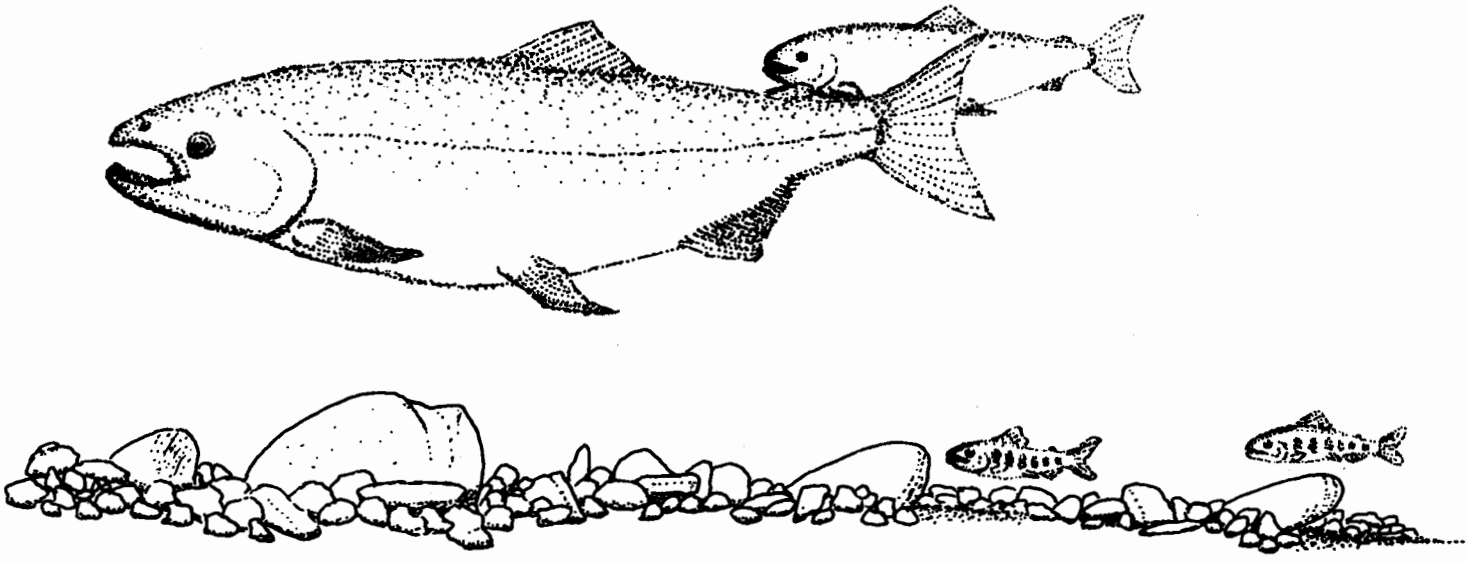
U. S. Fish and Wildlife Service
Fisheries Assistance Office
Olympia, Washington

and

Makah Tribe
Neah Bay, Washington

DISTRIBUTION AND ABUNDANCE OF JUVENILE SALMONIDS IN CLALLAM BAY AND NEAH BAY, WASHINGTON

May, 1985



UNITED STATES DEPARTMENT OF THE INTERIOR
Fisheries Assistance Office
U.S. Fish and Wildlife Service
Olympia, Washington

and

MAKAH TRIBAL COUNCIL
Neah Bay, Washington

DISTRIBUTION AND ABUNDANCE OF JUVENILE SALMONIDS IN CLALLAM BAY AND NEAH BAY, WASHINGTON

May, 1985

Prepared for

Seattle District
U.S. Army Corps of Engineers

by

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ABSTRACT

Fish were sampled in the intertidal and nearshore neritic zones of Clallam and Neah bays. Sampling was conducted at approximately two week intervals between May and August, 1984. Distribution, relative abundance, and timing of salmonids were described. Presence and relative abundance of non-salmonids were also noted.

Juvenile chum, pink, coho and chinook salmon utilized intertidal areas of Clallam Bay while chinook, pink and chum utilized the deeper neritic areas. These species utilized Clallam Bay throughout the sampling period. Peak abundances generally occurred during late June and early July.

Non-salmonid baitfish were also present in Clallam Bay throughout the study period. Surf smelt, sand lance, and small numbers of herring utilized the intertidal area while herring, sand lance and surf smelt predominated in the neritic zone.

Salmonid utilization of Neah Bay was much lower. Only very generalized observations could be drawn. Chinook, chum and pink utilized the bay but in very small numbers. Use of the deeper neritic area of the bay appeared to be somewhat greater than the intertidal area.

Baitfish utilization of Neah Bay was quite heavy. Herring, surf smelt and sand lance occurred in both intertidal and neritic zones. Herring were caught less frequently than surf smelt and sand lance, but in much greater numbers.

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INTRODUCTION

At the request of local sponsors, the U.S. Army Corps of Engineers, Seattle District, has initiated studies to determine the feasibility of proposed Federal navigation improvement projects at Neah Bay and Clallam Bay, Washington in the principal interest of improved safety and efficiency of waterborne commerce. These projects, requested by the Makah Tribe and the Port of Port Angeles are in response to perceived needs to facilitate the emerging salmon and bottom fish commercial fishing fleet at Neah Bay; the enhancing of forest products industry shipments (raw logs, chips, processed lumber); and the enhancing of a local harbor development program. The projects under study are a small boat basin and log channel at Neah Bay and a barge facility at Clallam Bay.

The environmental impacts to both Neah Bay and Clallam Bay caused by the construction of these projects could be significant in that water quality and habitat conditions could be markedly altered in the project areas. The changes in environmental quality could in turn adversely affect the fishery resources using the bays. For these reasons, the Corps requested baseline studies to document the salmonid usage of both Neah and Clallam bays. Specifically, the objectives of this study are as follows: a) determine the relative abundance of juvenile salmonid species utilizing the two project areas; b) describe their timing in the bays; c) assess their general distribution within the bays; and d) identify non-salmonids captured incidentally.

Description of Study Areas

Clallam Bay: Clallam Bay is located on the Olympic Peninsula, Clallam County, along the Strait of Juan de Fuca and about 25 miles (40 km) east of Neah Bay and 50 miles (80 km) west of Port Angeles (Figure 1). Most employment in the area is in the forest products or the fishing/tourism industries.

The Clallam River drains into Clallam Bay along the eastern shore (Figure 2) and supports anadromous runs of chinook (*Oncorhynchus tshawytscha*), coho (*O. kisutch*), and chum (*O. keta*) salmon plus steelhead trout (*Salmo gairdneri*). Hatchery-propogated coho, chinook and steelhead are planted into the river. A major recreational fishery, primarily focusing on Puget Sound-origin salmon stocks, operates within the bay itself and the Strait of Juan de Fuca. This fishery harvests chinook, coho, sockeye (*O. nerka*) and pink (*O. gorbuscha*) salmon during appropriate years (pink salmon are only available in odd-numbered years).

The Makah and Lower Elwha tribes operate a limited setnet fishery within the bay between Sekiu and Slip points during the summer and early fall. This fishery harvests predominantly mature chinook and coho salmon which pass through the mixed stock area while migrating to their natal streams. A summary of marine setnet catches in Area 5, which includes the Clallam Bay area, is presented in Table 1.

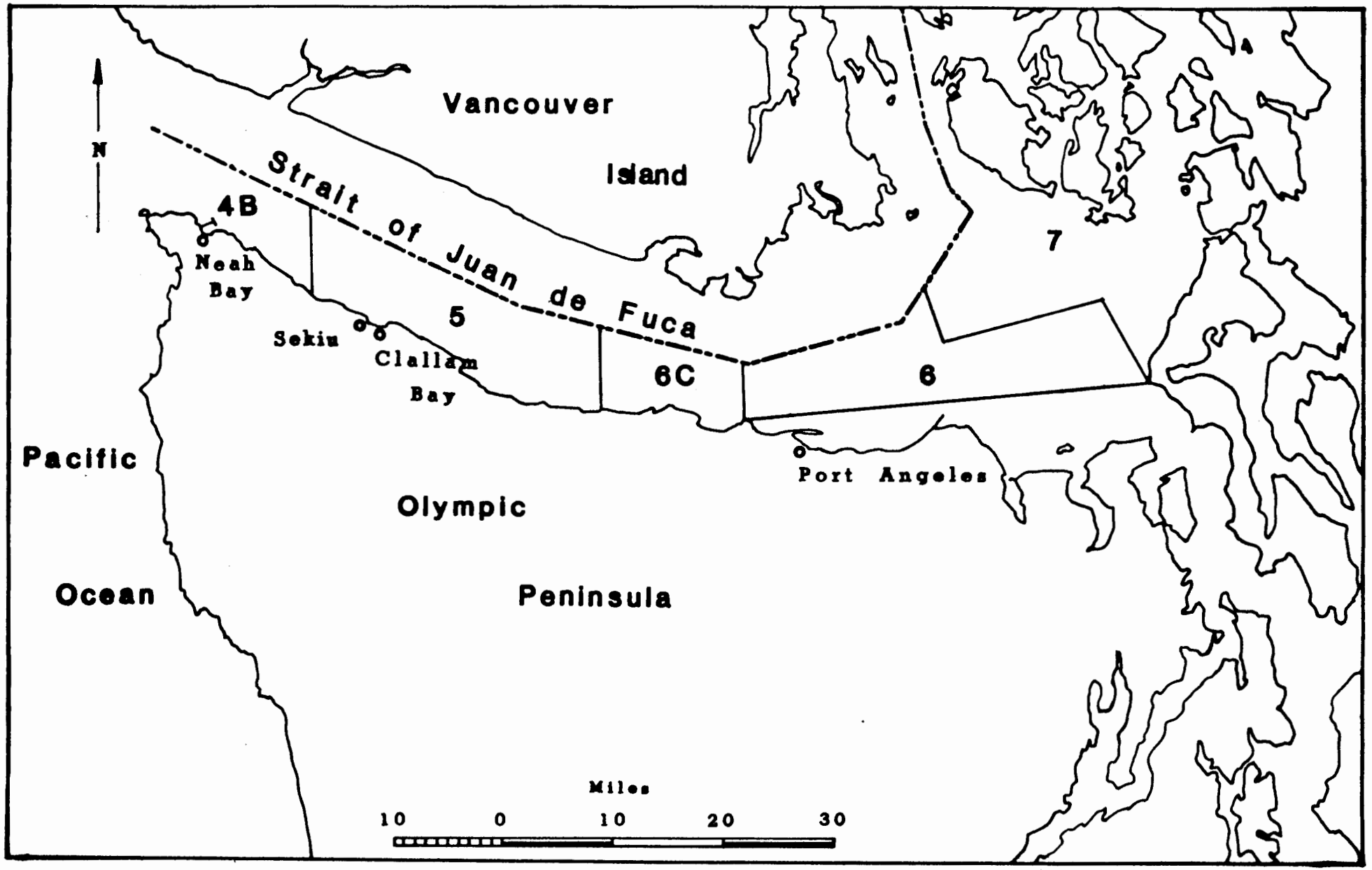

Figure 1. Northern Olympic Peninsula and proposed project sites in Clallam Bay and Neah Bay. Fishery management and catch reporting areas 4B, 5, 6C, 6 and 7 are also shown.

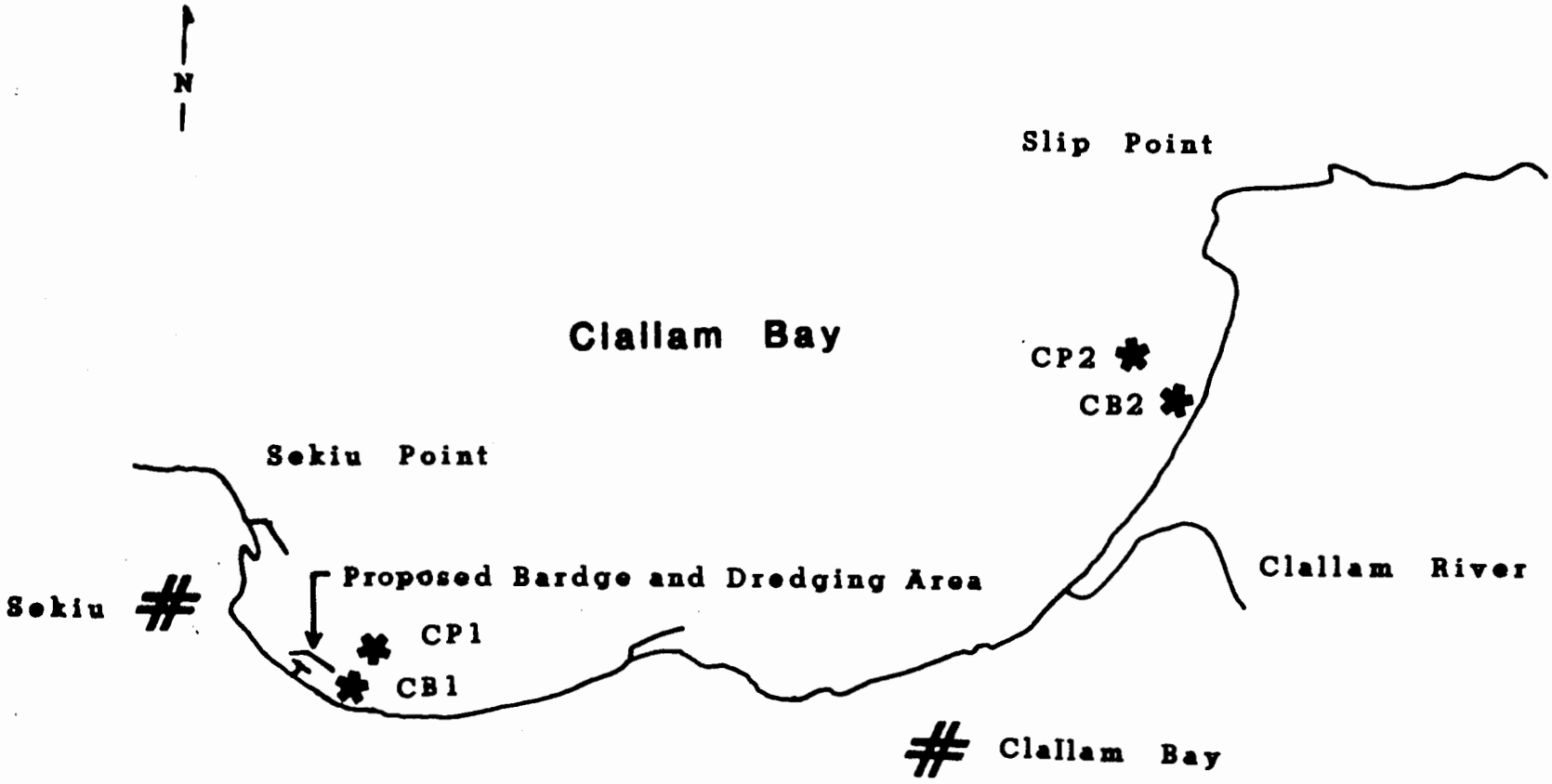

Figure 2. Clallam Bay and sampling locations.

Table 1. Marine setnet catches in Area 5.

Year	Chinook	Coho	Chum	Sockeye	Pink	Steelhead
1977	2,577	551	23	5	5	25
1978	2,109	251	19	5	-	9
1979	1,735	1,022	7	3	-	5
1980	3,674	370	19	1	-	1
1981	5,069	56	2	2	-	9
1982	989	12	1	1	-	1
1983	4,102	753	2	-	-	-
Total	20,255	3,015	73	17	5	50
Average	2,894	431	10	2	1	7

Table 2. Marine setnet catch in Area 4B.

Year	Chinook	Coho	Chum	Sockeye	Pink	Steelhead
1977	3,044	418	-	3	6	-
1978	1,550	91	5	8	-	6
1979	908	155	1	-	-	-
1980	4,215	91	-	2	-	5
1981	3,872	99	-	2	4	25
1982	3,217	50	2	1	-	11
1983	6,495	1,115	-	-	-	1
Total	23,301	2,019	8	16	10	48
Average	3,329	288	1	2	1	7

Neah Bay: Neah Bay is located at the northwestern tip of the Olympic Peninsula, in Clallam County along the Strait of Juan de Fuca approximately 150 miles (250 km) west of Seattle and 75 miles (120 km) west of Port Angeles. The town of Neah Bay is the principal village of the Makah Indian Reservation which is about 44 square miles in area. Principal industries are fishing, forestry and tourism.

Navigational activity in Neah Bay centers around a commercial harbor for a growing tribal fleet, a non-treaty commercial salmon fishery and a developing groundfish fleet and processing plant (Steve Joner, personal communication). Neah Bay is a well-known sport fishing area and supports a salmon and bottom fish recreational fishery during the spring through fall months.

Although no major rivers drain into Neah Bay, several small streams, Agency, Half-Way and Village creeks, (Figure 3) support minor runs of coho and chum salmon plus steelhead trout. There is little allochthonous input of fresh water into the bay and summer flows in these creeks total less than one cubic foot per second during the summer months. Occasional plants of hatchery reared coho and chinook are made into these streams by the Makah Tribe. A small tribal setnet fishery operates within the bay and harvests adult salmon and steelhead migrating through the area. Table 2 presents setnet catches in all of Washington Department of Fisheries Catch Reporting Area 4B including Neah Bay but does not include marine drift net catches which are taken offshore in the Strait of Juan de Fuca.

Previous Studies

There have been limited studies of fish usage in Neah Bay and Clallam Bay. Studies by the MESA program (Cross et al, 1978; Miller et al, 1980; and Simenstad et al, 1977) focused primarily on demersal species using intertidal habitats rather than the species that would utilize the near-shore neritic zones. The sites studied included Neah Bay, Kydaka Beach (mouth of the Hoko River) and Slip Point (the north-eastern entrance to Clallam Bay). However, the purpose of the MESA studies was not to document juvenile salmonid presence or timing in the bays.

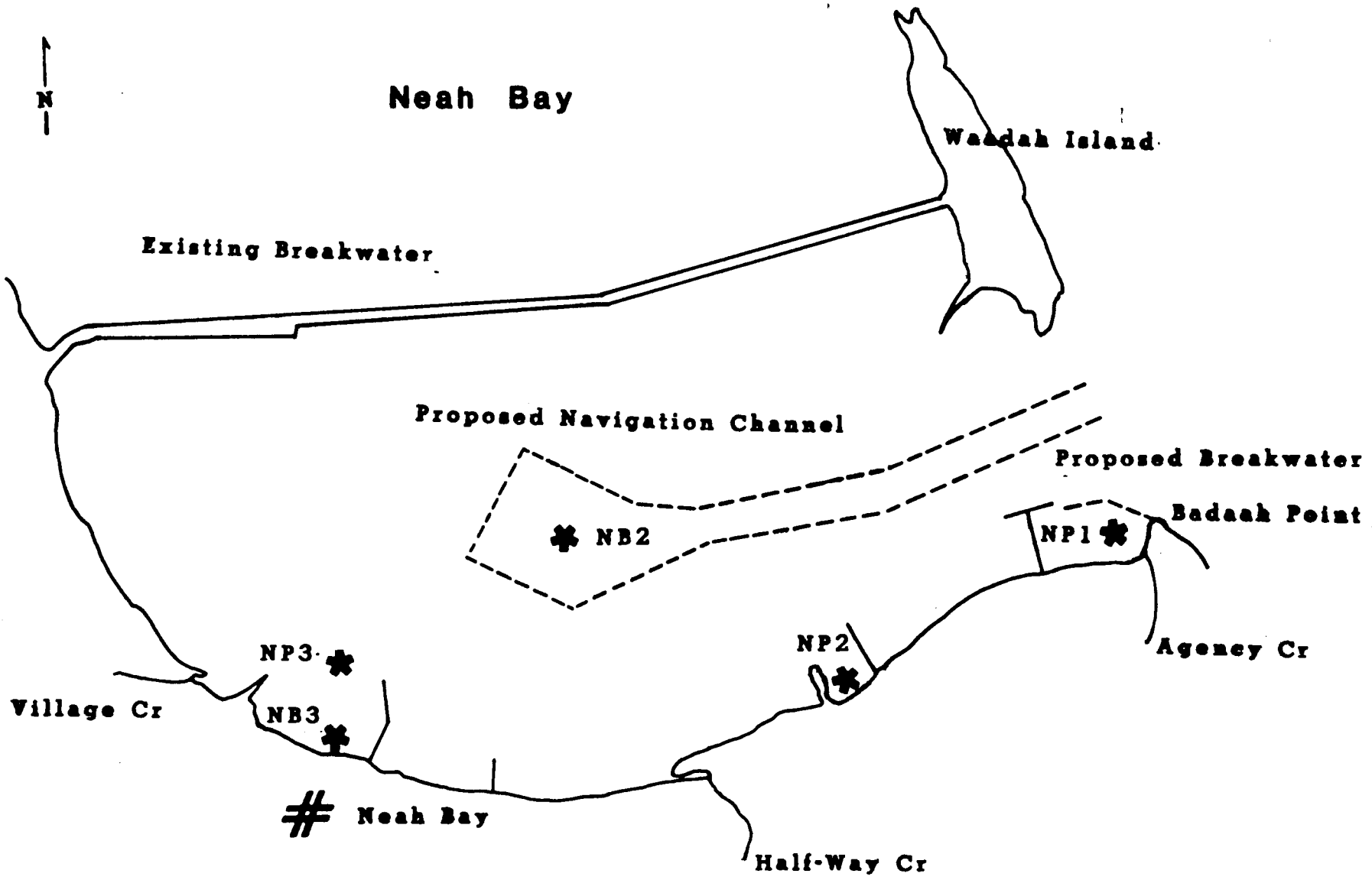

Figure 3. Neah Bay and sampling locations.

MATERIALS AND METHODS

Site Selection and Description of Sites

The proposed project sites in each bay were selected as a sampling location. In addition, another site was selected in a different area of the bay as a comparison in order to determine if there were differences in fish distribution. Sample sites are shown in Figures 2 and 3 for Clallam Bay and Neah Bay, respectively.

Fish populations in the nearshore intertidal area were sampled in both Clallam and Neah bays with a beach seine, 30.5 meters (m) in length and 3.0 m deep, with 6 mm mesh in the wings and 5 mm in the central panel. The use of this seine was limited to those areas with smooth bottoms. The purse seine was 61.0 m long, 2.1 m deep and 4.6 m deep in the bunt with 6 mm mesh throughout the net. This net was used to sample the nearshore neritic populations in both Neah Bay and Clallam Bay.

Sample sites were selected in Clallam Bay as follows:

CP1 -- Purse seine site directly offshore from the originally proposed project site (the proposed project site was later moved to another location a short distance to the north). The depth at this site was approximately 4.6 m at high tide. The bottom was composed of sand and some gravel. Moderate amounts of bull kelp (Nereocystis luetkeana) grew up in this area making it difficult to purse seine later in the summer.

CP2 -- Purse seine site two was located along the eastern shore of Clallam Bay. The high tide depth at this site was approximately 6.1 m. Little algal growth was evident.

CB1 -- Intertidal beach seine site number one was immediately south of the originally proposed project location. The bottom composition was primarily sand and small gravel. Some algae were present.

CB2 -- Intertidal beach seine site number two was located along the eastern shore of Clallam Bay. This site was near the mouth of the Clallam River. The substrate had a fairly steep slope and was composed of sand and small gravel. This site was exposed to the prevailing winds which occasionally created fairly heavy surf in the intertidal zone. These conditions probably reduced the efficiency of the sampling gear.

Sample sites were selected in Neah Bay as follows:

NP1 -- Purse seine site at the proposed marina site. The depth at this site was approximately 4.6 m at high tide and the bottom was composed of sand with patches of eelgrass (Zostera sp.) and sea lettuce (Ulva sp.).

NP2 -- Purse seine site number two was located northwest of NP1 in the proposed location of the navigation channel. The high tide depth at this site was approximately 7.6 m. The substrate was sand with no kelp present.

NP3 -- Purse seine site number three was located at the western end of Neah Bay. The depth at this site was about 4.6 m at high tide and the bottom was sand with moderate amounts of algae (primarily Fucus sp.). Algal growth became fairly heavy later in the summer and interfered with seining to some extent.

NB2 -- Intertidal beach seine site located directly west of the Coast Guard Station. Beach seining could not be conducted at the proposed marina location (would logically be designated NB1) because of riprap in the intertidal zone. This site (NB2) was the closest site available and was chosen to represent the fish populations in the intertidal zone in this portion of Neah Bay. The substrate at this site was composed of sand, pebbles and gravel. There was only a limited amount of algal growth.

NB3 -- Intertidal beach seine site at the western end of Neah Bay. This site had a sand bottom and a gently sloping beach. Algae was limited at this site.

Fish were collected from Clallam Bay and Neah Bay sites from May 2 through August 7, 1984. Beach seining was conducted at low tides. Purse seine sets were made at high tide. Two sets were made at each site with both gear types. Sampling occurred bi-weekly, with all samples in each bay taking one day. Sixteen sets were made at each site except the intertidal beach seine site along the eastern shore of Clallam Bay (CB2). Exposure to prevailing winds and heavy surf prevented effective sampling at this site on several occasions and only 13 sets could be completed.

All juvenile salmonids captured at a particular site were counted and the first 20 of each species were measured (fork length) to the nearest millimeter and released. Non-salmonid species were counted, or if their numbers were too great, their abundance was estimated and recorded. Daily catches are presented in the Appendix.

Some environmental data (weather, sea state, surface temperature, water clarity, and tidal stage) were collected, but there was little variability between sites. Weather was generally cloudy with moderate winds. Surface temperatures in both bays were similar, rising from the mid-forties to the mid-sixties over the summer. We did not note any trends between these data and fish catches.

RESULTS

Clallam Bay

Eighteen different species or taxonomic groups of fish were captured in beach seines and purse seines in Clallam Bay (Table 3). Four salmonid, four baitfish (herring, sand lance, surf smelt and anchovy) and a number of other recreational or commercially important species were caught. Species diversity was generally higher at the project site and in intertidal areas.

Salmonid Relative Abundance: Chum were the most frequently caught salmonid in the intertidal zone in Clallam Bay (Table 4). They occurred in 50% of the beach seine sets made at the project site (CB1), 31% of those made at the east end of Clallam Bay (CB2) and in 41% of all sets combined in Clallam Bay. Pinks were caught in a lower percentage of beach seine sets although the total catch of this species was greater than chum, chinook or coho. Chinook and coho occurred in the intertidal zone, but in relatively low numbers.

Chinook were the most commonly caught salmonids in the neritic zone at the project site (CP1) where they occurred in 31% of the purse seine sets (Table 5). They were not captured in the neritic zone at the comparison site (CP2) where the occurrence of salmonids was relatively rare. However, a catch of 193 pinks at this site on July 9 constituted the single largest catch of any salmonid in Clallam Bay by purse seine or beach seine. Only small numbers of chum and no coho were caught in the Clallam Bay neritic zone.

Salmonid Timing: Chinook appeared in the neritic zone of Clallam Bay in late May and were still present on the last day of sampling in early August (Figure 4). The peak catch/set occurred in late July. Timing patterns in the intertidal zone were less obvious. Chinook did not appear in beach seine catches until early June but were still present on the last day of sampling. They appeared to be present in greatest numbers in late June.

Chum were present in the nearshore areas of Clallam Bay when sampling with beach seines began in early May (Figure 5). Chum abundance peaked in mid-June and declined rapidly after this date. Occurrence of chum in the neritic zone was low. The few chum which were captured appeared in late July and early August when sampling was completed.

Pink were not captured in appreciable numbers in the intertidal zone until mid-June (Figure 6). Peak abundance occurred shortly after, in late June, and then declined. Pink abundance in the nearshore area increased on the last day of sampling. Occurrence of pink in the neritic zone, as indicated by purse seine catches, peaked in mid-July and then declined. There was no second increase in abundance similar to that seen in beach seine catches.

Table 3. Fish species caught in Clallam Bay with beach seines and purse seines, 1984.

Common Name	Scientific Name	Capture Sites
Pink salmon	Oncorhynchus gorbuscha	CB1, CB2, CP1, CP2
Chum salmon	Oncorhynchus keta	CB1, CB2, CP1, CP2
Chinook salmon	Oncorhynchus tshawytscha	CB1, CB2, CP1
Coho salmon	Oncorhynchus kisutch	CB1, CB2
True cod	Gadus macrocephalus	CB1
Sand lance	Ammodytes hexapterus	CB1, CB2, CP1, CP2
Blenny	Stichaeidae	CB1 CP1
Perch	Embiotocidae	CB1 CP1
Starry flounder	Platichthys stellatus	CB1, CB2
Flounder	Pleuronectidae	CB1 CP1, CP2
Greenling	Hexagrammidae	CB1 CP1
Sculpin	Cottidae	CB1, CB2
Irish Lord	Hemilepidotus	CB1
Herring	Clupea harengus	CB1, CB2, CP1
Surf smelt	Hypomesus pretiosus	CB1, CB2, CP1
Rockfish	Sebastes	CB1 CP1
Anchovy	Engraulis mordax	CB2
Bay pipefish	Syngnathus griseolineatus	CB2

Table 4. Total catch and percent of sets in which salmonids occurred (percent frequency of occurrence) in beach seine sets in Clallam Bay, 1984.

	Site					
	CB1		CB2		Total	
Species	Catch	%	Catch	%	Catch	%
Chinook	2	6	7	23	9	14
Chum	65	50	82	31	147	41
Pink	18	25	242	31	260	28
Coho	1	6	11	31	12	17
Total	86		342		428	

Table 5. Total catch and percent of sets in which salmonids occurred (percent frequency of occurrence) in purse seine sets in Clallam Bay, 1984.

	Site					
	CP1		CP2		Total	
Species	Catch	%	Catch	%	Catch	%
Chinook	25	31	0	--	25	16
Chum	6	13	2	6	8	9
Pink	27	19	193	6	220	13
Coho	0	--	0	--	0	--
Total	58		195		253	

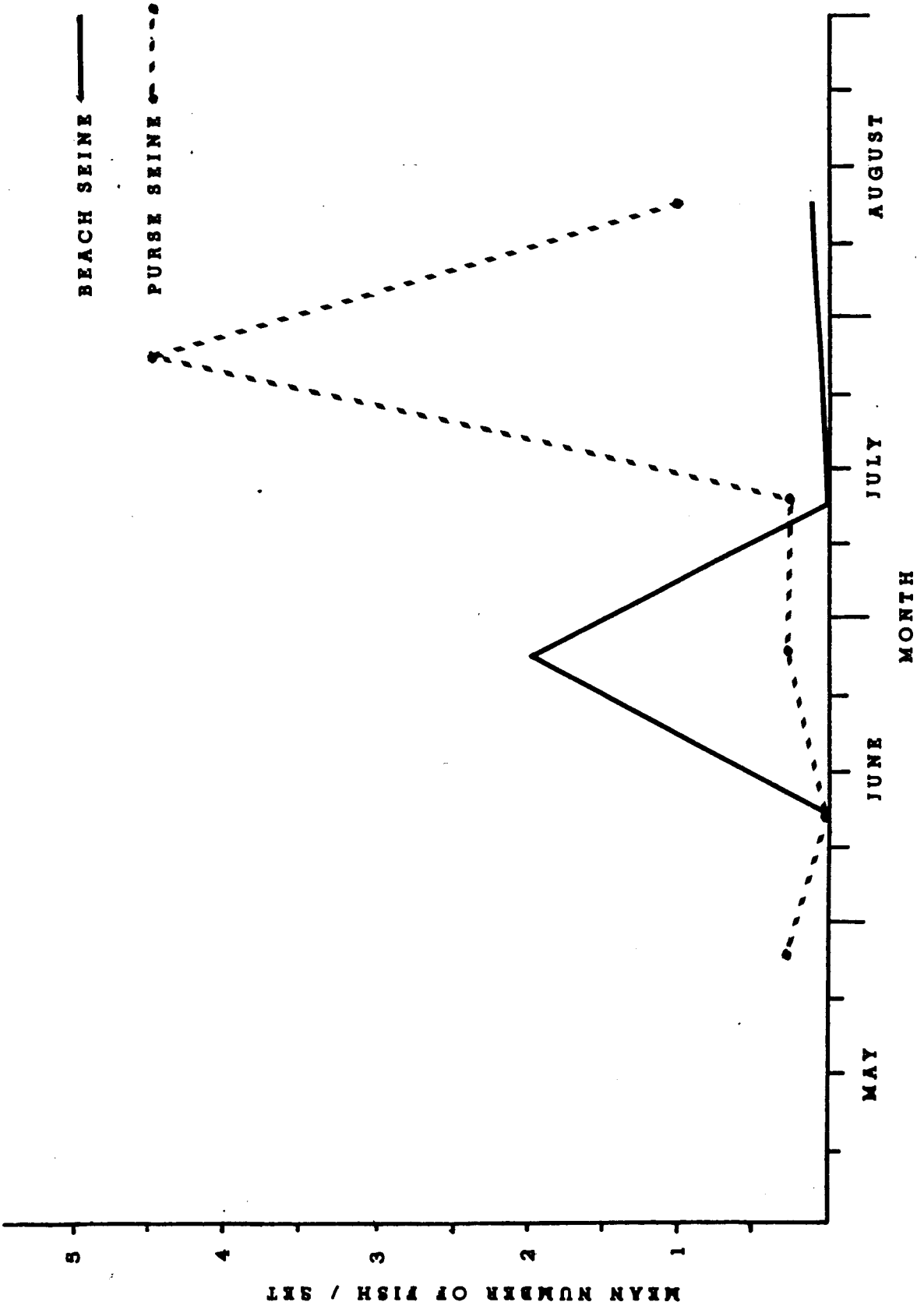

Figure 4. Mean number of chinook salmon caught per beach seine and purse seine set in Clallam Bay during May - August, 1984.

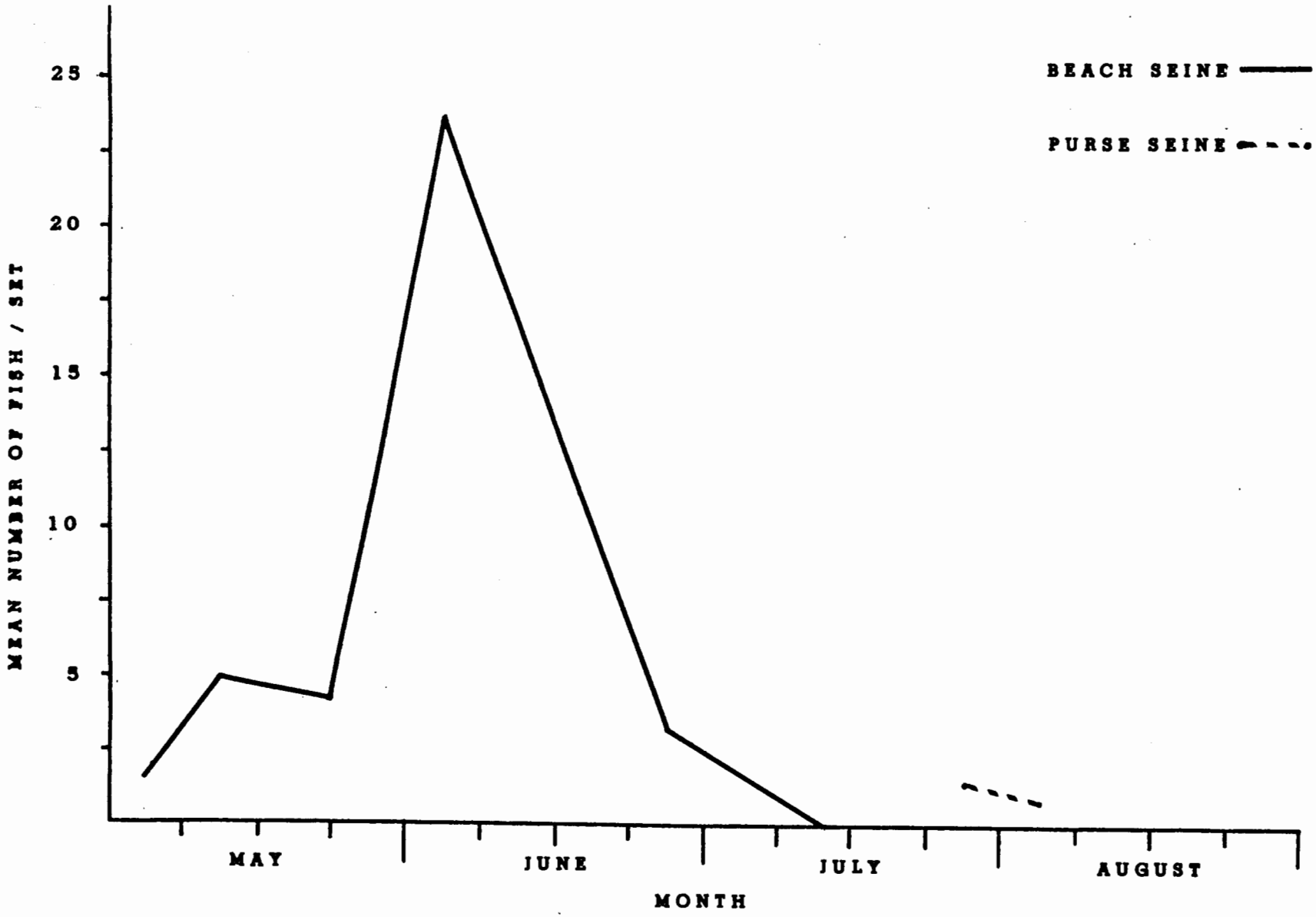

Figure 5. Mean number of chum salmon caught per beach seine and purse seine set in Clallam Bay during May - August, 1984.

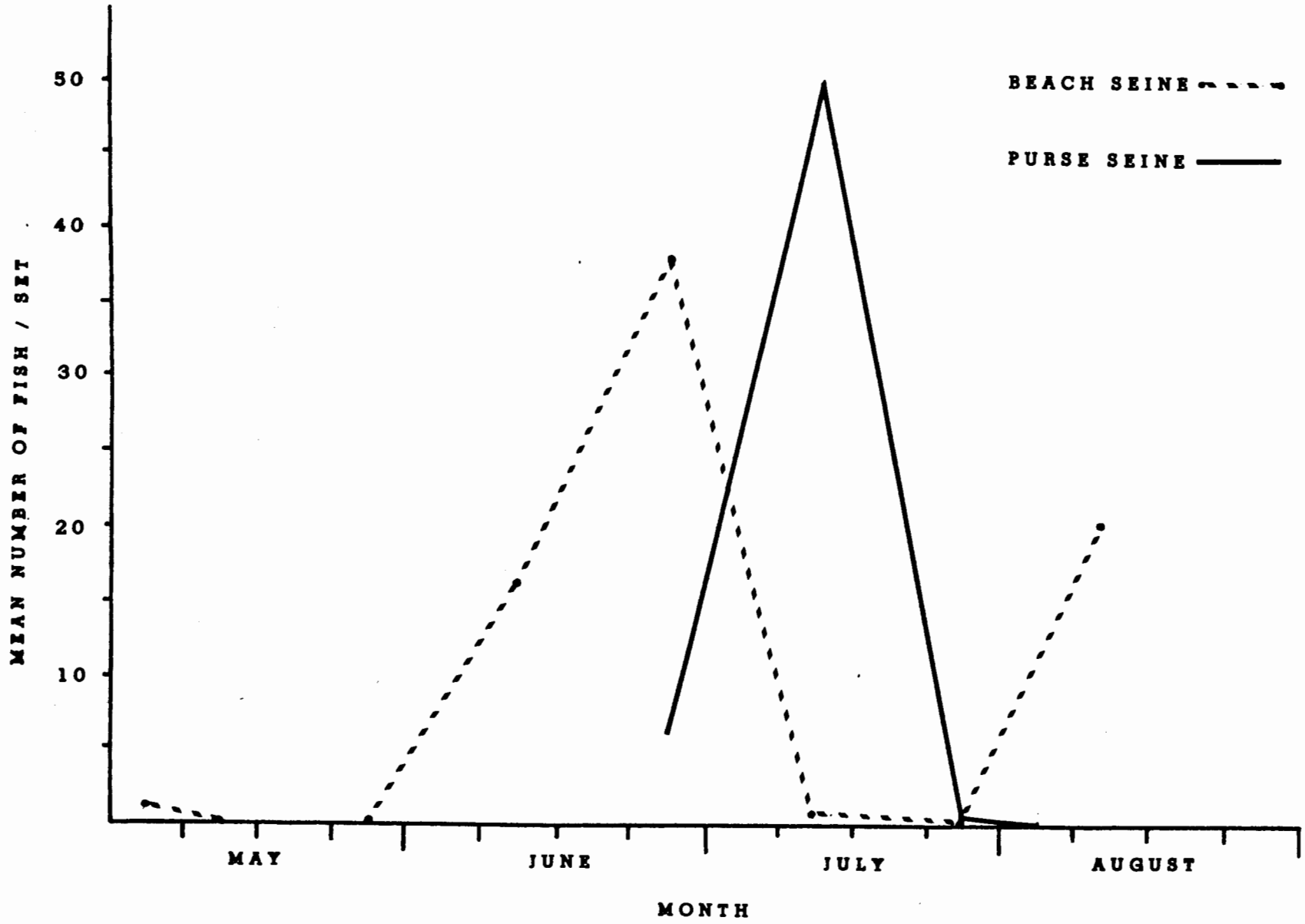

Figure 6. Mean number of pink salmon caught per beach seine and purse seine set in Clallam Bay during May - August, 1984.

Salmonid Distribution: Catches of chinook and coho in the intertidal zone were too small to draw any conclusions regarding distribution between the project and comparison sites. Catches of chum and pink were more consistent and appeared to provide some indication of greater use of the project site (CB1). Tables 6 and 7 display daily catch per set and the percentage of the total daily catch of chum and pink caught at each site, respectively. The average percent of the daily catch (over the entire season) of chum taken at CB1 was 68% while 32% was caught at CB2. The average percent of the daily catch of pinks was 54% at CB1 and 46% at CB2.

Catches in the neritic zone were too small to provide an evaluation of distribution between the two Clallam Bay sites. However, salmonids only occurred in purse seine sets at site CP2 on two occasions. They were noted in 10 sets at CP1.

Fish size probably influenced utilization of neritic and intertidal zones. Table 8 presents mean fork lengths for salmonids caught in beach seines and purse seines in Clallam Bay. The mean length of fish caught in purse seines was larger than those caught in beach seines. We also found an increase in size over time (Figure 7) for chum. This pattern was generally true with the other species.

Table 8. Mean fork length (millimeters) and standard deviation of juvenile salmonids captured in beach seines and purse seines in Clallam Bay, 1984.

	Beach Seine		Purse Seine	
Species	Mean	Standard Deviation	Mean	Standard Deviation
Chinook	127.1	64.83	133.4	16.02
Chum	72.3	17.37	106.5	10.86
Pink	83.8	8.68	96.7	15.86
Coho	104.4	6.29	--	--

Non-salmonids: Fourteen non-salmonid species or taxonomic groups were captured in Clallam Bay. The most common species in the intertidal zone were sand lance which occurred in 66% of the sets (Table 9). This species

Table 6. Daily chum catch/set and percent of the total daily catch which occurred in beach seine sets in Clallam Bay, 1984.

	Site			
	CB1		CB2	
Date	Catch/set	%	Catch/set	%
May 2	2.5	100	0	--
May 9	9.5	95	5	5
May 22	9.0	100	0	--
June 6	9.5	20	37.5	80
June 26	2	25	6	75
Mean %		68		32

Table 7. Daily pink catch/set and percent of the total daily catch which occurred in beach seine sets in Clallam Bay, 1984.

	Site			
	CB1		CB2	
Date	Catch/Set	%	Catch/Set	%
May 2	1.5	100	0	--
June 6	4	13	27.5	87
June 26	2.5	2	108	98
August 6	39.5	100	0	--
Mean %		54		46

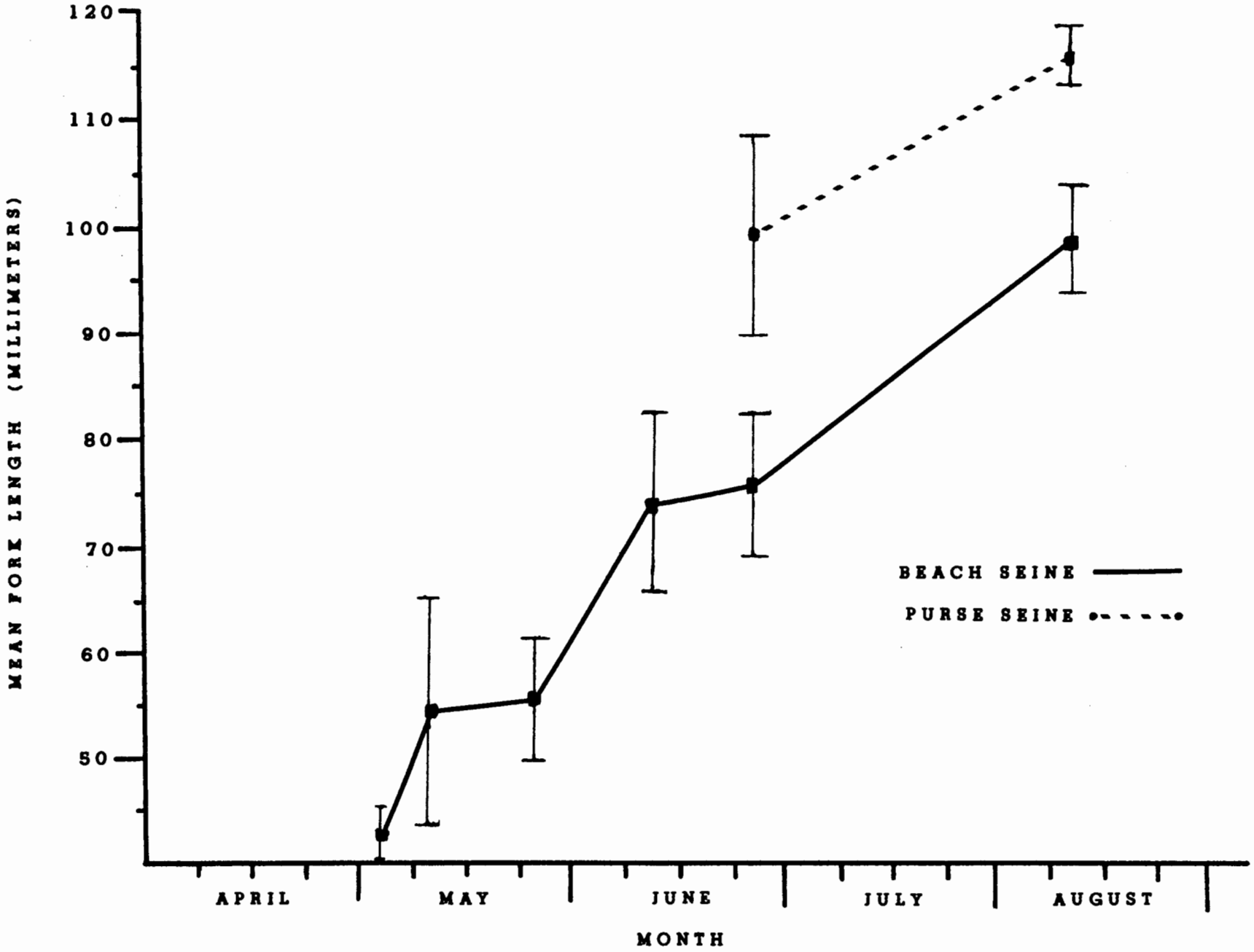

Figure 7. Mean fork length and one standard deviation for juvenile chum captured by beach seines and purse seines in Clallam Bay during May - August, 1984.

Table 9. Estimated total catch (rounded to the nearest thousand) and percent frequency of occurrence of the most commonly caught non-salmonids in beach seine catches in Clallam Bay, 1984. A (+) symbol indicates fish were caught but the total was less than 1,000.

	CB1		CB2		Total	
Species	No.	%	No.	%	No.	%
Sand lance	1,000	56	4,000	77	5,000	66
Surf smelt	13,000	56	+	23	13,000	41
Herring	+	7	+	7	+	7
Flounder	+	69	+	8	+	41

Table 10. Estimated total catch (rounded to the nearest thousand) and percent frequency of occurrence of the most commonly caught non-salmonids in purse seine catches in Clallam Bay, 1984. A (+) symbol indicates fish were caught but the total was less than 1,000.

	CP1		CP2		Total	
Species	No.	%	No.	%	No.	%
Sand lance	11,000	50	+	13	11,000	31
Surf smelt	4,000	19	0	--	4,000	9
Herring	55,000	38	0	--	55,000	19

was most abundant at site CB2. While surf smelt occurred in a lower percentage of sets, they were the most abundant non-salmonid in beach seine catches. This species was captured in greatest numbers at site CB1. Flounder were consistently caught in low numbers at site CB1.

The abundance of non-salmonids caught in the neritic zone was much greater than in intertidal areas and almost all of these fish were caught at site CP1 (Table 10). Sand lance were the most frequently caught species but herring were far more abundant.

The baitfish species were generally present in intertidal and neritic areas of Clallam Bay throughout this study. Their abundance appears to have peaked in late spring and early summer although the largest catch of surf smelt in the nearshore neritic zone (purse seines) occurred on the last day of sampling on August 8.

Neah Bay

Twenty species or taxonomic groups of fish were caught in beach seines and purse seines in Neah Bay (Table 11). Three salmonid, three baitfish, and 14 other species were captured. Species diversity was highest in beach seines and at the west end of the bay (NB3).

Salmonid Relative Abundance: Salmonids were caught in much lower numbers and frequency at Neah Bay in both beach and purse seine sets. Very small numbers of chinook, chum and pink were caught at Neah Bay intertidal sites (Table 12). There were no detectable differences in abundance between these species. Purse seine catches in the neritic zone were also very small except at one site (NP3) where chinook, chum and pink were each caught in 19% of all sets (Table 13). No coho were caught in beach seines or purse seines in Neah Bay.

Salmonid Timing: Salmonid catches in Neah Bay were too small to effectively describe timing in that area. Chinook did appear in the intertidal zone in late June and mid-July, chum were present in May and early June and pink were caught in mid-May, early June and mid-July. Appearance of these species in the neritic zone occurred slightly later with chum and chinook being caught in late June and late July. Pink were found in neritic purse seine catches in July.

Salmonid Distribution: No real patterns of distribution could be distinguished in Neah Bay. The only beach seine or purse seine site where any appreciable numbers were caught was the neritic site at the west end of Neah Bay (NP3).

The mean length of chinook, chum and pink caught in the neritic zone was larger than those captured in intertidal areas (Table 14).

Table 11. Fish species caught in Neah Bay with beach seines and purse seines, 1984.

Common Name	Scientific Name	Capture Sites
Chum salmon	Oncorhynchus keta	NB2, NP2, NP3
Pink salmon	Oncorhynchus gorbuscha	NB2, NB3, NP1 NP3
Chinook salmon	Oncorhynchus tshawytscha	NB2, NB3 NP2, NP3
Sand lance	Ammodytes hexapterus	NB2, NB3, NP1 NP3
Sailfish sculpin	Nautichthyes oculofasciatus	NB3
Sculpin	Cottidae	NB2, NB3
Snailfish	Cyclopteridae	NB2
Greenling	Hexagrammidae	NB2, NB3 NP3
Starry flounder	Platichthys stellatus	NB3
Flounder	Pleuronectidae	NB2, NB3, NP1 NP3
Blenny	Stichaeidae	NB2, NB3 NP3
Herring	Clupea harengus	NB2, NB3, NP1, NP2, NP3
Surf smelt	Hypomesus pretiosus	NB2, NB3, NP1, NP2, NP3
True cod	Gadus macrocephalus	NB2
Shiner perch	Cymatogaster aggregata	NB3
Perch	Embiotocidae	NB2, NB3
Bay pipefish	Syngnathus griseolineatus	NB3
Clingfish	Gobiesocidae	NB3
Rockfish	Sebastes	NP1
Poacher	Agonidae	NP2

Table 12. Total catch and percent of sets in which salmonids occurred (percent frequency of occurrence) in beach seine sets in Neah Bay, 1984.

	Site					
	NB2		NB3		Total	
Species	Catch	%	Catch	%	Catch	%
Chinook	1	6	1	6	2	6
Chum	3	19	0	--	3	9
Pink	1	6	2	13	3	9
Total	5		3		8	

Table 13. Total catch and percent of sets in which salmonids occurred (percent frequency of occurrence) in purse seine sets in Neah Bay, 1984.

	Site							
	NP1		NP2		NP3		Total	
Species	Catch	%	Catch	%	Catch	%	Catch	%
Chinook	0	--	3	6	15	19	18	13
Chum	0	--	1	6	9	19	10	13
Pink	2	13	0	--	13	19	15	13
Total	2		4		37		43	

Table 14. Mean fork length (millimeters) and standard deviation of juvenile salmonids captured in beach seines and purse seines in Neah Bay, 1984.

	Beach Seine		Purse Seine	
Species	Mean	Standard Deviation	Mean	Standard Deviation
Chinook	95.5	10.61	130.1	16.77
Chum	52.3	18.77	102.9	12.10
Pink	79.7	12.22	96.6	10.20

Non-salmonids: Seventeen non-salmonid species or taxonomic groups were captured in Neah Bay. The most commonly caught species in the intertidal zone were flounder and sand lance (Table 15). Although herring were captured with lower frequency than flounder, sand lance, or surf smelt, they occurred in very large numbers. Abundance was greatest at the west end of the bay (NB3).

Surf smelt and sand lance occurred with slightly greater frequency in the neritic zone than herring (Table 16). However, herring were, once again, far more abundant. Differences in abundance between neritic sites were less evident in Neah Bay.

Herring and sand lance were generally present in the intertidal and neritic zones of Neah Bay throughout this study. They appeared in greatest numbers during May and June with some large catches of herring occurring in July. Surf smelt appeared later and generally peaked in abundance during July and August.

Table 15. Estimated total catch (rounded to the nearest thousand) and percent frequency of occurrence of the most commonly caught non-salmonids in beach seine catches in Neah Bay, 1984. A (+) symbol indicates fish were caught but the total was less than 1,000.

	NB2		NB3		Total	
Species	No.	%	No.	%	No.	%
Sand lance	3,000	3	3,000	94	6,000	78
Surf smelt	+	44	6,000	64	6,000	53
Herring	3,000	38	120,000	25	123,000	31
Flounder	+	75	2,000	100	3,000	88

Table 16. Estimated total catch (rounded to the nearest thousand) and percent frequency of occurrence of the most commonly caught non-salmonids in purse seine catches in Neah Bay, 1984. A (+) symbol indicates fish were caught but the total was less than 1,000.

	NP1		NP2		NP3		Total	
Species	No.	%	No.	%	No.	%	No.	%
Surf smelt	+	13	+	13	5,000	50	5,000	25
Sand lance	+	25	0	--	1,000	50	1,000	25
Herring	52,000	13	50,000	13	17,000	44	119,000	23

DISCUSSION

Beach seine and purse seine sampling in Clallam Bay indicated use by four species of juvenile salmonids: chinook, chum, pink, and coho. Chum were the most commonly caught salmonid species in nearshore shallow areas followed by pink, coho and chinook. Chinook were the most commonly caught salmonid in the deeper neritic areas followed by pink and chum. No coho were caught in the neritic zone in Clallam Bay. Use of the nearshore areas by chum and pink agreed with findings from other studies along the Strait of Juan de Fuca and Puget Sound. We expected to find greater use of nearshore areas by chinook. However, the location of the study area is some distance from the major chinook producing rivers of Puget Sound and the fish sampled in this study may be predominantly larger migrants from these rivers. Their large size would partially explain their greater use of the neritic areas relative to the nearshore habitat.

Within Clallam Bay, there may have been somewhat greater use of the intertidal nearshore area at the project site (CB1) by pink and chum relative to the comparison site at the east end of the bay (CB2). Catches in the neritic zone were too small to assess distribution between the sites. However, there did appear to be more consistent use of the project site (CP1) relative to the east end of the bay (CP2). Protection from prevailing winds and surf, a more stable substrate, and fairly heavy growth of bull kelp (Nereocystis luetkeana) at the project site may provide more favorable habitat for juvenile fish and account for the greater use of this site. Allen (1974) noted juvenile salmonids concentrating in areas exhibiting these characteristics. However, high variability in our catches makes comparison between these sites risky. In addition, differences in amount of surf, intertidal vegetation, substrate types and slope of the beach affect the sampling gear's catch efficiency at each site.

Distribution between intertidal and neritic zones appeared to be affected by size and time. Later in the outmigration period when larger salmonids were caught, there was a general movement away from the shallow nearshore area into deeper waters. Fresh et al (1979) and Schreiner et al (1977) found that juvenile chum in southern Puget Sound and Hood Canal moved from shallow nearshore areas into deeper offshore waters over time and with increasing size. We found a similar pattern in Clallam and Neah bays.

Sampling in the nearshore and intertidal areas of Neah Bay indicated very limited use by chinook, chum and pink. No coho were captured in Neah Bay. Frequency of occurrence and abundance of salmonids in our catches was much lower in this area. There was no real discernible difference in the relative abundance of these species. Distribution patterns within the bay were not obvious except at the neritic site at the west end of the bay (NP3). Although the total catch of salmonids at this site was not large, it was greater than any of the other Neah Bay sites. This site is characterized by a gradually sloping beach with moderate amounts of Nereocystis luetkeana kelp.

It appears that salmonid use of intertidal areas in Neah Bay is much less than that found in Clallam Bay. Although not tested with statistical

analysis, beach seine catches in Clallam Bay appear to be substantially greater than those observed in Neah Bay. Differences in use of the deeper offshore neritic areas in the two bays were less apparent.

A number of economically important non-salmonid fish utilized Clallam and Neah bays. Most important among these are the baitfish species (Pacific sand lance, surf smelt, and herring). They have sport and commercial value, but their importance as a prey resource is critical. Therefore, a realistic assessment of the impacts of these projects upon the salmonid resource must also take into account the potential impacts upon these baitfish. Our sampling indicated extensive use of both bays by surf smelt, sand lance, and herring.

Sand lance and surf smelt were commonly caught in the intertidal areas of Clallam Bay. Several different life stages were captured including newly hatched juveniles. It is likely that these two species utilize the sand and gravel beaches of Clallam Bay for spawning.

Herring were captured in fairly large numbers in the deeper neritic area at the Clallam Bay project site. These fish were predominately juveniles which were probably entering their second year of life. We could not determine the origin of these fish but it is apparent that schools of juvenile herring do utilize Clallam Bay for rearing.

These baitfish species were present throughout the spring and summer. Simenstad et al (1979) found that these species and others utilize the nearshore areas of the Strait of Juan de Fuca and northern Puget Sound during spring and summer and then move into deeper waters during the winter.

Sand lance, surf smelt, and flounder were common inhabitants of the intertidal areas in Neah Bay. Several life stages were observed and it's likely these species utilize the sand and gravel beaches of the bay for spawning. Juvenile herring were very abundant in the intertidal zone, particularly at the west end of the bay (NB3). Sand lance and surf smelt were less abundant in Neah Bay's neritic waters, but herring were very abundant and widespread. These herring also appeared to be entering their second year of life.

Baitfish species inhabited Neah Bay throughout this study. Peak abundance of sand lance and herring occurred in early summer. Surf smelt abundance peaked later.

Use of Clallam and Neah bays by baitfish appears to be relatively intense. Miller et al (1977) examined fish distribution in Northern Puget Sound from 1974-1976. They examined intertidal and neritic populations using a beach seine and townet. Although their data are not directly comparable to ours, it would appear that baitfish utilization of Clallam and Neah bays is comparable or greater than any of the sites examined by Miller et al (1977).

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APPENDIX

CLALLAM BAY

DAILY CATCH BY BEACH SEINE AND PURSE SEINE

DATE	SITE	SPECIES	NUMBER	ESTIMATE
5/2/84	CB1	PINK	3	0
5/2/84	CB1	CHUM	5	0
5/2/84	CB1	SAND LANCE	500	1
5/2/84	CB1	BLENNY	1	0
5/2/84	CB1	PERCH	1	0
5/2/84	CB1	STARRY FLOUNDER	1	0
5/2/84	CB1	FLOUNDER-JUV	1	0
5/2/84	CB1	SAND LANCE	200	1
5/2/84	CB2	SAND LANCE	50	1
5/2/84	CB2	SAND LANCE	450	1
5/2/84	CP1		0	0
5/2/84	CP1		0	0
5/2/84	CP2		0	0
5/2/84	CP2		0	0
5/9/84	CB1	CHUM	14	0
5/9/84	CB1	BLENNY	3	0
5/9/84	CB1	SAND LANCE	300	1
5/9/84	CB1	CHUM	5	0
5/9/84	CB1	GREENLING	1	0
5/9/84	CB1	BLENNY	3	0
5/9/84	CB1	PERCH	1	0
5/9/84	CB1	SAND LANCE	30	1
5/9/84	CB2	COHO	1	0
5/9/84	CB2	SAND LANCE	1200	1
5/9/84	CB2	CHUM	1	0
5/9/84	CB2	SCULPINS	12	0
5/9/84	CB2	SAND LANCE	40	1
5/9/84	CP1		0	0
5/9/84	CP1		0	0
5/9/84	CP2		0	0
5/9/84	CP2	SAND LANCE	100	1
5/22/84	CB1	IRISH LORD	2	0
5/22/84	CB1	BLENNY	2	0
5/22/84	CB1	HERRING(JUV)	200	1
5/22/84	CB1	SURF SMELT	2000	1
5/22/84	CB1	CHUM	16	0
5/22/84	CB1	FLOUNDER	1	0
5/22/84	CB1	FLOUNDER(JUV)	36	0
5/22/84	CB1	BLENNY	10	0
5/22/84	CB1	SURF SMELT	400	1
5/22/84	CB1	SCULPINS	4	0
5/22/84	CB1	CHUM	2	0
5/22/84	CB2	SAND LANCE	100	1
5/22/84	CB2	SCULPIN	3	0
5/22/84	CB2	COHO	1	0
5/22/84	CB2	SAND LANCE	2000	1

5/22/84	CP1	CHINOOK	1	0
5/22/84	CP1	SAND LANCE(JUV)	10000	1
5/22/84	CP1	SAND LANCE	10	0
5/22/84	CP1	ROCKFISH(JUV)	34	0
5/22/84	CP2		0	0
5/22/84	CP2		0	0
6/6/84	CB1	PERCH	1	0
6/6/84	CB1	SURF SMELT	10000	1
6/6/84	CB1	FLOUNDER(JUV)	100	1
6/6/84	CB1	STARRY FLOUNDER	1	0
6/6/84	CB1	PINK	8	0
6/6/84	CB1	CHUM	17	0
6/6/84	CB1	COHO	1	0
6/6/84	CB1	CHUM	2	0
6/6/84	CB1	ROCKFISH(JUV)	8	0
6/6/84	CB1	FLOUNDER(JUV)	100	1
6/6/84	CB1	SCULPIN	60	1
6/6/84	CB1	PERCH	1	0
6/6/84	CB2	COHO	1	0
6/6/84	CB2	CHUM	8	0
6/6/84	CB2	PINK	21	0
6/6/84	CB2	SAND LANCE	1	0
6/6/84	CB2	SCULPIN	24	0
6/6/84	CB2	SAND LANCE	300	1
6/6/84	CB2	ANCHOVY	1	0
6/6/84	CB2	COHO	8	0
6/6/84	CB2	CHUM	67	0
6/6/84	CB2	PINK	34	0
6/6/84	CP1	HERRING(JUV)	50000	1
6/6/84	CP1	SAND LANCE	100	1
6/6/84	CP1		0	0
6/6/84	CP2		0	0
6/6/84	CP2		0	0
6/26/84	CB1	SURF SMELT	87	0
6/26/84	CB1	FLOUNDER(JUV)	8	0
6/26/84	CB1	SCULPIN(JUV)	3	0
6/26/84	CB1	STARRY FLOUNDER	1	0
6/26/84	CB1	PINK	5	0
6/26/84	CB1	CHUM	4	0
6/26/84	CB1	CHINOOK	2	0
6/26/84	CB1	TRUE COD(JUV)	42	0
6/26/84	CB1	TRUE COD(JUV)	209	0
6/26/84	CB1	SAND LANCE	29	0
6/26/84	CB1	STARRY FLOUNDER	4	0
6/26/84	CB2	PINK	108	0
6/26/84	CB2	CHUM	6	0
6/26/84	CB2	CHINOOK	4	0
6/26/84	CB2	SURF SMELT	19	0
6/26/84	CP1	HERRING	2000	1
6/26/84	CP1	SAND LANCE	200	1
6/26/84	CP1	PINK	3	0
6/26/84	CP1	SURF SMELT	300	1
6/26/84	CP1	GREENLING	1	0
6/26/84	CP1	BLENNY	2	0
6/26/84	CP1	FLOUNDER(JUV)	3	0

6/26/84	CP1	SURF SMELT	300	1
6/26/84	CP1	SAND LANCE	50	1
6/26/84	CP1	HERRING	500	1
6/26/84	CP1	PINK	22	0
6/26/84	CP1	CHINOOK	1	0
6/26/84	CP2		0	0
6/26/84	CP2		0	0
7/9/84	CB1	SURF SMELT	50	1
7/9/84	CB1	SAND LANCE	75	1
7/9/84	CB1	BLENNY	1	0
7/9/84	CB1	STARRY FLOUNDER	1	0
7/9/84	CB1	FLOUNDER(JUV)	3	0
7/9/84	CB1	PINK	2	0
7/9/84	CB1	SURF SMELT	30	1
7/9/84	CB1	SAND LANCE	10	0
7/9/84	CB1	FLOUNDER(JUV)	3	0
7/9/84	CP1	HERRING	1000	1
7/9/84	CP1	SAND LANCE	100	1
7/9/84	CP1	ROCKFISH(JUV)	1	0
7/9/84	CP1	CHINOOK	1	0
7/9/84	CP2		0	0
7/9/84	CP2	PINK	193	0
7/24/84	CB1	SURF SMELT	24	0
7/24/84	CB1	FLOUNDER(JUV)	1	0
7/24/84	CB1	SCULPIN	3	0
7/24/84	CB1	SURF SMELT	14	0
7/24/84	CB2	SURF SMELT	50	1
7/24/84	CB2	SAND LANCE	1	0
7/24/84	CB2	SAND LANCE	72	0
7/24/84	CB2	PIPEFISH	1	0
7/24/84	CB2	HERRING	29	0
7/24/84	CB2	SURF SMELT	178	0
7/24/84	CB2	CHINOOK	1	0
7/24/84	CP1	SAND LANCE	200	1
7/24/84	CP1	FLOUNDER(JUV)	8	0
7/24/84	CP1	PERCH(JUV)	1	0
7/24/84	CP1	HERRING	1	0
7/24/84	CP1	CHINOOK	18	0
7/24/84	CP1	CHUM	3	0
7/24/84	CP1	PINK	2	0
7/24/84	CP2	SAND LANCE	5	0
7/24/84	CP2	FLOUNDER(JUV)	1	0
7/24/84	CP2	CHUM	2	0
8/6/84	CB1	SCULPIN	2	0
8/6/84	CB1	FLOUNDER(JUV)	1	0
8/6/84	CB1	SAND LANCE	1	0
8/6/84	CB1	SAND LANCE	32	0
8/6/84	CB1	SURF SMELT	1	0
8/6/84	CB1	SCULPIN	2	0
8/6/84	CB1	PERCH(JUV)	2	0
8/6/84	CB2	CHINOOK	2	0
8/6/84	CB2	PINK	79	0
8/6/84	CB2	ANCHOVY	1	0
8/6/84	CB2	STARRY FLOUNDER	1	0
8/6/84	CP1		0	0

8/6/84	CP1	CHINOOK	4	0
8/6/84	CP1	CHUM	3	0
8/6/84	CP1	SAND LANCE	20	0
8/6/84	CP1	SURF SMELT	3000	1
8/6/84	CP1	HERRING	1000	1
8/6/84	CP2		0	0
8/6/84	CP2		0	0

NEAH BAY

DAILY CATCH BY BEACH SEINE AND PURSE SEINE

DATE	SITE	SPECIES	NUMBER	ESTIMATE
5/3/84	NB2	CHUM	1	0
5/3/84	NB2	SAND LANCE	50	1
5/3/84	NB2	SCULPIN(JUV)	50	1
5/3/84	NB2	SNAILFISH	2	0
5/3/84	NB2	GREENLING	3	0
5/3/84	NB2	FLOUNDER(JUV)	50	1
5/3/84	NB2	SAND LANCE(JUV)	25	1
5/3/84	NB3	SAND LANCE(JUV)	300	1
5/3/84	NB3	STARRY FLOUNDER	5	0
5/3/84	NB3	FLOUNDER(JUV)	30	1
5/3/84	NB3	SCULPIN(JUV)	100	1
5/3/84	NB3	SAND LANCE	300	1
5/3/84	NB3	SCULPIN(JUV)	100	1
5/3/84	NB3	STARRY FLOUNDER	50	1
5/3/84	NP1		0	0
5/3/84	NP1		0	0
5/3/84	NP2		0	0
5/3/84	NP2		0	0
5/3/84	NP3	SAND LANCE	5	0
5/3/84	NP3	SAND LANCE	1000	1
5/10/84	NB2	BLENNY	1	0
5/10/84	NB2	SCULPIN	50	1
5/10/84	NB2	SAND LANCE	1300	1
5/10/84	NB2	FLOUNDER(JUV)	25	0
5/10/84	NB2	GREENLING	1	0
5/10/84	NB2	PINK	1	0
5/10/84	NB2	SAND LANCE	1200	1
5/10/84	NB2	SCULPINS	100	1
5/10/84	NB2	HERRING(JUV)	2	0
5/10/84	NB2	FLOUNDER(JUV)	30	0
5/10/84	NB3	STARRY FLOUNDER	2	0
5/10/84	NB3	FLOUNDER(JUV)	25	0
5/10/84	NB3	SCULPIN	200	1
5/10/84	NB3	SAND LANCE	1000	1
5/10/84	NB3	PIPEFISH	2	0
5/10/84	NB3	PIPEFISH	2	0
5/10/84	NB3	SCULPINS	100	1
5/10/84	NB3	SAND LANCE	500	1
5/10/84	NB3	FLOUNDER	75	1
5/10/84	NP1	SAND LANCE	2	0
5/10/84	NP1	ROCKFISH(JUV)	2	0
5/10/84	NP2	POUCHER(JUV)	1	0
5/10/84	NP2		0	0
5/10/84	NP3		0	0
5/10/84	NP3	SAND LANCE	1	0
5/23/84	NB2	CHUM	1	0

5/23/84	NB2	SCULPIN	60	1
5/23/84	NB2	SAND LANCE	1	0
5/23/84	NB2	SCULPIN	300	1
5/23/84	NB3	GREENLING(JUV)	3	0
5/23/84	NB3	SCULPIN	6	0
5/23/84	NB3	PIPEFISH	200	1
5/23/84	NB3	BLENNY	400	1
5/23/84	NB3	SAND LANCE	6	0
5/23/84	NB3	STARRY FLOUNDER	10	0
5/23/84	NB3	FLOUNDER(JUV)	600	1
5/23/84	NB3	CLINGFISH	1	0
5/23/84	NB3	PIPEFISH	47	0
5/23/84	NB3	GREENLING	1	0
5/23/84	NB3	BLENNY	60	0
5/23/84	NB3	SCULPIN	500	1
5/23/84	NB3	STARRY FLOUNDER	2	0
5/23/84	NB3	FLOUNDER(JUV)	300	1
5/23/84	NP1		0	0
5/23/84	NP1		0	0
5/23/84	NP2		0	0
5/23/84	NP2		0	0
5/23/84	NP3		0	0
5/23/84	NP3	BLENNY	1	0
6/7/84	NB2	CHUM	1	0
6/7/84	NB2	SURF SMELT	200	1
6/7/84	NB2	SCULPIN	100	1
6/7/84	NB2	GREENLING(JUV)	4	0
6/7/84	NB2	FLOUNDER(JUV)	50	0
6/7/84	NB2	HERRING(JUV)	3000	1
6/7/84	NB2	SAND LANCE(JUV)	100	1
6/7/84	NB2	SAND LANCE	50	1
6/7/84	NB2	SCULPIN	200	1
6/7/84	NB2	FLOUNDER(JUV)	75	1
6/7/84	NB3	PINK	1	0
6/7/84	NB3	SURF SMELT	2000	1
6/7/84	NB3	SAND LANCE	200	1
6/7/84	NB3	PERCH	1	0
6/7/84	NB3	FLOUNDER(JUV)	200	1
6/7/84	NB3	STARRY FLOUNDER	7	0
6/7/84	NB3	GREENLING(JUV)	3	0
6/7/84	NB3	PIPEFISH	6	0
6/7/84	NB3	BLENNY	17	0
6/7/84	NB3	SAILFIN SCULPIN	3	0
6/7/84	NB3	SCULPIN	60	1
6/7/84	NB3	SAND LANCE	300	1
6/7/84	NB3	SURF SMELT	500	1
6/7/84	NB3	FLOUNDER(JUV)	300	1
6/7/84	NB3	GREENLING	2	0
6/7/84	NP1	SAND LANCE	1	0
6/7/84	NP1		0	0
6/7/84	NP2		0	0
6/7/84	NP2		0	0
6/7/84	NP3	HERRING(JUV)	10000	1
6/7/84	NP3	SAND LANCE	100	1
6/7/84	NP3		0	0

6/27/84	NB2	SURF SMELT	28	0
6/27/84	NB2	SAND LANCE	42	0
6/27/84	NB2	HERRING(JUV)	21	0
6/27/84	NB2	SCULPIN	36	0
6/27/84	NB2	HERRING	59	0
6/27/84	NB2	SAND LANCE	29	0
6/27/84	NB2	SCULPIN	36	0
6/27/84	NB2	FLOUNDER(JUV)	3	0
6/27/84	NB2	SURF SMELT	15	0
6/27/84	NB3	SHINER PERCH	2	0
6/27/84	NB3	SURF SMELT	23	0
6/27/84	NB3	SCULPIN	150	1
6/27/84	NB3	STARRY FLOUNDER	4	0
6/27/84	NB3	FLOUNDER(JUV)	57	0
6/27/84	NB3	SAND LANCE	300	1
6/27/84	NB3	SAND LANCE	3	0
6/27/84	NB3	SCULPINS	300	1
6/27/84	NB3	FLOUNDER(JUV)	150	1
6/27/84	NB3	STARRY FLOUNDER	2	0
6/27/84	NB3	SURF SMELT	200	1
6/27/84	NB3	CHINOOK	1	0
6/27/84	NP1		0	0
6/27/84	NP1		0	0
6/27/84	NP2		0	0
6/27/84	NP2		0	0
6/27/84	NP3	SURF SMELT	100	1
6/27/84	NP3	HERRING	1000	1
6/27/84	NP3	SAND LANCE	500	1
6/27/84	NP3	FLOUNDER(JUV)	1	0
6/27/84	NP3	GREENLING(JUV)	1	0
6/27/84	NP3	CHINOOK	7	0
6/27/84	NP3	CHUM	6	0
6/27/84	NP3	SURF SMELT	68	0
6/27/84	NP3	HERRING	500	1
6/27/84	NP3	FLOUNDER(JUV)	2	0
6/27/84	NP3	CHUM	2	0
6/27/84	NP3	CHINOOK	2	0
7/10/84	NB2	FLOUNDER(JUV)	3	0
7/10/84	NB2	SMELT	300	1
7/10/84	NB2	HERRING	65	1
7/10/84	NB2	SCULPIN	17	0
7/10/84	NB2	FLOUNDER(JUV)	16	0
7/10/84	NB2	TRUE COD	1	0
7/10/84	NB2	SAND LANCE	100	1
7/10/84	NB2	SURF SMELT	100	1
7/10/84	NB2	HERRING	25	0
7/10/84	NB2	SCULPIN	150	1
7/10/84	NB2	CHINOOK	1	0
7/10/84	NB3	HERRING(JUV)	100000	1
7/10/84	NB3	SMELT	100	1
7/10/84	NB3	SAND LANCE	100	1
7/10/84	NB3	STARRY FLOUNDER	1	0
7/10/84	NB3	FLOUNDER(JUV)	50	1
7/10/84	NB3	SCULPIN	50	1
7/10/84	NB3	HERRING(JUV)	20000	1

7/10/84	NB3	SMELT	50	1
7/10/84	NB3	SAND LANCE	50	1
7/10/84	NB3	FLOUNDER(JUV)	16	0
7/10/84	NB3	PINK	1	0
7/10/84	NP1	PINK	1	0
7/10/84	NP1		0	0
7/10/84	NP2		0	0
7/10/84	NP2	SMELT	1	0
7/10/84	NP3	PINK	2	0
7/10/84	NP3	SURF SMELT	2000	1
7/10/84	NP3	SAND LANCE	500	1
7/10/84	NP3	SURF SMELT	1500	1
7/10/84	NP3	HERRING	100	1
7/10/84	NP3	SAND LANCE	25	1
7/10/84	NP3	PINK	10	0
7/25/84	NB2	FLOUNDER(JUV)	11	0
7/25/84	NB2	SCULPIN	50	1
7/25/84	NB2	PERCH(JUV)	1	0
7/25/84	NB2	FLOUNDER(JUV)	16	0
7/25/84	NB3	SCULPIN	50	1
7/25/84	NB3	FLOUNDER	4	0
7/25/84	NB3	FLOUNDER(JUV)	19	0
7/25/84	NB3	SURF SMELT	47	0
7/25/84	NB3	HERRING(JUV)	14	0
7/25/84	NB3	SAND LANCE	2	0
7/25/84	NB3	SURF SMELT	108	0
7/25/84	NB3	SAND LANCE	19	0
7/25/84	NB3	HERRING(JUV)	6	0
7/25/84	NB3	FLOUNDER(JUV)	42	0
7/25/84	NB3	FLOUNDER	2	0
7/25/84	NB3	SCULPIN	50	1
7/25/84	NP1	PINK	1	0
7/25/84	NP1	HERRING(JUV)	50000	1
7/25/84	NP1	SAND LANCE	50	1
7/25/84	NP1	SURF SMELT	50	1
7/25/84	NP1	HERRING(JUV)	2000	1
7/25/84	NP1	SURF SMELT	100	1
7/25/84	NP1	SAND LANCE	50	1
7/25/84	NP2	HERRING	22	0
7/25/84	NP2	SURF SMELT	38	0
7/25/84	NP2	CHINOOK	3	0
7/25/84	NP2	CHUM	1	0
7/25/84	NP2	HERRING	50000	1
7/25/84	NP3	HERRING(JUV)	5000	1
7/25/84	NP3	SURF SMELT	50	1
7/25/84	NP3	PINK	1	0
7/25/84	NP3	CHINOOK	6	0
7/25/84	NP3	CHUM	1	0
7/25/84	NP3	SURF SMELT	35	0
7/25/84	NP3	SAND LANCE	13	0
8/7/84	NB2	SCULPIN	51	0
8/7/84	NB2	FLOUNDER(JUV)	18	0
8/7/84	NB2	SURF SMELT	1	0
8/7/84	NB2	FLOUNDER(JUV)	9	0
8/7/84	NB2	SURF SMELT	1	0

8/7/84	NB2	SAND LANCE	1	0
8/7/84	NB2	SCULPIN	60	1
8/7/84	NB2	BLENNY	1	0
8/7/84	NB3	SURF SMELT	2000	1
8/7/84	NB3	SAND LANCE	75	1
8/7/84	NB3	STARRY FLOUNDER	10	0
8/7/84	NB3	FLOUNDER(JUV)	26	0
8/7/84	NB3	SCULPIN	58	0
8/7/84	NB3	BLENNY	2	0
8/7/84	NB3	STARRY FLOUNDER	3	0
8/7/84	NB3	SCULPIN	150	1
8/7/84	NB3	FLOUNDER(JUV)	300	1
8/7/84	NB3	SURF SMELT	500	1
8/7/84	NB3	PERCH	1	0
8/7/84	NB3	SAND LANCE	30	0
8/7/84	NP1		0	0
8/7/84	NP1	FLOUNDER(JUV)	1	0
8/7/84	NP2		0	0
8/7/84	NP2		0	0
8/7/84	NP3	SURF SMELT	300	1
8/7/84	NP3	HERRING	100	1
8/7/84	NP3	SURF SMELT	1000	1
8/7/84	NP3	HERRING	500	1
8/7/84	NP3	FLOUNDER(JUV)	1	0
8/7/84	NP3	BLENNY	1	0