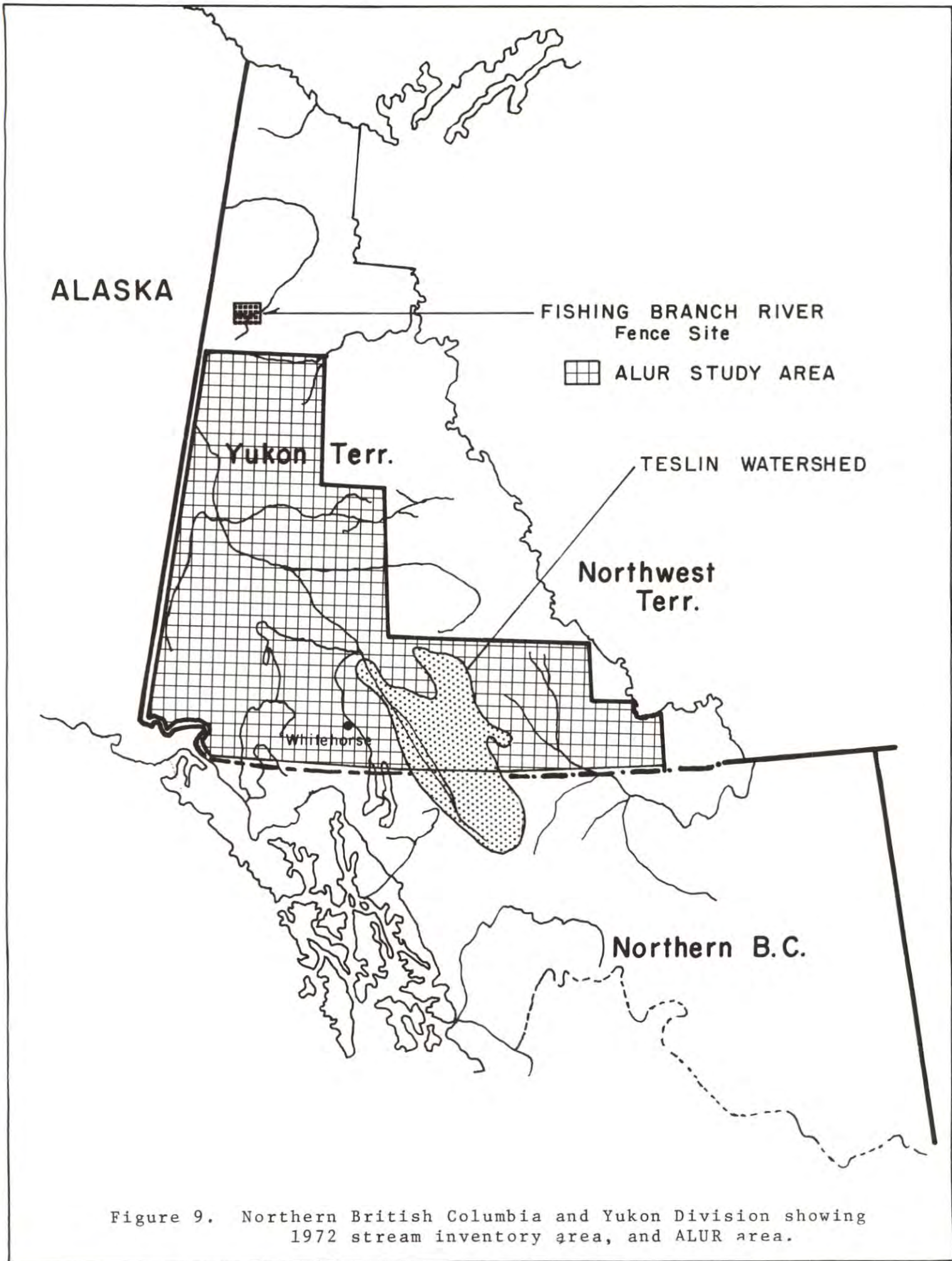


Figure 9. Northern British Columbia and Yukon Division showing 1972 stream inventory area, and ALUR area.

d. Nisutlin River chinook studies

The Nisutlin River is a major stream, approximately 142 miles long, which flows into Teslin Lake. In 1972 the river was chosen for study to determine if it could serve as an index stream to reflect escapements of chinook salmon to Canadian spawning grounds. A counting tower and fence facility was constructed on the river approximately 75 miles upstream from Teslin Lake, and at a point downstream of major spawning areas as determined by aerial surveys carried out over several years (Plate 19). Unfortunately, unusually high rainfall prevailed for about three weeks commencing mid July and as a result stream conditions seriously delayed completion of the necessary structures. Subsequently, 127 chinook salmon were counted (August 9-23). Aerial surveys indicate that fish had passed the count site prior to August 9.



Plate 19. Counting fence on the Nisutlin River
(river 400 ft. wide at this point
with a discharge of 3000 c.f.s.)

Other species observed at the fence were broad whitefish, Arctic grayling, longnose suckers, and northern pike.

e. Pothole lake trout and salmon farming

The planting of rainbow trout in the Yukon was first carried out by the Whitehorse Fish and Game Association in the late 1940's. In 1958 the Fisheries Service became involved and has since been responsible for planting 1.58 million trout eggs

and 32,400 trout fry and yearlings. Also in 1972, 4750 pre-smolt coho were planted.

In the early stages of the program when incubation trays and simulated gravel redds were used survival from egg to fry was very low. However, the introduction of stream-side and upwelling incubation boxes improved this survival figure and showed promise providing a suitable water source was developed properly.

In an attempt to further reduce the mortality figures, in 1971 30,000 rainbow trout approximately two to two and half inches in size were trucked 1700 miles to four planting sites in the Yukon. Overall survival to planting was 88 percent which was much higher than the previous results. The growth rate on these fish was excellent, increasing from an average of .08 ounces at planting to an average of 22.9 ounces in only 54 weeks. The earlier plants had produced fish up to nearly 20 pounds in four years.

With the apparent high growth rate, the reduction of mortality to the planting stage, and the number of barren and semi-barren potholes or small lakes in the Yukon, the Department decided to conduct an experiment with pothole farming in 1972. The program began with the trucking of 2400 yearling rainbow trout and 4750 pre-smolt size coho salmon to the territory from Mission City, B. C., to be planted in five lakes pre-selected to meet the following criteria:

- (1) Lakes must be less than 15 acres and less than 40 feet deep;
- (2) Lakes must contain enough natural food to support a fish population without supplemental feeding;
- (3) Lakes must have no native fish present;
- (4) Lakes must be accessible by road to facilitate stocking and harvesting; and
- (5) Lakes must have no surface drainage.

On arrival in the Yukon the mortality of the coho had reached 50 percent with the remainder in a very excited state. The rainbow trout suffered 20 percent mortality but the remainder did not appear to be suffering adversely.

On September 26, 1972, 111 days after planting, harvesting operations began on two of the lakes. The fish were recovered using monofilament gillnets of two, two and half and three inch extension measure. The fish were cleaned, washed and frozen as soon as possible to maintain quality. Recovery was as high as 94 percent and the weight after 111 days as high as 18 ounces (Table XI).

Harvesting of the first two lakes proceeded smoothly with the complete operation taking 20 man days. The second set of lakes provided several problems. A cold spell covered the lakes with ice and before operations could continue, adequate

TABLE XI. Planting densities, growth rate and survival of fish planted in pothole lakes, Yukon.

Lake	Species Planted	Density in Fish Per Acre	Weight at Planting in Ounces	Weight After 50 Days in Ounces	Weight After 111 Days in Ounces	Number Planted	Number Recovered
Colleen	Coho Salmon	500	0.6	1.8	4.2	2300	76
	Rainbow Trout	Coho and Rainbow	2.3	7.5*	12.4	200	188
Marcella	Rainbow Trout	143	2.3	5.6	9.2	1435	1261
Bishop	Coho Salmon	952	0.6	no data	5.6	2380	Terminated
Muriel	Rainbow Trout	320	2.3	2.8	4.1	800	Terminated

*Sample taken after 63 days.

time had to lapse to ensure sufficient ice thickness so that fishing operations could be conducted through the ice. Because the lakes were very shallow and there were no shallow nets available at the time of the operation, considerable difficulty was experienced with nets freezing to the underside of the ice. Due to the problems involved with freezing nets, the low returns and the small size of the fish, the operation was terminated after two days fishing time.

The rainbow trout production from the pothole lakes was sold locally to supermarkets and restaurants at 60 cents a pound. The supermarkets sold the fish fresh and frozen, and the restaurants sold them as plate size whole rainbow.

The marketed trout were very bright in colour with a rich orange flesh colour with no indication of the "muddy" flavour experienced with some of central Canada's pothole production. The public's reaction to sales was excellent and the entire supply was depleted in a very short time.

From the preliminary survey this year, the program results are for the most part promising. It would appear that the best results are obtained from lakes greater than five acres in size with planting densities of less than 200 fish per acre.

Although the rainbow trout produced better results than the coho salmon, the fact that the coho had a very high mortality rate during transport may have a bearing on the results.

The aquaculture program is to continue in 1973 and will provide a clearer picture of the potential in this type of operation.

f. Arctic Land Use Research Study

The Department of Indian Affairs and Northern Development in pursuance of their responsibilities in the Yukon and Northwest Territories established and funded the Arctic Land Use Research (ALUR) Program (Figure 9). This program will generate the collection and dissemination of baseline information and provide support for the implementation and application of the Territorial Lands Act and Northern Inland Waters Act regulations.

The participating agencies taking an active role in the collection, research, and preparation of information for this program are the Land Use Planning Branch, Canadian Wildlife Service, Canadian Land Inventory and Fisheries Service.

The role of the Fisheries Service in this program is to collect data on species composition, and their relative or absolute abundance; seasonal migrations; habitat characteristics; domestic, commercial and recreation fishing areas; and critical and important areas for fisheries. This information,

along with that submitted by other agencies, is produced in a land use planning map series. These maps summarize the information available on renewable resources and related human activities and provide guidance in regional planning allowing a managed approach to development and environmental protection.

Fisheries Service participation commenced in 1971 with input into the northern Yukon. In 1972 the study area was south and west Yukon. The east Yukon will be studied in 1973 and will terminate this program.

g. Pipeline studies

Pipeline studies began in 1971 under the authority of the Environmental-Social Program. The study area is located north of the 66th parallel and much of it lies above the northern limit of trees (Figure 10). Old Crow is the only village found in this study area. It is about 1300 air miles from Vancouver, 1700 river miles from the Bering Sea, and lies at the confluence of the Old Crow River and the Porcupine River. The inhabitants are mostly Vanta Kutchin natives and Métis, and until recently their livelihood centered around trapping for furs. Oil and gas exploration is on the increase, as some of the largest sedimentation basins in the Yukon are located here. In 1968 oil and gas deposits were discovered at Prudhoe Bay in Alaska. Since that time a pipeline system has been planned to accommodate the Prudhoe Bay deposits. The problems of building a pipeline on permafrost and across unstable water courses are only now being appreciated. Two pipeline routes have been proposed; one across the barrens on the north slope, and a second through the Porcupine River Valley. It is hoped that the route which will have the least environmental and social effects, and is still economically feasible will be chosen.

(i) Purpose of the study

Each pipeline route is associated with a unique fish population. The Old Crow area is of particular interest since it provided an open refuge area, during the last glacial age.

Very little is known of the life histories of most northern fishes. What data has been collected comes mostly from easily accessible regions along the Mackenzie River. This study has been faced with the problem of accumulating enough data to assess the potential effects of pipeline construction and operation, and to recommend stipulations to minimize or eradicate these effects. The necessary data includes life history of fishes, spawning migrations and areas, rearing areas,

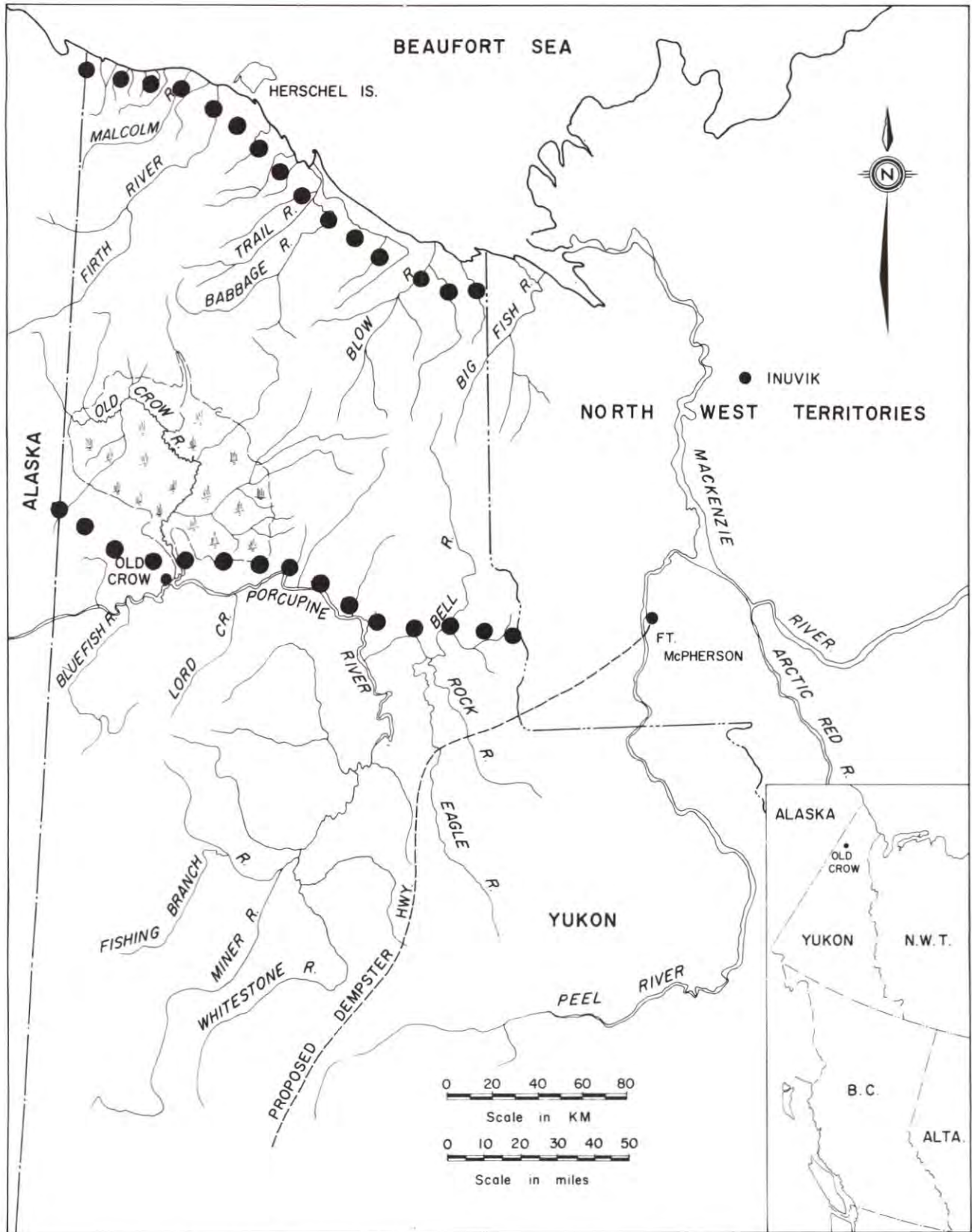


Figure 10. Pipeline study area in northern Yukon Territory. Rows of dots indicate proposed alternate routes of prospective gas pipeline from Prudhoe Bay, Alaska.

dispersion migrations and foraging areas, and overwintering areas. The habitat requirements of each species, water chemical and physical parameters, and food regimes must be determined. In addition, scales and other aging techniques are utilized to determine the age structure and growth rates of populations, and to outline recruitment and mortality rates of each species population. The behavioural and physiological effects on fish of pipeline construction, siltation, and associated pollutants must be determined under various habitat conditions as would occur throughout the year. Finally stipulations on construction, operation and abandonment of the pipeline will be recommended.

(ii) Field studies and results

The 1971 field work was very preliminary. The study surveyed a number of rivers and streams associated with the proposed pipeline routes. Some chemical and physical characteristics were measured, and aquatic invertebrates and plant life were sampled. Seine nets, gillnets and angling were used to sample fish populations (Plate 20). The resulting data produced species composition charts for the two pipeline routes, and age, sex, maturity and mortality characteristics of the general populations. In addition, some heavy metal and pesticide contents of a limited number of fish samples were analyzed.



Plate 20. Seining on Porcupine River.

The major discovery was that of a chum and coho salmon spawning run in the Porcupine River, and the

delineation of the spawning grounds in a groundwater section of the Fishing Branch River. The run was estimated at 250,000 fish in 1971 which has since been shown to probably be the peak spawning year. This spawning ground and the surrounding area has since been made the Fishing Branch River Fish and Game Preserve.

Field work in 1972 was much more extensive. An aerial winter survey in March classified rivers according to ice and open water conditions (Plate 21). With some chemical measurements, the probability of overwintering areas for fish in different rivers was assessed. In May, sampling began in the immediate area around Old Crow (Plates 22 and 23). Breakup of the ice in the rivers occurred on or around May 27, and sampling spread to outlying areas of the Porcupine River drainage soon after.



Plate 21. Doing water chemistry, Chinnitlui Lake on Old Crow River of Porcupine drainage.

Arctic grayling, broad whitefish, round whitefish, lake trout and northern pike were found by ourselves or other agencies in both drainages. Additionally, Arctic char and fourhorn sculpin were found on the Beaufort Sea side whereas Arctic lamprey, burbot, chinook salmon, chum salmon, coho salmon, inconnu, lake chub, lake whitefish, least cisco, longnose sucker, slimy sculpin and trout perch appeared in the Porcupine drainage.



Plate 22. Helicopter used
in river survey on
Fishing Branch River.



Plate 23. Coho yearlings caught at
Fishing Branch River.

Although not yet completely analyzed, it is felt that the data collected will give a good outline of life history and population dynamics for several species. In particular chinook salmon spawning grounds have been located in the Miner River.

D. Marine Services

Patrol vessels continuously ply northern waters ensuring that British Columbia Fishery Regulations and Coastal Fisheries Protection Act and Regulations are being upheld. These vessels are responsible for policing the various salmon and herring fisheries, for monitoring annual escapements of spawning creeks and rivers and herring spawning beds, for surveillance of waters to guard against marine pollution, and for assisting Fishery Officers and technical staff. In addition, Fisheries patrol vessels provide search and rescue assistance to vessels in distress.

In addition to vessels headquartered in the north, larger vessels from the regional headquarters often work in northern waters on an assignment basis. These vessels include the "Tanu", "Laurier" and "Howay", which patrol specific fisheries such as halibut, for example, in northern waters. International fisheries carried out by USSR and Japanese vessels are also generally monitored by these larger patrol vessels.

In 1972, the FPC "Kitimat" was retired from the Fisheries Service. She will be replaced by a smaller but faster vessel in 1973.

1. Prince Rupert Marine Station

The present Marine Station located at Sourdough Bay in Prince Rupert was constructed in 1957. The main floor contains a workshop area for woodworking, an area for mechanical repairs, a number of utility rooms, and an office for the engineer-in-charge. The upper story contains a two bedroom apartment for use of the engineer-in-charge plus smaller locker rooms for storage of equipment for patrol vessels.

The staff includes the engineer-in-charge, two engine fitters, and one ship's carpenter. In addition, one casual engine fitter is employed during the period of refits or annual overhauls of vessels.

The Marine Station staff services twelve diesel-powered patrol vessels from 25 feet to 56 feet in length, nine speedboats from 18 to 22 feet in length powered by high

speed gasoline engines, and many small aluminum or fibreglass boats used by Fishery Officers or fishery Guardians. In addition they are at times required to repair outboard motors, or to proceed to remote areas such as Babine Lake or Dawson's Landing to service mechanical equipment at these facilities.

In 1972 the ground levelling project initiated in 1970-71 was completed providing the Marine Station with a level area used for vehicle parking and outside storage of speedboats and other small craft not used during the winter months (Plate 24 and 25). The addition of two concrete floats in 1972 now provides adequate facilities for all vessels during the winter months. The floats are equipped with power, and water is available at all times.



Plate 24.
Prince Rupert Marine
Station prior to
clearing and
levelling.

Plate 25.
Prince Rupert Marine
Station after
levelling.



2. FPC "Kitimat"

The "Kitimat" was built in 1939 and retired by the Fisheries Service in October, 1972 (Plate 26).



Plate 26. FPC "Kitimat", retired in October, 1972.

Her statistics are as follows:

Official Number	- 171785
Length	- 79.7 feet
Beam	- 15.6 feet
Draught	- 9.0 feet
H.P.	- 300
Gross Tons	- 79.0
Registered Tons	- 29.0

The original engine was a Vivian. In 1956 she was re-engined with a Vivian National and in 1961 with a 300 H.P. Caterpillar Diesel. When the vessel was first commissioned she carried a complement of seven persons. The late Captain L. Sheppard was her original master, having joined the vessel April 12, 1939, at a monthly salary of \$175.00. Mr. W. Earnshaw was Mate, joining the vessel April 26, 1939, at a salary of \$125.00. Mr. Earnshaw eventually became her master for many years. The first Chief Engineer was Mr. Robert Fenwick, joining the vessel April 17, 1939, at a monthly salary of \$165.00. The Second Engineer was a Mr. Harry Landry, who took his position April 14 and was paid \$125.00 per month. The first Cook hired was Mr. Sam Bozza, who received \$80.00 per month for his services. In addition to the above, a Mr. William Sims was employed as an able seaman receiving \$65.00 per month and Mr. Francis McGraf was a 'Galley Boy' being paid \$45.00. It is interesting to note that these men served 'at the Minister's pleasure' since collective agreements in the Federal Service were not in existence in those days.

From 1939 to 1963 the vessel served coastwise, being based either in Vancouver or Victoria. In 1963 she was transferred to Prince Rupert where she was based until her retirement. Many of those who served as her master or chief engineer are still with the Fisheries Service. Such persons include Captain R. G. McLellan now Master, FPC "Tanu"; Captain W. Furlong, Relief Master; Captain M. B. Gay, Marine Officer; Captain R. E. Armstrong, Master FPC "Laurier"; and Captains Johansen, Wylie, Swim, Galley and Walker who are now masters of smaller patrol vessels. Former engineers include Chief Engineer A. S. Service, now aboard "Tanu" in that capacity; and Mr. A. R. Snodgrass, also aboard "Tanu" as Relief Chief Engineer.

The vessel was used primarily in her early years to cover the salmon, herring and halibut fisheries off the west coast, particularly in the Gulf of Georgia and at San Juan. When the 'surf line' came into existence she was used to patrol this line coastwise, and when foreign fishing vessels appeared off the coast in the sixties she was called upon to enforce the Coastal Fisheries Protection Act.

During the years she was called upon to make many search and rescue expeditions. The most notable perhaps was the search for the vessel "Kaare" which disappeared in Hecate Strait between Bonilla Island and the international boundary to the north, and the search for the herring seiner "Combat" which went down crossing lower Hecate Strait from the Queen Charlotte Islands to the mainland.

3. Queen Charlotte Islands

a. FPL "Pillar Rock"

The "Pillar Rock" is a 48 foot vessel assigned to Area 1 (which includes the north coast of Graham Island, Naden Harbour and Masset Inlet). She is based in Masset, is manned by a three man crew, and is responsible for numerous activities within the Sub-District. Her duties include enforcement of the Fisheries Act and Regulations, spawning ground surveys, gathering of statistics, search and rescue responsibilities, and various other duties, such as the transportation provided in 1972 on the Governor General's visit to Masset.

b. FPC "Arrow Post"

The "Arrow Post", a former air force vessel built in 1944, is a 60 foot vessel assigned to Area 2E, and is responsible for enforcement of the Fisheries Act and Regulations in the waters of the east coast of the Queen Charlotte Islands. The "Arrow Post" also assists in spawning ground surveys, and search and rescue operations. Other duties performed by the "Arrow Post" in 1972 include solving disputes between irate fishermen. For example, two halibut fishing vessels were involved in a dispute concerning tangled gear. Some shots were fired and as a result the "Arrow Post" was dispatched to the scene with a R.C.M.P. Officer on board, after having been called by the Sandspit Search and Rescue Station. The dispute was solved to the satisfaction of all concerned and no charges were laid. She also gave assistance to biological staff on the east coast of the Queen Charlotte Islands.

c. FPC "Sooke Post"

The "Sooke Post", built in 1944, is a 60 foot long, 52 tonnage vessel assigned to fisheries patrol duties in Area 2W, west coast Queen Charlotte Islands (Plate 27). She was originally an air force vessel used for transportation of personnel and freight to isolated radar outposts, and will be replaced by a new "Sooke Post" in June, 1973. The new vessel will be a 64.3 foot long, 36 tonnage vessel with much greater speed and crew accommodation.

The "Sooke Post" provided various services in 1972. In March, she patrolled the herring fishery in Areas 2E and 2W, and later measured herring spawn depositions for these areas. In April and May, assistance was given to biological staff working on herring spawn on kelp propagation studies in Cumshewa and Skidegate Inlets. The patrol of the pink and chum salmon fisheries in August and September ensured a fair to good

escapement of spawners to the majority of creeks in Area 2W. The crew of the "Sooke Post" sampled spawning salmon for scales, sex and lengths in September and October.



Plate 27. FPC "Sooke Post", built 1944,
and to be replaced in 1973.

On September 10, 1972, the "Sooke Post" found a giant squid (Moroteuthis robusta), 108 inches long, in Tasu Sound (Plate 28). This animal may have a total length in excess of 14 feet and occurs off the west coast of British Columbia north to Alaska. It is distinguished by its size, hooked suction cups and the cone shaped end of the cuttle bone. While the giant squid is not rare it is infrequently caught because it inhabits very deep water and few are cast ashore.

Various other marine animals are also encountered by the "Sooke Post" in the western waters of the Queen Charlotte Islands. Different species of whales are often observed. There is one very large rookery of sea lions in addition to several smaller ones on the west coast of the Queen Charlotte Islands. On April 20, a school of 'Pacific Dolphin', estimated at over 100, was observed approximately one mile off Cape Henry. Usually these fish are not seen so close to shore but are more common ten or twelve miles off shore.

International fishing vessels are frequently encountered by the "Sooke Post". Japanese long-liners fishing for black cod are occasionally observed as well as the odd stern trawler. For the past two years, Russian trawlers and transport vessels have been using Tasu for transshipment of fish and all encounters with masters of these vessels have been very

co-operative. These larger Russian stern trawlers are crewed with over 100 people, a small percentage of the crew being female.

Various other types of vessels travel off the west coast of the Queen Charlotte Islands, usually at least ten or twelve miles off shore. One vessel which the "Sooke Post" stopped to check several years ago was the famous oceanographer Jacques Cousteau on his "Calypso", travelling from Sitka, Alaska, to Seattle.



Plate 28. Giant squid, 108 inches long, found in Tasu Sound, Q.C.I.

4. Skeena District

a. FPL "Cutter Rock"

The "Cutter Rock" operates in Area 3 and is a 55 foot long, 14 foot beam and 6 foot draught vessel, and is powered by a V71-220 General Motors diesel engine, with an average speed of 10 knots. She sleeps five persons including crew. The vessel was built and launched in May of 1967, and replaced the vessel "Onerka II". The patrol area includes the head end of Portland Canal, where the town of Stewart and Hyder, Alaska, are situated, and Alice Arm at the top end of Observatory Inlet. During the fishing season the "Cutter Rock" patrols to the

'surf line' and the international boundary between Alaska and British Columbia. There are five villages in the patrol area: Port Simpson, at the entrance to Portland Inlet; Kincolith in the estuary of the Nass River; and Greenville, Aiyansh and Canyon City situated further up the Nass River. There were seven or eight canneries in this area at one time but salmon are now transported to canneries on the Skeena River for processing.

The "Cutter Rock" performed various duties in Area 3 in 1972. She collected and passed daily catch figures to the Prince Rupert office. She was assisted in her work by four charter boats during the months of July, August and September. The patrol of this vessel ensured salmon escapements to the Nass River, Kwinamass River, Kitsault and Illiance Rivers, Bear River, Georgie River, Stagoo Creek, Lizard Creek, Donahue and Cascade Creeks. She patrolled a small herring fishery in the spring of 1972, and checked American fishing vessels travelling in British Columbia waters to see that they were complying with regulations under the Coastal Fisheries Protection Act.

The "Cutter Rock" encounters numerous porpoises in its patrol area especially in Portland Canal. Also, quite large herds of killer whales are present at times in the area with most being sited in Portland Inlet. The occasional fur seal is seen and during the salmon season hair seals and sea lions are encountered. There are now very few sightings of humpback or any other species of whales in Area 3.

b. FPL "Babine River"

The "Babine River" is used to patrol Babine Lake. She is a 25 foot aluminum vessel and was built in 1965. She was used for several years as a patrol vessel on the lower Fraser River and was brought north in the late sixties to replace a wooden vessel "Branta" on Babine Lake. She is used during the period May 15 to October 15 in the lake, and is taken out of the water each winter. The vessel is powered by twin V6 Buick engines with OMC out-drives.

She has a crew complement of one man on a seasonal basis, May to October.

c. FPL "Petrel Rock"

The "Petrel Rock" was built in 1969 as a small fast patrol vessel to cover mainly the gillnet operation in the Skeena area (Area 4).

In 1972 she was the largest fibreglass vessel in the Northern Operations Branch. The vessel is 37 feet in length with a beam of 12.3 feet. She is twin screw, powered by Perkins Diesels of 140 H.P. The vessel carries two sounders,

an Ekolite for herring sounding operations and a Furuno for salmon operations. A Decca Radar and two radio-telephones are also available for navigational purposes and use by the Fishery Officers and vessel master. The vessel carries a crew of two persons, a master on a full time basis and an engineer for approximately eight months per year.

d. FPL "Beaver Rock"

The "Beaver Rock" was built in 1961. She is 47 feet in length, of wooden construction and is powered with a General Motors diesel.

The vessel carries a complement of three men: master, engineer and cook deckhand. Her equipment consists of three radio-telephones, a radar set and an Ekolite sounder.

For many years the vessel was based at Campbell River and carried out patrol duties in that vicinity. In 1970 she was brought north to replace the vessel "Clavella" which was disposed of through Crown Assets Disposal Corporation. At present she covers the Grenville-Principe area (Area 5) from Ogden Channel to Wright Sound.

e. FPL "Thrasher Rock"

The "Thrasher Rock", a one man vessel, is utilized by the Environmental Quality Unit for investigation of estuaries. She is therefore fitted with special winches and equipment for towing nets and other gear for catching various sizes of fish at various depths, and taking other samples.

5. Kitimat District

a. FPC "Babine Post"

The "Babine Post" was built in 1944 and was commissioned by the Department of Fisheries in 1946 after serving two years as an air force supply boat. After 27 years of service in various locations on the British Columbia coast as a Fisheries Protection Vessel, the "Babine Post" will be retired early in 1973 and will be replaced by a high-speed, fibreglass, 54 foot patrol vessel. The "Babine Post" is approximately 56 feet long and operates with a crew of four men and has additional accommodation for two Fishery Officers. It patrols waters of the Butedale Sub-District (Area 6).

The vessel is generally responsible for carrying out patrols to protect closed areas or other patrols as designated by the Fishery Officers or the District Supervisor. In addition,

she is responsible for issuing licences, enforcing Acts and Regulations, gathering fish statistics and reporting on the abundance of fish and effort in the area. Assistance is also given in air sea rescues when necessary.

b. FPL "North Rock"

The "North Rock", built in 1957, has provided the Department with 16 years of service, and will continue to be utilized until it is replaced sometime in the near future. The "North Rock" is 45 feet long and operates with a crew of two men and accommodation for two Fishery Officers.

The vessel is used to supplement the work of the "Babine Post" in the Butedale Sub-District.

c. FPL "Surge Rock"

The patrol vessel "Surge Rock" operates primarily in the Bella Bella Sub-District (Area 7). Built in 1964 she is 48 feet long with a beam of 14 feet, and a draught of just over 5 feet.

The "Surge Rock's" main duties are patrolling the various fisheries that take place in and adjacent to the Sub-District. As well as this the vessel also took part in several search and rescue operations, and was used as a transportation vessel for Department officials.

The master and crew also took part in other activities such as spawning ground surveys, minor construction, and other duties that help a Sub-District to function properly.

d. FPL "Gale Rock"

The "Gale Rock" was built in 1967. She is 30 feet in length, constructed of fibreglass, powered by a 427 cc gasoline operated Crusader engine.

The vessel is one of the smaller coastal patrol craft, being the only gasoline operated patrol craft, the only patrol craft in the northern fleet operated by one man and also the fastest vessel in the Northern Operations Branch fleet.

The ship carries a small radar set, two radio-telephones and an echo sounder. She is used to patrol Area 8 from Bella Coola to Namu, including the waters of Fitz Hugh Sound.

e. FPL "Temple Rock"

The "Temple Rock" was built in 1960 and she is a 43.6 foot long vessel with a beam of 12.4 feet. For several years

she was employed as a patrol vessel along the lower mainland but was sent north to carry out patrol duties in the Bella Coola - Namu area in 1967, where she is currently operating.

The vessel carries a crew of two persons, a master and engineer. She is single screw, powered with a General Motors diesel. Her equipment consists of three radio-telephones, a small radar set and an Ekolite sounder for navigational purposes.

6. Rivers and Smith Inlets District

a. FPL "Falcon Rock"

The "Falcon Rock" was constructed in 1960, the first of several "Rock" class vessels that replaced vessels being used by the Department which were built in the twenties and thirties.

She carries a crew complement of three men: master, engineer and cook deckhand. She is single screw and was originally equipped with a Cummins Diesel, but was re-engined in the late sixties with a General Motors diesel. Her electronic equipment consists of three radio-telephones, radar and two sounders. Apart from carrying out general patrols in Rivers and Smith Inlets, she is primarily used to protect salmon stocks inside the head boundary of Rivers Inlet during the heavy sockeye fishery in July and August.

III. FISHING REGULATIONS, LICENCES AND CATCH DATA CENTRE

The Fishing Regulations Unit, Licencing Section, and Commercial and Sport Fishing Data Centre are administered by the Northern Operations Branch but serve the entire Pacific Region of the Fisheries Service, and are located in the Vancouver regional headquarters office.

A. Fishing Regulations Unit

Each year in the Pacific Region, Fishery Officers lay approximately 500 charges under the B. C. Fishery Regulations, the Fisheries Act or the Coastal Fisheries Protection Act. Most charges are laid against individuals, relatively few against companies. Individuals charged may be commercial fishermen, sports fishermen, offenders in connection with the Indian food fishery, polluters or those guilty of such offences as shooting or stoning salmon on the spawning grounds, etc.

The prosecution success ratio is considered to be quite satisfactory. For example, during the year 1971-72 a total of 488 charges were laid, with convictions being obtained in over 90 percent of the cases. Twenty-two cases were dismissed, 15 were withdrawn, 8 had Not Guilty verdicts, and 2 Stays of Prosecution were entered by the Crown. A number of cases were withdrawn because of a loophole in the Regulations, which has since been rectified.

Penalties in the year 1971-72 ranged from suspended sentences through to \$1000 fines under the general penalty section, and up to \$5000 under the pollution section of the Act. In the case of two old offenders in the "fish running" trade, there was a mandatory 30 day jail sentence, plus a \$250 fine. Such jail sentences without option of a fine are not meted out in Fisheries cases except in particularly flagrant violations.

Fishery Officers are aware that the prevention of offences is a significant part of their role, and spend some time educating fishermen and others on the existing regulations, special fishing closures, etc. Further, Officers are in a position to exercise some discretion as to whether or not a charge is laid under certain circumstances. At times, when dealing with persons who have committed minor infractions, it is possible to make a friend for the Department rather than an enemy.

An important project completed during 1972 by the Regulations Unit was the re-drafting of the B. C. Fishery Regulations into a new format. This task was necessary as it has become difficult to locate items in the Regulations, due largely to many amendments having been incorporated piecemeal over the years. The new format is more concise, has a good index, and is

set up in a more rational manner. The new format is presently being reviewed by Department of Justice officials in Ottawa.

B. Licencing Section

1. Commercial Fishing Licences

The sale of commercial fishing vessel licences, personal commercial fishing licences, collectors and packers vessel decal licences, and tuna licences for the 1972-73 season commenced on March 13, 1972.

From that date until February 5, 1973, revenue collected by the Licence Section at regional headquarters and payments to upgrade vessels amounted to \$1,071,250.00. Of this amount \$935,580.00 was the Buy Back portion of commercial salmon vessel licence fees.

In addition to this, the Districts submitted cash blotters and licence stubs to the Licence Section at regional headquarters to cover sale of \$37,925.00 for personal commercial fishing licences and \$105.00 for tuna licences sold in the field.

Total revenue derived from all licence sales was \$1,109,380.00.

2. Non-Resident of Canada Tidal Waters Sport Fish Vessel Licences

Effective April 1, 1972, non-residents of Canada were required to pay a vessel licence to engage in the tidal waters sport fishing in British Columbia. There will be no substantial change to this program in 1973.

The fees for licencing vessels owned by non-residents of Canada are as follows:

(a) Privately owned vessels

1. Under 15 feet in overall length	\$15.00
2. 15 feet but under 30 feet in overall length	\$25.00
3. 30 feet but under 40 feet in overall length	\$50.00
4. 40 feet and over in overall length	\$75.00

(b) Vessels owned by recognized charter and rental agencies

1. Under 30 feet in overall length	\$100.00
2. 30 feet and over but under 50 feet	\$200.00
3. 50 feet and over	\$400.00

A total of 4,142 privately owned vessels and 41 charter vessels were licenced under this program.

C. Commercial and Sport Fish Data and Information Centre

The Operations Room is responsible for maintaining an up to date record of all daily commercial salmon landings by species for all statistical areas on the British Columbia coast. These catch statistics are collected from Fishery Officers in the field by radio-telephone and by land telephone for the purpose of having up-to-date information available for management use. All historical catch data is also stored for reference purposes in the Operations Room.

The Operations Room is responsible for notifying field staff and industry by radio-telephone and land telephone of all changes to fishing times and boundary movements during the fishing season.

Staff of the Operations Room are available to answer queries and give information by correspondence, telephone and in person on commercial and sport fishing to industry and the general public.

Commencing mid-June, 1972, until the end of the salmon net fishing season, salmon net fishing times for that portion of the coast lying south of Cape Caution were recorded on telephone number 666-1101 every Friday night. A recorded message for that portion of the coast lying north of Cape Caution was prepared by the Prince Rupert District office on telephone number 624-9137.

Weekly sport fish reports are prepared and distributed to headquarters staff, field staff and news media during the period May 15 to September 15 each year. Commencing in 1972 a recorded message on tidal waters sport fishing was prepared during the period May 15 to September 15 on the telephone number 666-3169.

IV. ENVIRONMENTAL QUALITY UNIT

The Northern Operations Branch Environmental Quality Unit is responsible for the environmental impact assessment and surveillance of industrial proposals and activities involving hydroelectric developments, port developments, logging activities, and road, rail and pipeline construction activities. In addition, the Northern Environmental Quality Unit is responsible for the operation of regional chemical and biological laboratories at Cypress Creek in West Vancouver, as well as inputs into the pollution control activities of the Environmental Protection Service insofar as they relate to northern British Columbia and the Yukon.

A. Laboratory Operations

The 1972-73 season was a busy one for the Cypress Creek laboratory (Plates 29 and 30). It provided a service for the Northern and Southern Operations Branches of the Fisheries Service, the Environmental Protection Service and to a lesser extent the Fisheries Research Board. A few samples were analyzed for the R.C.M.P. Crime Laboratory, the provincial Fish and Wildlife Branch, the International Pacific Salmon Fisheries Commission, the Canadian Forces and the Inland Waters Branch as part of their check sample programs. Over 15,000 chemical analyses were performed on fresh-water, sea-water, industrial and domestic effluents, tissues, sediments and gravels. The laboratory has the capability of performing 59 different analyses, 20 of which are for heavy metals including mercury. This level of productivity could not have been obtained without very substantial manpower contributions from the Environmental Protection Service.



Plate 29.
Chemistry laboratory
at Cypress Creek.



Plate 30.
Bioassay laboratory
at Cypress Creek.

The laboratory is also equipped to perform bioassays and identification of marine and fresh-water organisms.

B. Fish - Power Problems

Several hydroelectric developments in northern British Columbia are either under study or are in the planning stages. Because of manpower constraints it was not possible to undertake investigations pertinent to the Iskut-Stikine development. However, comprehensive investigations into the fish power problems associated with the Aishihik hydro proposal in the Yukon and Kemano II development in north-central British Columbia were initiated.

1. Aishihik Lake Power Development

In October, 1971, the Northern Canada Power Commission applied for a water licence to develop the hydroelectric potential of the Aishihik River watershed in the Yukon Territory. The watershed contains three large lakes of 8, 40 and 25 miles in length. The outlet stream drops 600 feet in seven miles and it is this energy source that the developer wishes to utilize. The watershed has a very large recreational potential and contains a very large population of lake trout and grayling, as well as whitefish. The Otter Falls area shown on the old five dollar bill is a popular tourist attraction.

In May, 1972, the newly established Yukon Territorial Water Board held its first public hearing in Whitehorse to consider the water licence application. The Northern Operations

Branch presented a brief and successfully argued that the water licence application should be held in abeyance until the impact of the project on the fisheries resource could be assessed.

A crash program was authorized and extensive fisheries studies were carried out in the Aishihik River system in 1972. Because of the immensity of the area under examination, the Northern Environmental Quality Unit undertook the lake and the engineering investigations while the Northern British Columbia and Yukon Division undertook population and utilization assessments of the streams which would be influenced by the development.

The biological lake studies involved the gillnet sampling of fish from 29 stations in Aishihik Lake to determine species composition, age/length/weight relationships and diet through analysis of stomach contents; dredge sampling of 38 stations in shallow zones of the lake to determine benthic invertebrate population and their relationship to fish diet; and plankton sampling from a total of 37 stations to ascertain the productive significance of shallow bays as compared to deeper positions of the lake. It was anticipated that the benthic and planktonic production in shallow areas of the lake might have a critical significance if the lake levels were altered from the natural state.

Traditional limnological determinations of temperature profiles, dissolved oxygen profiles, nutrient and heavy metal concentrations were obtained from 3 to 8 stations in the main lake depending on the parameter of measurement to establish which of these factors, if any, were limiting insofar as lake productivity is concerned.

The engineering field studies on the Aishihik River system included the following:

- (a) The Aishihik Lake shoreline study;
- (b) Limited stream surveys on Giltana Creek, Albert Creek, Sekulmun River and four major tributaries to Aishihik Lake;
- (c) The sounding of Aishihik Lake.

The shoreline study on Aishihik Lake established an inventory of shoreline conditions. This information will be used in connection with biological data to estimate changes due to drawdown on shoreline, bays and low land.

The lower reaches of the major tributary streams were surveyed and water surface profiles, cross sections and stream velocities were obtained.

The sounding program on Aishihik Lake, the lake most affected by storage or drawdown, established the underwater topography so that areas affected by drawdown could be delineated.

The outcome of the stream investigations is dealt with in another section of this report.

A second public hearing was held by the Water Board in Whitehorse on January 17, 1973. An interim report entitled "Fisheries Problems Associated with the Proposed Aishihik River Power Development" was prepared to familiarize the Board with the outcome of our investigations and to make recommendations as to how the fisheries resource could be maintained in the face of this development. It is now apparent that the Board accepted all of the major recommendations and that the resource will be maintained.

These bio-engineering studies will continue in 1973 to produce a complete baseline study and to resolve some outstanding data gaps.

2. Kemano II Development

The Kemano development was brought to life again in August, 1970, when the Province informed the Fisheries Service that consideration was being given to the final phase of development. The first phase went into effect in October, 1952, with closure of the Kenney dam on the Nechako River. Since this time, the Nechako River has received less than one third of its natural flow. The remainder has been diverted through the Kemano power plant to produce power for Kitimat. The final phase of development would involve diversion of the remaining flow on the Nechako River plus diversion of the Nanika, Morice and Dean Rivers. A second power plant would be constructed at Kemano to double the power output.

Fisheries investigations were carried out during 1950 and 1951 on the Nechako and Nanika Rivers. These studies were continued in 1971 and expanded to include the Morice, Dean and Kemano Rivers. Engineering surveys were conducted on selected spawning areas in the Nanika and Morice Rivers during 1971 and 1972, and a discharge recording gauge was installed on the lower Dean River early in 1972. Initial surveys were conducted on several prime spawning areas in the Kemano River during the fall of 1972. Surveys were also carried out during 1972 on the Nechako River above Fort Fraser. Field studies are in various stages of completion, but are expected to be essentially completed during 1973.

3. Cutoff Mountain

Prior to the release of the B. C. Energy Board Report, the Fisheries Service had every indication that the Cutoff Mountain site on the Skeena River was a prime candidate for hydroelectric development. Virtually nothing was known about the population size of salmon stocks utilizing the upper Skeena River. All such stocks would be eliminated by a high dam at this site and consequently it is mandatory that their enumeration be undertaken. Counting fences were erected on the Bear, upper Sustut and Johanson Rivers by the

Northern Environmental Quality Unit, and were operated from August through October. A total of 10,292 sockeye and 3,466 chinook salmon were tallied. With the release of the Energy Board Report in October, it was learned that the development of the Cutoff Mountain site had been put off until after 1990. As a consequence this study will be temporarily discontinued.

4. B. C. Energy Board Report

The B. C. Energy Board Report was released in October, 1972. The Report outlines the energy requirements of the Province together with a recommended program of power development to the year 1990. Hydroelectric development makes up most of this program. Thus far there has been no official comment on the Report by the new provincial government.

A summary of the B. C. Energy Board Report with particular reference to projects affecting the Northern Operations Branch was prepared by the Northern Environmental Quality Unit in December, 1972. Earlier in the year the potential power projects in northern British Columbia and the Yukon were summarized in a report entitled "Fish Power Studies - Northern British Columbia and Yukon"

C. Port Developments

With the ever increasing industrial expansion of British Columbia and Alberta, and the construction of railroads to large mineral resources destined for utilization in Japan, the demand for expanded port facilities, particularly bulk handling terminals, has been increasing at a furious rate. Because estuarine areas near railheads afford attractive construction sites, the Fisheries Service must determine the role of estuaries vis-a-vis fish production of terminal sites that are to be located in areas where impacts on fisheries resource are to be kept at a minimum. The Skeena River estuary program was expanded in 1972 with this purpose in mind.

The proposal for the construction of a bulk loading terminal at Flora Bank within the Skeena River estuary prompted a biological assessment of the area in 1971. The results of this initial survey indicated that Flora Bank was one of the most productive areas in the estuary. In 1972 the study was greatly expanded to determine the utilization by fish of all major estuarine banks and passages, and to define alternative, less productive site locations for the bulk loading facilities. This study entailed the collection of fish, benthic organisms and plankton to illustrate food availability and utilization, and residence time of fish in the estuary. The fish were collected by seines and trawls operated from two charter vessels, the "Thrasher

Rock" and a 19-foot outboard. The sampling period extended from May 1 to August 22. In excess of 9,000 fish were caught and 1,200 were analyzed for weight, age, length and stomach content. The results are presently being tabulated and analyzed.

The original "Flora Bank" proposal by a private developer has been halted and future ship-loading facilities at Prince Rupert will be developed by the National Harbours Board. At this point it appears that a general cargo dock will be built in the inner harbour at Fairview, and a bulk loading port is proposed for Ridley Island. Our investigations to date suggest that these two sites are relatively unproductive and their utilization for port development would not interfere with fisheries resource maintenance.

This type of study will be expanded in 1973-74 to include the Bella Coola River estuary where large inter-tidal land reclamation projects are proposed to facilitate dock expansion and industrial development.

D. Forestry

During 1972 the major logging monitoring undertaken by the Environmental Quality Unit occurred in the Nose Bay region situated directly across from Topley Landing, Babine Lake. Parameters monitored were air and water temperature, turbidity, dissolved oxygen content, suspended sediment, bottom invertebrates, plankton, bottom substrate deposits, nutrient loss, precipitation, and hours of solar radiation. Recently, suitable temperature and flow instrumentation have been obtained for next year's studies. On site inspection of the logging operation showed that the company obviously has yet to implement many of the Multiple Resource Use Protection Guidelines adopted by the British Columbia Forest Service in 1972 (Plate 31).



Plate 31.
Logging through
stream.

Improper road construction, bridging and culverting are evident throughout the area and are probably responsible for much of the sedimentation found below the harvest area (Plates 32 and 33).



Plate 32.
Road erosion.



Plate 33.
Bridge washout.

The Fisheries Service also conducted an initial nutrient sampling program and onsite inspection of Lakelse Lake at the specific request of the Terrace-Kitimat Regional District Planning Committee. Due to an increase in logging, residential population, and tourist facilities the Regional District has had concern for the immediate future of the lake and its environs. An expanded sampling program, especially of the Hot Springs and logging areas, will continue in 1973.

E. Pulpmill Effluent Tainting

A study undertaken by the Northern Environmental Quality Unit in association with the Fisheries Research Board and the provincial Fish and Wildlife Branch indicated that biologically treated unbleached kraft pulpmill effluent caused a tainting of fish flesh at relatively low concentrations. The study was prompted by a proposal to construct an unbleached kraft pulpmill at Houston, B. C., which would discharge treated effluent into the Bulkley River, which supports a very large steelhead and salmon sports fishery. The Eurocan mill at Kitimat employing an up-to-date treatment system proved to be an appropriate study location. The study consisted of maintaining sockeye salmon in effluent concentrations ranging from 1.3 to 4 percent, and submitting samples of fish removed at weekly intervals to a taste panel. Results indicated that only a one week exposure to all concentrations was required to render the fish unpalatable. Samples of eulachon collected from the Kitimat River exhibited similar off-flavours.

Although the Houston proposal has since been shelved, the study was useful in providing important insights into the potential problem of fish tainting.

F. Railway Construction

Negotiations and onsite inspections were continued with the British Columbia Railway during 1972 in connection with the northern extension of the line to Dease Lake. At the time of writing, the rails have been laid to the Driftwood River valley; the subgrade has reached the junction of the Bear and Sustut Rivers; and right-of-way clearing has proceeded twenty miles beyond the subgrade.

In September, 1972, a landslide was triggered by the railway construction activities on the Bear River. At the time Environmental Quality Unit undertook tests to ascertain the effects of the resulting silt deposition on salmon eggs and obtained frozen gravel samples for silt measurement. Large quantities of silt were found in the river at and below the slide, but due to poor visibility in the water and scattered redd locations, it was not possible to locate any chinook salmon eggs. From visual observations during the run, it is felt that no more than 200 chinooks of the 3300 escapement spawned below the slide area.

At the time, the question of prosecution was seriously considered, however, a decision was made to reserve prosecution when the Fisheries Service, the provincial Fish and Wildlife Branch, and the British Columbia Railway reached agreement on measures to protect stream environments affected by the northern extension of the railway. These measures included repairing any

damage already incurred, stabilizing natural slide areas, taking steps to prevent run-off siltation and bank erosion by seeding embankments, rip-rapping critical stream bank areas, relocating the right-of-way in sensitive areas, stabilization of cut banks and installation of culverts in such a way as to minimize siltation.

The Fisheries Service is now providing constant onsite monitoring of construction with consultation and discussion between the three agencies continuing. Co-operation of the three agencies should ensure that the northern extension of the rail-road will proceed without loss of productive aquatic environments in the Bear, Sustut and tributary streams of the upper Skeena River.

G. Miscellaneous Investigations

Several small scale investigations were initiated by the Northern Environmental Quality Unit on matters pertaining to pollution, logging and railway construction.

1. Babine Lake Ecological Study

An ecological study was initiated under the auspices of the Babine Watershed Change Program to assess the impact of forest utilization, mining development, and community growth on Babine Lake water quality.

2. Mining

Included in the Babine study was a review of the effects of the two operating mines, Granisle Copper on McDonald Island and the newly opened Noranda (Bell Copper) mine on the Newman Peninsula. Granisle Copper is an open pit copper mine and concentrator which processed 6,500 tons of ore per day since 1966. Production has been increased to 14,000 tons per day recently. Tailings disposal has been a problem for some time. Because the mine is located on an island, land tailings sites are not available. Therefore, several bays have been dyked off for utilization as tailings impoundments, and routine sampling must be carried out to ensure that excessive seepage of mine tailings does not occur (Plate 34).

The 1972 study consisted of monitoring for parameters such as turbidity, solids content, bottom invertebrates, plankton, alkalinity, and heavy metals including copper, iron and zinc. In addition, substrate identification around dykes was used to assess tailings deposits in the lake bottom. Although results showed no major problems stemming from this operation a similar study will

be carried on next year with a possible expansion of the program to include heavy metal analysis of substrates and tissues of resident fishes.



Plate 34.
Granisle Copper
tailings pond no.
1 - reclamation
with evergreen
trees.

Noranda (Bell Copper Division) is a 10,000 ton per day open pit mine and concentrator which commenced operation in the fall of 1972. Like Granisle Copper it entails a complete recycle system for tailings water. This together with a sound area for tailings disposal should ensure a minimum disturbance to the water quality of Babine Lake.

3. Community Development Studies

Community development studies were aimed mainly at the town of Granisle. A dissolved oxygen survey was undertaken to assess the effects of sewage disposal from the town-site into Babine Lake. The population is expected to double as a result of the newly opened Noranda mine and a more intensive study is proposed for next year. This will probably include nutrient and oxygen loading and treatment plant efficiency tests.

The program next year will also be expanded to include an assessment of oxygen depletion and nutrient loading resulting from the two spawning channels at Fulton River and Pinkut Creek.

V. TECHNICAL SUPPORT UNIT

The Technical Support Unit provides Pacific regional services (Northern Operations Branch plus Southern Operations Branch) in the fields of technical information (statistical design and analysis, scientific computer programming, fish meristics, tag recovery and rewards), radio communications and technical development (electronic and mechanical). In addition to its regional responsibilities, the Technical Support Unit provides the Northern Operations Branch with engineering and biological support geared towards fisheries enhancement.

A. Technical Information

1. The "Sounder"

The Technical Information Section began production of the "N.O.B. News" in 1972 as a newsletter to keep Northern Operations staff informed of activities relating to the Branch. The idea proved successful and after meeting with the Southern Operations Branch, it was arranged that the newsletter, renamed the "Sounder", would provide this service to both Operations Branches and that copies be made available to staffs of other branches at headquarters.

2. Scale Laboratory

The scale laboratory provided a course on aging salmon scales for field personnel in the spring of 1972. A total of 12 officers and technicians attended two separate sessions of three days each. They discovered the difficulty of aging some species and learned the consequences of poor mounting and data recording techniques. Some of the officers were provided with field presses and viewers, and aged their own chum and sockeye scales during the 1972 fishing season.

3. Miscellaneous

Members of the Technical Information Section also participated in the P.N.E. exhibit at Vancouver, redesigned the tag return envelopes, and contributed towards stock identification and data analysis through computer programming advising on statistical procedures and specialized scale reading techniques.

B. Radio Communications

The Unit installs, and maintains the regional radio network which provides communication between headquarters, field establishments, mobile and portable units, and protection vessels (as far north as the Bering Sea). The system is used to provide exchange of fishery information between managers and field staff.

C. Technical Development

1. Multiple Tunnel Fish Counter

Fish were counted through a block of twelve individual tunnels connected to a single electronics package during the successful test of a new concept in electronic fish counting at the Capilano Hatchery. This new concept was made possible by the use of the very latest "state-of-the-art" solid-state semiconductor devices. The counter can keep track of the upstream and downstream movements of fish through up to thirty-two tunnels at the same time. The first practical full scale application of the "tunnel counter" with large numbers of fish will be at the Fulton River in 1973. A simpler version of the device is under development for counting fry or smolts moving one direction only. The first proto-type for testing should be ready in spring, 1973.

2. Egg Counter

An egg counter, capable of counting 1,500 eggs per minute, is in use at the Robertson Creek Hatchery (Plate 35). This counting rate is well below the capabilities of the electronics and the egg-separation system. The limiting factor in the speed is the rate of feeding of eggs into the counting block.

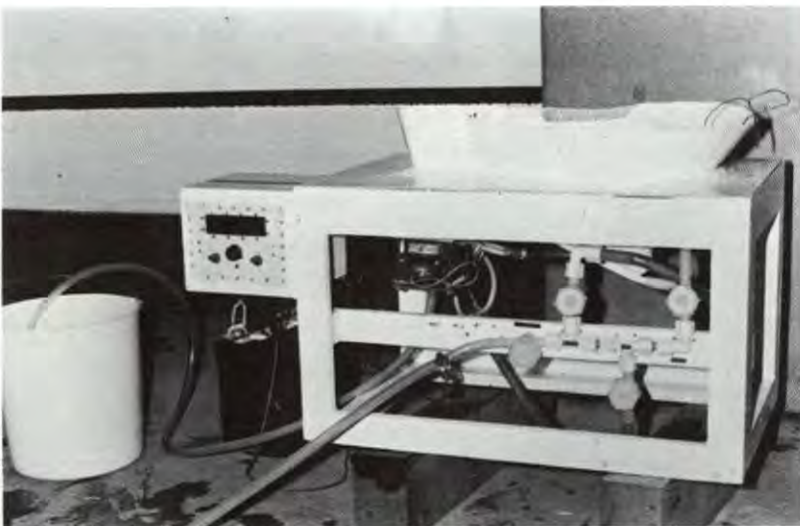


Plate 35.
Egg counter at the
Robertson Creek
Hatchery.

The instrument has two significant features:

- (a) the risk of electric shock has been eliminated by powering the electronics from a 12-volt battery; and
- (b) under-counting of eggs is prevented by a hydraulic system that spaces the photo-transistor counting cell.

3. Counting Strip

In July the first installation of a new counting panel was made on the Atnarko River (Figure 11). The light-weight aluminum panels, due to their shape, are forced onto the river bottom by the water flow over them. Alignment is maintained by fastening the panels to a heavy chain laid across the river and anchored at each bank. The panels provided a good background for fish counting and the assembly was easily removed at the end of the season.

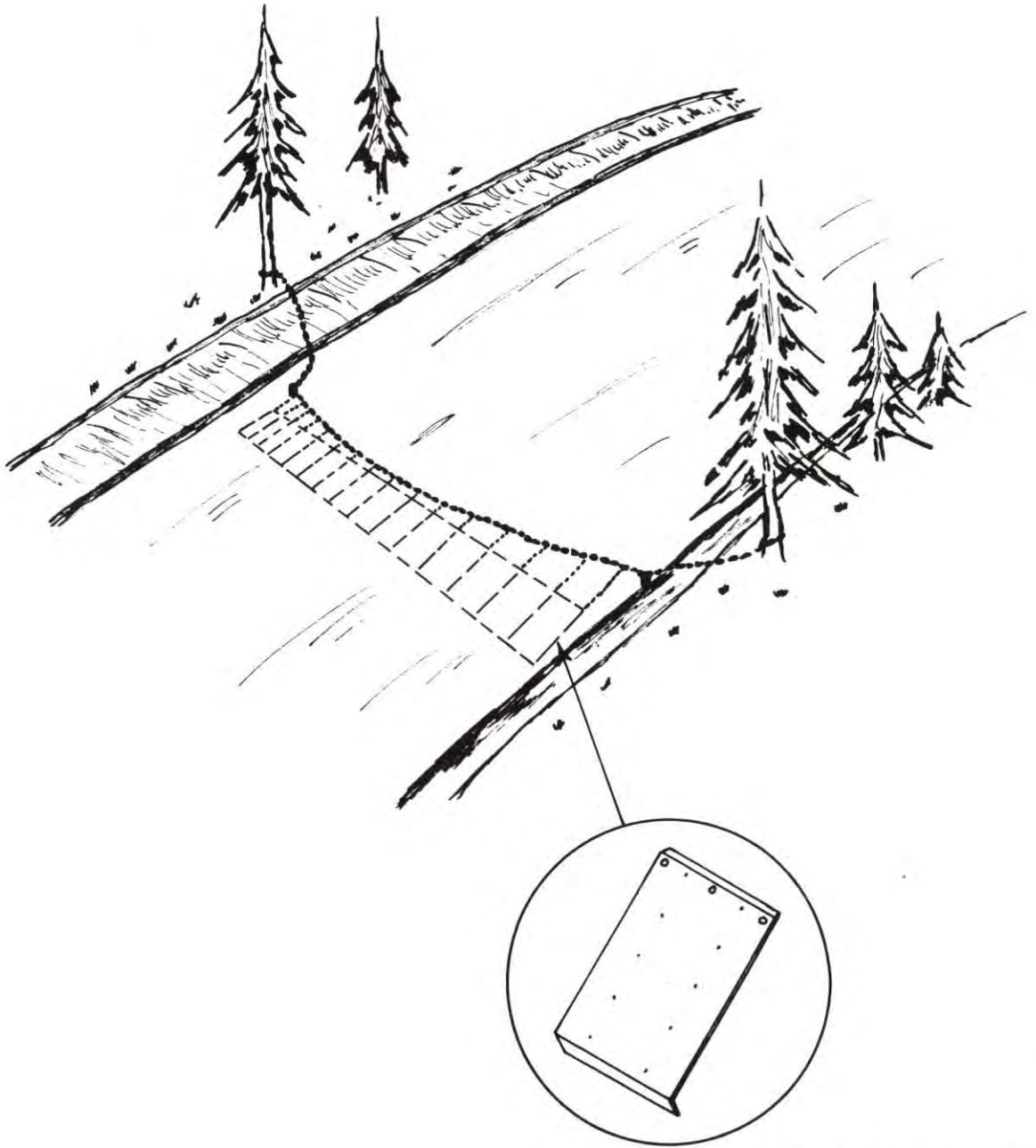
A smaller number of panels was also successfully used in the Yukon. The success of the panel and the high transportation costs in the Yukon warrant further development of an even lighter panel.

4. Small Format Aerial Photography

An unsuccessful attempt was made to record chum salmon spawners in the Fishing Branch, a tributary of the Porcupine River in northern Yukon Territory, through small format aerial photography. While the Alaskans use the technique for counting sockeye salmon, in this location the chum salmon were almost the same colour as the river gravel. Photography may work under favourable conditions for fish counting but the more promising application demonstrated was for stream inventory. The cost of finished colour film strip is 50 to 80 cents per mile plus aircraft and personnel. All controls and power supplies for this project were produced in Fisheries Service workshops.

5. Echo Counter

Echo sounder enumeration of fish stocks has been automated by the development of an echo counter (Plate 36). This device is intended for use with fish stocks which can be resolved by the sounder as individual targets. The device is adjustable so that it "counts" only those targets which are above a preset minimum size and within a depth range selected by the operator. The device will reject electrical noise, and bottom echoes. The "count" produced by the unit is corrected for the change in area of the sound cone with depth and is printed out at a preset interval, or on command.



TYPICAL PANEL (2'-0" X 3'-9")

Figure 11. Atnarko River aluminum counting panels.

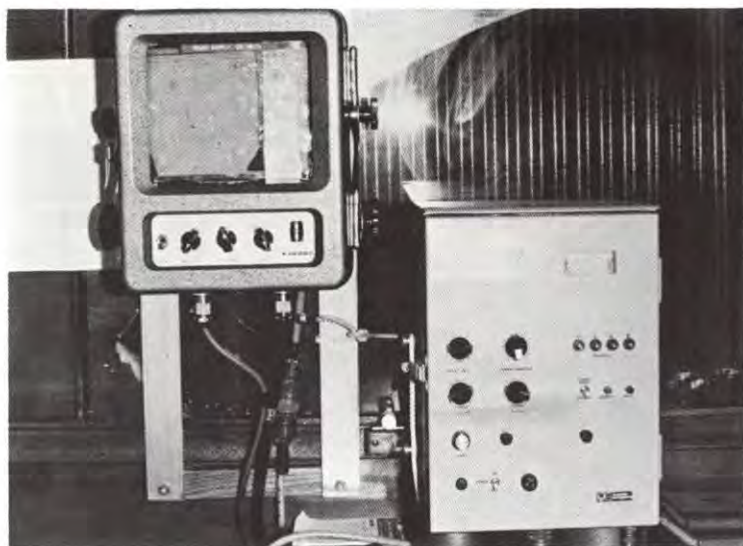


Plate 36.
Echo counter and modified
Furuno FM21 echo sounder.

The echo counter was attached to the Furuno FM21 with a modified receiver and used in Rivers Inlet in 1972. The correlation between the corrected visual counts made from the echo sounder tapes and the electronic echo counter was better than 80 percent.

6. Echo Sounder T.V.G.

A Furuno FM21 50 KHz echo sounder has been modified so that a target in the center of the sound beam will make a mark of the same darkness on the echo sounder tape regardless of the target depth (between 2 and 40 fathoms). This modification also makes the effective shape of the sound beam or "detection volume" conical within these depth limits. As a result, the characteristic inverted "V" produced by fish increases in width as the fish's depth increases (Plate 37).

The Time Varied Gain is applied to the sounder's receiver instead of the STC (Sensitivity Time Control) provided by the manufacturer. This modification permits the operator to make a reasonable estimate of target size without having to attempt a difficult mental correction for target depth and sounder performance.



Plate 37.
Series of identical
targets displayed on
Furuno FM21 0 to 27
fathom scale.

7. Water Level Alarm and Communications - Robertson Creek Hatchery

An alarm to sense low water level in the hatchery trays has been designed and installed at Robertson Creek Hatchery.

The design is fail-safe so will continue to function during power failures and provide an alarm in the technician's or caretaker's residence.

Communication between the fish trap at Stamp Falls and Robertson Creek was provided at a low cost with GRS radios.

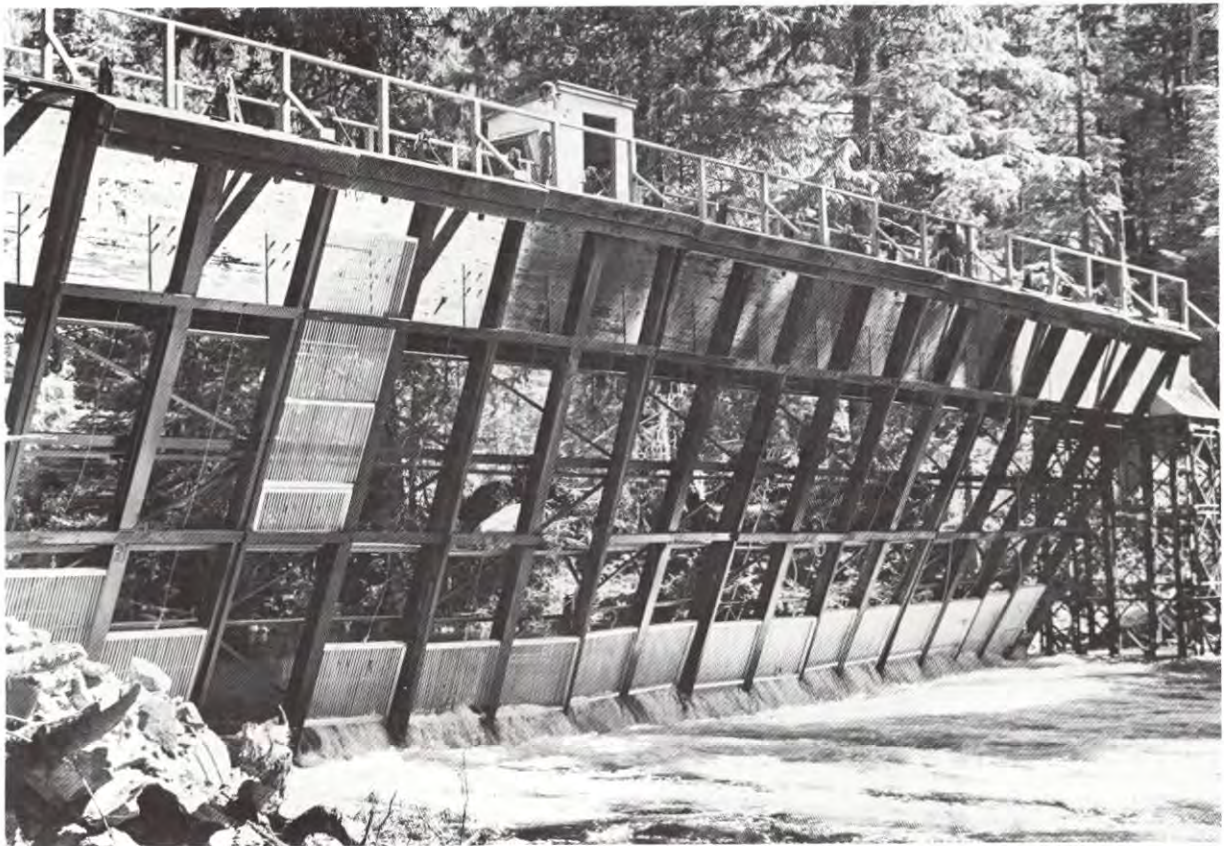
A surplus 40-foot tower was erected at the hatchery for this system. Good communications were available at almost all points on the route between the falls and the hatchery.

D. Engineering Projects, Studies and Maintenance

1. Projects

a. Docee River counting fence

Construction of the Docee River counting fence in Smith Inlet started January 4, 1972, following two years of investigative work and design. As the site required that no permanent obstruction lie within the river bed, a clear span bridge with the fence panels suspended from the underside of it was used. Panels were designed to seat directly on the river bottom. Steel towers on reinforced concrete pads dowelled to bedrock were used for each pier and two 6'0" x 1'0" x 107'0" long glue laminated beams fitted with a steel horizontal truss were used for the bridge structure. Steel frames hinged on the underside of the downstream beam are both support and guide for the aluminum panels. A moveable counting strip provides the flexibility to accommodate rapid fluctuations in the river stage (Plate 38).



The only access to the site is by sea or air so the handling of the 60 tons of beams and panels required special attention. All materials were shipped by barge to Smith Inlet and through tidal rapids to Wyclees Lagoon. A caterpillar tractor with a logging arch and a logging trailer were used to transport the beams over the 1½ miles of corduroy road to Long Lake. The beams were then loaded onto four bridging floats, floated down the river to the site and skidded up inclined ramps on to the piers. The frames were also hoisted to the beams from the floats.

The fence was completed in time for the 1972 sockeye run. The operational flexibility of the panels and counting strips allow easy counting and because of the precision of the count the fishery can be managed with good results. It is feasible that in a single good year the \$180,000 cost could be realized in effective management and subsequent benefits to the commercial fishermen.

b. Prince Rupert Marine Station

The first contract in a series designed to update the facilities at the Northern Marine Station in Prince Rupert was instituted in 1972.

The site preparation was completed in March of 1972. It consisted of levelling the periphery of Seal Cove by drilling and blasting, and finishing the area with gravel to provide about one acre of usable land for boat storage and repairs.

c. Queen Charlotte City warehouse

A new warehouse at Queen Charlotte City was completed March 3, 1972. This 40 x 30 ft. building is designed to replace the warehouse space in the office trailer needed for expanded office requirements. It is large enough to accommodate storage and workshop facilities for use on the development programs for the Islands.

d. Upwelling incubation box construction

The early success of incubation boxes on Inches Creek in the Fraser Valley as a means of enhancement and restoration led to the preparation of a number of boxes for the Northern Operations Branch. Ten boxes were cut, painted and packaged for shipment to potential sites by the residents of Klemtu. Two boxes were subsequently brought to the Lower Mainland for installation at Blaney Creek, and the balance were shipped to Queen Charlotte City.

e. Babine Development Project - reservoir clearing

The final full scale cleanup operation for the Fulton reservoir was started in early August. The operations of past years concentrated on the main lake area leaving the flats at the head of the lake until this year. Working on the south shore, the debris was piled and burned in place using log skidders and a small bulldozer. The north shore, especially those areas open to the public, was cleared of all debris. Two specific areas were prepared for boat launching access. The operation was completed amid flurries of snow in late October. Remaining flotsam will be collected by standing booms for annual removal.

2. Studies

a. Washwash River

Biological-engineering studies were conducted on the Washwash River to document the nature of this river. A review of the history of this stream from reports and examination of aerial photographs has clarified the biological importance of this stream as well as its extensive hydraulic activity. The potential of the Washwash River was evaluated by onsite measures of the spawning area and substrate quality. The results of these studies indicate a short term program of annual stream maintenance pending the arrival of road access from Bella Coola.

b. Pallant Creek

Preliminary observations were made of properties adjacent to the creek as a proposed incubation box site. Site surveys and final cost estimates are pending.

3. Maintenance

a. Facilities

(i) Fishway

Only the Meziadin Fishway required some work this year. Due to the very unstable rock conditions, a large slab which threatened the structure was removed.

(ii) Spawning channels and associated properties

Fulton River

Activity of the pipeline slide once again required attention. Ground water pressures were relieved by a minimal amount of excavation. A large scale ditching project was completed to drain off all surface water in the area. Minor maintenance to Channel No. 1 intake was performed and an access trench for the adult migration was constructed in the lowest 100 yards of Channel No. 2. Valve inspection and repairs were conducted and the valves were repainted with epoxy type paint. Inspections revealed that all supply tunnels were in excellent condition. The cathodic protection for the pipeline was checked and found faulty. It will be replaced by a revised scheme during 1973. Minor road maintenance and building maintenance was necessary.

Flow control operations saw the highest annual discharge on record. An accumulation of debris at the regulating channel of Fulton Lake restricted the flows through the tunnel and it was necessary to open the low level gate on the dam for the first time since operations began in 1968. Discharges were held to 4800 cfs. Debris was removed during the summer months and a revised collection bin installed.

Pinkut Creek

No major works were undertaken during this year. The tunnel intake was cleared of collected gravels and debris. The tunnel was inspected and found to be in good condition. Due to the very high runoff last spring, large amounts of gravel were carried down the stream and lodged along the left bank of the river in the vicinity of the fence. These materials were removed to allow full operation of the fence in the spring of 1973 and to provide a larger spawning area.

b. Residences and properties

No maintenance work was undertaken in 1972.

4. Stream Clearance and Improvements

Routine stream clearance projects undertaken during the year included the removal of log jams, beaver dams and forest debris on the following creeks and rivers: La Hou River

(Pearl Harbour) Area 4; Bear River (Stewart, B.C.) Area 3;
Kumealon River (north Grenville Channel) Area 5; MacLeod Creek
(Meziadin Lake) Area 3; Hanna Creek (Meziadin Lake) Area 3;
Skunsnat River (Kispiox River tributary) Area 4; Station Creek
(tributary to Bulkley River) Area 4; Honna River (Queen Charlotte
Islands) Area 2E.

VI. ECONOMICS AND SOCIOLOGY UNIT

A number of major studies and programs were undertaken by the Economics and Sociology Unit, Northern Operations Branch, during 1972. A brief general description of each program is provided in this section of the Annual Report.

A. Socio-Economic Values of Sport Fisheries

1. British Columbian Sport Fishermen

The major work published by the Economics and Sociology Unit in 1972 was The British Columbian Sport Fishermen. This report is based on a series of surveys conducted during the summers of 1970 and 1971. The British Columbian Sport Fishermen provides an overall view of British Columbia's recreational fishery and presents a profile of the people who use it. Income, age and occupational categories were used to gain an understanding of the type of individual who participates in the sport fishery. The study's findings indicated that sport fishing is held in high regard by both resident and non-resident anglers alike. Fishing was also held in high esteem when compared with other recreational pursuits available to fishermen.

2. Effects of Proposed Kemano Phase II Power Development on Sport Fishermen

In an effort to evaluate the sociological and economic impact of the proposed Kemano Phase II power development, a major sport fish survey was conducted on waterways that will be affected by this project. An establishment questionnaire was used to estimate the number of jobs and the income created by sport fishing in the area. Shoreline and campsite interviews provided an estimation of the total anglers in the area, the total expenditures by these anglers and the total expenditures that were attributable to sport fishing. Further, socio-economic evaluations of the commercial and Indian food fisheries were also undertaken. The results of this study will be available in published form in the spring of 1973.

3. Yukon Sport Fishery

Also during this year two major studies on the Yukon were undertaken, both of which will be published in the spring of 1973. One report, entitled The Socio-Economic Value of the Yukon Sport Fishery, is an indepth study of the Yukon sport fishery utilizing a mailed questionnaire which was sent to five percent of

those purchasing sport fish licences in 1971. The study attempts to develop economic values pertaining to this fishery. Sport fishing is shown to be an important recreational activity which makes a significant contribution to the Yukon economy. The socio-economic characteristics of Yukon sport fishermen were also examined in this report. Both the average expenditure per angler-day and the capitalized value of sport fishing to the year 2000 were estimated. This report emphasizes the importance of sport fishing to the Yukon and should provide valuable assistance for resource managers.



Plate 39. Interview of a non-Canadian sport fisherman from Nevada at Kwinitza on the Skeena River, July 18, 1972.

B. Review of the Commercial, Sport and Subsistence Fisheries of the Yukon

An overview of the commercial, the sport and the subsistence fishery in the Yukon is presented in another report on the Yukon. This report is based on the results of a sport fish survey and various other data collected during the summer of 1972. Sport fishing was shown to be the most important and also the fishery with the highest potential for future growth. The commercial fishery, which is very small at present, has the potential for future growth. Whether or not this resource can be marketed profitably is still questionable. A large number of the Yukon's native people participate in a subsistence fishery. Although participation in this fishery is declining it is

expected to remain important to a significant number of Indians for many years. Both these reports provide necessary background information on the Yukon's fishery resources.

C. Socio-Economic Study of Northern Commercial Fishermen

A socio-economic study of the northern area commercial fishermen will be completed in the spring of 1973. The report uses data from the "Fishery Economic Survey - 1970". Characteristics of north coast commercial fishermen such as age, education, number of dependents, fishing experience, and fishing effort are studied in relation to earnings, location, gear type, etc. This study will provide necessary information so that the Fisheries Service can better understand the needs of north coast commercial fishermen.

D. Pulpmill and Power Development Studies

1. Projection of Economic Losses to Fisheries Resulting from the Proposed Houston Pulpmill

A report entitled An Assessment of the Effects on the Morice and Bulkley River Systems of a Pulpmill at Houston, B. C. was prepared jointly by the Environmental Quality Unit and the Economics and Sociology Unit. The economic portion of this report evaluates the potential loss to the commercial, sport and Indian food fisheries as a result of a pulpmill at Houston, B. C. Although the construction of this mill no longer seems likely in the near future, the report is still useful as an evaluation of the fishery resources on the Morice and Bulkley River systems.

2. Effects of the Proposed Aishihik River Power Development

An interim report was completed late in 1972 by engineers, biologists and economists from the Northern Operations Branch on the Fisheries Problems Associated with the Proposed Aishihik River Power Development. As part of this report the socio-economic benefits from the fishery resources on the effected waterways were evaluated. Data pertinent to the Aishihik power development was obtained from the two Yukon reports described above.

E. Fish Marketing Studies

Research into the future market potential of various fish products was carried out during 1972. It is felt that examining the future markets of west coast fish products is of extreme importance and additional marketing research likely will continue in the future.

F. Evaluation of the Resource Benefit System

During the summer and fall of 1972, both the Northern Operations Branch and Southern Operations Branch personnel were engaged in testing what is referred to as the RBU (Resource Benefit Unit) system. The Bulkley Valley - Morice River systems and Area 1 on the Queen Charlotte Islands were selected as test areas for the Northern Operations Branch. This system was designed to help managers set objectives in recreation and also to help field personnel assess the present status of their recreational business as it pertains to their areas. The system measured various quality factors such as catch success, crowdedness, remoteness, relative social or economic importance and accessibility. Further testing of the RBU system will be required before its worth and how it should be used may finally be determined.

VII. INSPECTION BRANCH WORK ON THE NORTHERN B. C. COAST

The Inspection Branch has responsibilities for a variety of functions in the Northern Operations Branch. The Branch regulates, advises, instructs and assists the fishing industry along with members of allied industries on construction and operational requirements of fish boats and fish processing plants. Assistance is provided through planning and development programs to improve fish processing techniques and the general quality of fish and fish products. The northern offices are located in the Federal Building at Prince Rupert (Appendix Table II).

A. Fish Inspection Laboratory

The Fish Inspection Laboratory in Prince Rupert is responsible for the bacteriological and organoleptical evaluation of fish and fish products to ensure compliance with regulations and standards set by our Department as well as by the Department of National Health and Welfare (Plate 40). Bacteriological examination of a variety of fish and shellfish products, plant water supplies, waste water, ice and a variety of other substances associated with fish processing are carried out on a routine basis. Investigations directed to improving the efficiency of analysis are carried out as necessary.



Plate 40. Development of improved analysis.
F. A. technique for salmonella.

B. Fish Facility and Product Inspection Programs

1. Inspection of Processing Establishments

The Branch maintains close surveillance over fish processing establishments such as canneries, filleting operations, freezing and cold storage facilities to ensure that the quality of landed fish is maintained until it reaches retail outlets (Plate 41).



Plate 41. Inspection of landed fish.

2. Inspection of Fish for Export and Imported Fish

The Branch also inspects all fish intended for export for glaze, evidence of dehydration or rancidity, safety and overall quality. Imports are also given the same close scrutiny.

3. Cold Storage Survey

Currently a survey is being conducted to determine fluctuations in storage temperatures associated with fish holding rooms and cold storages to test their compliance with regulations (Plate 42). It is hoped eventually that all cold storages will be able to meet minimum temperature requirements which will contribute to improvements in the storage of fish and fish products.



Plate 42. Cold storage survey.

C. Fish Spoilage, Defects and Quality Investigations

1. Taste Panels

Problems associated with fish spoilage and quality are given close study. Taste panels are conducted and results evaluated to determine the stages of spoilage, under normal conditions, and at given intervals. Consideration is being given to relating organoleptic evaluation with organic analysis so that the relationship between the two can be better understood.

2. Fish Defects

An intensive study on fish defects is now underway to assess the landed quality as well as the quality of processed fish in order to evaluate the product going to the consumer to determine

where improvements can best be made. Poor quality products affect the consumption of fish which results in loss of markets and revenue to the industry.

3. Fish Quality Studies

Methods to improve fish quality are continually being researched and recommendations are made to industry for implementation where applicable. Technical advice is also given to boat captains and crews in order to assist in improving the landed quality of fish.

D. Shellfish Monitoring Program

A close surveillance is maintained on the presence and levels of paralytic shellfish toxin in shellfish in the northern district. Officers of the Northern Operations Branch gather and submit clam samples every month to our laboratory where extractions are made, and mailed to Ottawa for bioassay. This enables the Department to keep industry and the public informed as to the safety of shellfish harvested on the coast of British Columbia.

E. Boat Inspection Program

The boat inspection program, which is an integral part of the salmon licence limitation program, has played a significant role in the past year's operations. Inspection staff have travelled from the Nass River to Smith and Rivers Inlets, and to the Queen Charlotte Islands in order to survey the fishing fleet. The Northern Operations Branch has done much to make this program a success (Plate 43).



Plate 43.
Boat inspection
program.

F. Summary

The efforts of the Inspection Branch on the northern coast have therefore been aimed at safeguarding public health and ensuring the production of high quality fish products through a program of inspection at various intervals from the time the fish is caught to its ultimate distribution.

APPENDIX TABLE I.

NORTHERN OPERATIONS BRANCH - STAFF
1972

J.R. MacLeod	Manager, Northern Operations Branch, 1090 West Pender Street, Vancouver 1, B.C.
Miss K. Glover	Secretary to Manager and Supervising Stenographer

Northern Operations Control Unit

J.W. Connor	Chief, Northern Operations Control Unit
-------------	--

Vancouver Staff

J.H. Ellis	Head of Licencing and Operations Section
Mrs. I. McCracken	Licencing
Mrs. L. McCaskill	Licencing
Miss M. Zelensky	Licencing
Mrs. J. Curry	Licencing
C.S. Woods	Head, Statistical Support Section
Miss B. Blake	Clerk, Statistical Support Section
J.O.L. Lake	Stream Inventory Research
Mrs. J. Lockhart	Stenographer
Miss E. Nolting	Stenographer

Prince Rupert

R.R. Mallory	Head, Northern Marine Services Station
J.F. Coates	Engineer I.C. Prince Rupert Marine Station
B.A. Leren	Shipwright
W. Kangas	Engine Fitter
M. McIntyre	Engine Fitter

Regulations Unit - Vancouver

G.T. McIndoe	Chief, Regulations Unit
Mrs. H. Vanstone	Clerk

...continued

Central Coastal Division

J.B. Hawley Chief, Central Coastal Division

Vancouver Staff

D.C. Schutz Senior Biologist
S. Hembrough Technician - Rivers Inlet Management
R. Boyd Biologist
B. Chernoff Technician - Rivers Inlet Biological
Studies
J.D.C. Holland¹ Senior Conservation Officer and
Regional Halibut Co-ordinator

District 6

J.A. MacKay Supervisor, Rivers Inlet and Smith
Inlet District, Dawson's Landing P.O.,
Rivers Inlet, B.C.
J.L. Broome Fishery Officer

District 7

E.R. Christiansen Supervisor, Kitimat District, Rm. 310,
450 Federal Bldg., City Centre,
Kitimat, B.C.
Miss J. MacDonald Clerk

Fishery Officers

P.C. Harvey Kitimat District Office
J.A. MacDonald Butedale-Kitimat Subdistrict (Area 6),
Kitimat District Office
D.D. Aurel Butedale-Kitimat Subdistrict (Area 6),
Kitimat District Office
B.T. Kurtz Bella Bella Subdistrict (Area 7),
Box 38, Bella Bella, B.C.
H. Gjaltema Bella Coola Subdistrict (Area 8),
Box 227, Bella Coola, B.C.
N.J. Lemmen Bella Coola Subdistrict (Area 8),
Box 227, Bella Coola, B.C.

North Coastal Division

R.N. Palmer Chief, North Coastal Division

Vancouver Staff

P.D. Murray² Biologist - Nass and Skeena
J.D. Buxton Senior Management Technician -
Skeena District
W.J. Haimes Technician - Skeena District
R.K. Kearns Babine Project Manager

¹Transferred to Environmental Quality Unit, Vancouver, B.C.

²Transferred to Ottawa headquarters; E.R. Zyblut - Biologist
(effective January, 1973).

I.A. MacLean	Project Technician I.C. Fulton River Project
C.A. Harrison	Project Technician I.C. Pinkut Creek Project
A. Stefanson	Project Technician - Babine Lake Enumeration Studies
Miss F.V. Dickson	Biologist - Queen Charlotte Islands District
G.A. Buxton	Senior Management Technician - Queen Charlotte Islands District

Babine Project Resident Staff

C.W. Somers	Fulton River Resident Technician, P.O. Box 9, Granisle, B.C.
J. Portka	Fulton River Assistant Technician
A. Finch	Pinkut Creek Resident Technician, P.O. Box 188, Burns Lake, B.C.
G. Minger	Pinkut Creek Assistant Technician

District 8

V.H.B. Giraud	Supervisor, Skeena District, Rm. 109, 417 Second Ave. W., Prince Rupert, B.C.
Mrs. E. Kitson	Clerk
Mrs. E. Landrath	Clerk

Fishery Officers

J.A. Kent ¹	Nass Subdistrict, Prince Rupert District Office
L.J. Gray	Nass Subdistrict, Prince Rupert District Office
L.S. Freeman	Lower Skeena Subdistrict, Prince Rupert District Office
G.K. Harper	Lower Skeena Subdistrict, Prince Rupert District Office
M.E. Bogart	Terrace-Lakelse Subdistrict, 4618 Lazelle Avenue, Terrace, B.C.
A.M. Groat	Babine-Morice Subdistrict, Box 578, Smithers, B.C.
D.N. Meyers	Babine-Morice Subdistrict, Box 578, Smithers, B.C.
L.B. Duke	Grenville-Principe Subdistrict, Prince Rupert District Office
L. Ottman	Grenville-Principe Subdistrict, Prince Rupert District Office
H. Lang	Sport Fish Officer, Prince Rupert District Office
W.H. Mackenzie	Skeena District, Prince Rupert District Office

¹ Transferred to Operations Unit, Vancouver, B.C.

District 9

J.D. McCulloch¹ A/Supervisor, Queen Charlotte Islands
District, Box 99, Queen Charlotte,
B.C.
Mrs. E. White Clerk

Fishery Officers

G.E. Scott East Coast Queen Charlotte Islands
Subdistrict, Sandspit, B.C.
J.D. McCulloch North Coast Queen Charlotte Islands
Subdistrict, Masset, B.C.
K.H. Hebron West Coast Queen Charlotte Islands
Subdistrict, Q.C.I. District Office
W.D. Pastuch Queen Charlotte Islands District,
Q.C.I. District Office

Northern British Columbia and Yukon Division

A. Gibson Chief, Northern B. C. and Yukon
Division

Vancouver Staff

C.E. Walker Senior Biologist
R.F. Brown Technician
J.E. Bryan Biologist I.C. Pipeline Studies
M. Elson Biologist I.C. A.L.U.R. Program

District 10

G.E. Jones Supervisor, Yukon District,
111 Federal Bldg., Whitehorse, Yukon
O.D. Sweitzer Fishery Officer, Yukon District
Office
P.J. Savoie Fishery Officer, Yukon District
Office
Mrs. E. Sutton Clerk

Economics and Sociology Unit - Vancouver

W.F. Sinclair Chief, Economics and Sociology Unit
Miss S. Walker Clerk
R.C. Bryan Economist

¹
Transferred to Port Alberni, Southern Operations Branch.

Technical Support Unit

F.E.A. Wood Chief, Technical Support Unit

Enhancement - Engineering

D.L. Deans Senior Engineer
A.C. Mitchell Engineer
W.J. Peterson Engineer
J.F.A. Beyer Technician - Surveys
W.E. Southgate Stream Clearance Foreman

Enhancement - Special Biology

R. Ginetz Enhancement Biologist

Technical Information and Development

P. Ryan I.C. Information and Development
A.J. Wiebe Electronics Technician
G.B. Hunter Electronics Technician - Communications
D. Harding Biologist - Information
K.A. Petersen¹ Biological Technician - Technical Data
Miss P. Christie Technician - Fish Scale Laboratory
Miss M. Haugen Information
Miss S. Dyck Computer Applications & Data Analysis
Specialist

Environmental Quality Unit

W.J. Schouwenburg Chief, Environmental Quality Unit
R.H. Kussat Senior Biologist I.C. Resource Impact
Studies
R. Higgins Biologist - Resource Impact Studies
B.C. Lawley Technician - Resource Impact Studies
R.A. McIndoe Technician - Resource Impact Studies
M.G. Jones Technician - Resource Impact Studies
W.D. Knapp Technician - Resource Impact Studies
J.W. Davidson Technician I.C. Cypress Creek
Laboratory, 4160 S.W. Marine Drive,
West Vancouver, B.C.
Miss L. Martin Lab Technician - Cypress Creek
Mrs. E. McGown Lab Technician - Cypress Creek
K. Kupka Senior Engineer I.C. Energy Studies
R.A. Robertson Engineer - Energy Studies
R. Eliassen Technician - Energy Studies
K. Johansen Technician - Energy Studies
I. Stout Technician I.C. Physical Problems
(screens, bridges, etc.)

¹ Transferred to Robertson Creek Hatchery, Southern Operations
Branch.

Northern Marine Services - Vessels and Crews

District 6

Falcon Rock L. Nilssen
 D.C. Collison

District 7

Babine Post R. Skog
 R. Paziuk
Gale Rock J.M. Lewis
North Rock J. Gosse
Surge Rock W. Zitzewitz
Temple Rock H.W. Veelbehr
 K. Delaney

District 8

Beaver Rock A.L. Swim
 W. Bosas
 S. McKenna
Cutter Rock A.W. Wylie
 A.W. MacDonald
Petrel Rock R.L. Newton
Thrasher Rock J. Reynolds

District 9

Arrow Post R.M. Kinnie
 A. Moody
 C.J. Gladstone
 A. Kereluk
Pillar Rock H.H. Connor
 R. Crist
 C.J. Webster
Sooke Post K.R. Harley
 P. Lloyd
 T. Squires
 G.O. Tompkins
Relief A B.R. Murray
 J. Seigler
 R.E. Beard
Relief B C.A. Casey

APPENDIX TABLE II.

NORTHERN INSPECTION BRANCH STAFF
1972

Prince Rupert Inspection Laboratory, Room 109,
417 Second Avenue West, Prince Rupert,
B.C.

Northern Inspection Supervisor - T.J. Perry

Technical Officers

M.G. Dacy
C.D. Kelland
L. Limpus
C. MacRae
D. Paterson
J. Pynn
R.I. Thornber

APPENDIX TABLE III.

PUBLICATIONS
1972

A. Manuscript Reports

- 1972 - 1 KUSSAT, R.H., JONES, M. and LAWLEY, B. A cursory evaluation of the deeplake tailings disposal system at Cominco's Benson Lake operation. January, 1972.
- 2 SLOAN, JOHN P. Statistical analysis of some preliminary data on effects of logging on the Sheemahant Basin of Owikeno Lake. April, 1972.
- 3 HEIZER, S.R. and ARGUE, A.W. Basic tag and recovery information for coho and chinook taggings conducted in the Strait of Georgia and Johnstone Strait in 1970 and 1971. September, 1972.
- 4 VROOM, P.S. Publications List, Environment Canada - Fisheries Service, Pacific Region. July, 1972.
- 5 BOURQUE, S.C. and PITRE, K.R. Tag and recovery information for coho and chinook tagged off the lower west coast of Vancouver Island in 1969 and 1971. July, 1972.
- 6 GRAHAM, C.C. and ARGUE, A.W. Basic data on Pacific salmon stomach contents, size, catch and effort for 1967 and 1968 test trolling catches in Juan de Fuca Strait, B. C. December, 1972.

B. Technical Reports

- 1972 - 1 PALMER, R.N. Fraser River chum salmon. May, 1972.
- 2 LEMMEN, N.J. The non-tidal sport fisheries of the Skeena and Nass Rivers in 1969 and 1970. February, 1972.
- 3 ARGUE, A.W. and PITRE, K.R. Distribution of commercial and sport vessels fishing Pacific salmon in southern British Columbia marine waters, based on overflights from 1965 to 1971. May, 1972.
- 4 ZYBLUT, E.R. The 1972 report on the even-year pink salmon stocks of the Johnstone Strait study area. May, 1972.

- 5 RYAN, P. Scale reading equipment. May, 1972 (type-script).
- 6 HEBERT, G.W. and KUSSAT, R.H. A laboratory evaluation of the toxicity of certain oils and chemical dispersants to juvenile coho salmon and staghorn sculpins. June, 1972.
- 7 BOURQUE, S.C. and PITRE, K.R. Size and maturity of troll chinook salmon (Oncorhynchus tshawytscha) caught off the west coast of Vancouver Island in 1969 and 1970. June, 1972.
- 8 GINETZ, R.M.J. Some factors affecting rainbow trout (Salmo gairdneri) predation on migrant sockeye salmon (Oncorhynchus nerka) fry. June, 1972.
- 9 ZYBLUT, E.R. The 1972 report on chum salmon stocks of the Johnstone Strait - Fraser River study area. September, 1972.
- 10 GINETZ, R.M.J. Sockeye egg-to-fry mortality in the Fulton River spawning channels. July, 1972.
- 11 HUMPHREYS, R.D. and WEBB, L.A. The abundance of herring spawn in the coastal waters of British Columbia. September, 1972.
- 12 GOODMAN, D. and VROOM, P.R. Investigations into fish utilization of the inner estuary of the Squamish River. October, 1972.
- 13 DICKSON, F.V., BUXTON, G.A. and ALLEN, B. Propagation and harvesting of herring spawn on kelp. December, 1972.

C. Economics and Sociology Unit Reports

SINCLAIR, WILLIAM F. Statement on future market potential for Pacific coast salmon. (Internal Report) May, 1972.

SINCLAIR, WILLIAM F. The British Columbian Sport Fishermen. July, 1972.

1975 Smalts - 89 million