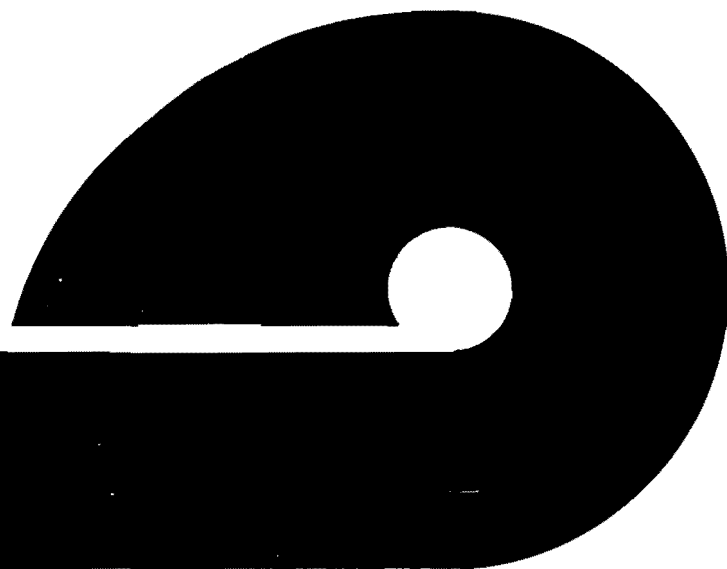


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# NEHALEM RIVER ESTUARY

A STUDY IN RESOURCE USE  
DIVISION OF MANAGEMENT AND RESEARCH



# **1971 NEHALEM RIVER ESTUARY RESOURCE USE STUDY**

by  
**Tom Gaumer  
Darrell Demory  
Laimons Osis**

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Division of Management and Research

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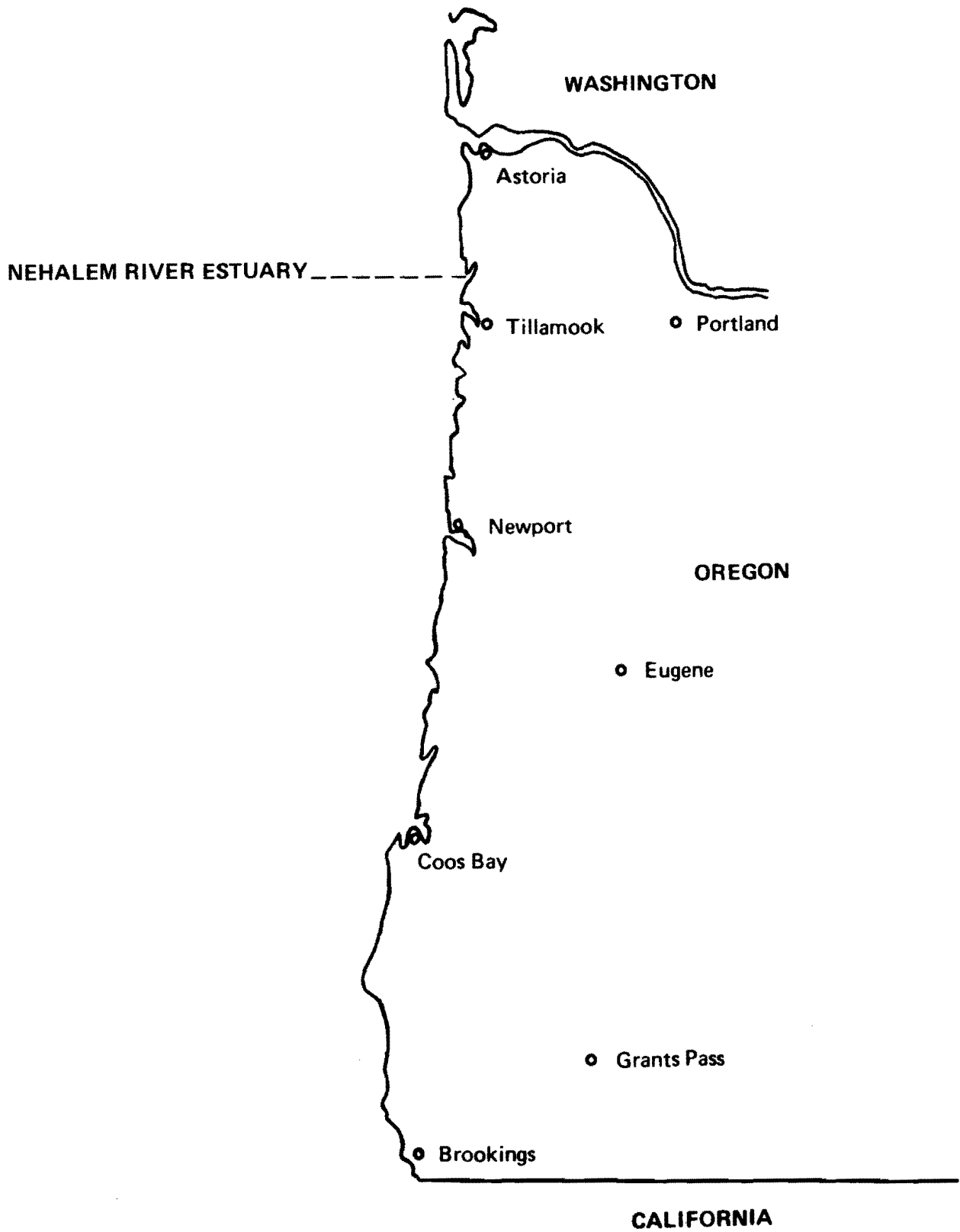


Figure 1. Location of Nehalem River Estuary.

# **1971 NEHALEM RIVER ESTUARY RESOURCE USE STUDY**

## **INTRODUCTION**

In 1971 the Fish Commission of Oregon conducted a comprehensive study of the recreational use of marine food fish, shellfish, and other miscellaneous invertebrates in 16 Oregon estuaries. The anadromous sport fisheries in the upper portions of most estuaries were not included in the study due to the lack of manpower to adequately sample those areas. The study was supported by state general funds and by the National Marine Fisheries Service under the Commercial Fisheries Research and Development Act. The U.S. Army Corps of Engineers funded portions of the data processing, preparation of a series of marine resource maps, and a special report for each estuary. This report summarizes the results of the Nehalem River Estuary study.

## **PROCEDURE**

The Nehalem River Estuary is located 48 miles south of the Columbia River (Figure 1). The 2,309-acre bay contains 1,078 acres of tidelands.

From March 1 through October 31, 1971, boat and shore anglers, tideflat users, and scuba divers were interviewed for catch, effort, and origin data in a program designed for statistical analysis. Resource users were categorized as (1) county: people that reside west of the coast range summit within the county where the sampled estuary is found, (2) state: residents of Oregon not classified as county, and (3) nonstate: nonresidents of Oregon.

The study area extended from the mouth of the estuary upstream 6 miles to the Highway 101 bridge. Survey areas and their station numbers are outlined in Table 1 and are shown in Figure 2.

The 1971 Nehalem River Estuary commercial landings of shellfish and their value, taken from Fish Commission catch statistic reports, are included in the results as supplemental information.

The following maps were prepared using information collected in previous Fish Commission studies and the 1971 resource use survey.

1. Principal boat fishing areas.
2. Clam beds.
3. Eel grass beds.
4. Food production areas, fish feeding areas, and fish migration routes.

## RESULTS

During the study 2,427 boat, shore, tideflat, and scuba resource user interviews were obtained to estimate catch and effort values and angler origin. The values presented in the tables are estimates and have been rounded off when used in the text.

### Boat Fishery

Figure 3 shows the principal boat fishing areas of the Nehalem River Estuary. Only sport boat fishing areas are shown on the map since no commercial boat fishing occurs on the estuary. Principal species of fish and shellfish caught and peak periods of fishing activity are outlined.

An estimated 17,000 boat angler trips were expended on the estuary (Table 2). These anglers spent 57,600 hours fishing (Table 3). Peak months of activity were July, August, and September.

Fifteen species of fish and one species of crab were identified in the boat anglers' catch (Table 4). Dungeness crab was the principal species taken and accounted for 84% of the total number of animals caught. Catch and fishing success (catch per hour) were highest during July (Table 5).

### Shore Fishery

Interview data revealed that 2,900 shore angler trips were expended on the estuary (Table 6). The fishing docks were the principal fishing locations; 83% of the anglers fished there. Shore anglers spent 7,500 hours fishing (Table 7). Peak activity was in August.

Twelve species of fish and one species of crab were identified in the shore anglers' catch (Table 8). Pacific staghorn sculpin, shiner perch, and Dungeness crab were the principal species taken, accounting for 63% of the total number of animals caught. The peak catch occurred during August (Table 9), and fishing success was highest during June.

### Tideflat Fishery

Figure 4 shows the distribution of the two species of bay clams found in the estuary. Native littleneck clams are found subtidally off George's Dock and softshell clams are found scattered throughout the upper portions of the bay. Principal area of digging is outlined on the map.

Table 10 shows that 400 tideflat user trips were expended to harvest clams and shrimp from the estuary. Tideflat users spent 500 hours collecting marine animals (Table 11). The peak month of activity was July.

Softshell clams and ghost shrimp were the only species of tideflat animals observed harvested from the bay (Table 12). The principal catch occurred during July (Table 13).

### Scuba Fishery

The small number of scuba divers interviewed on the Nehalem River Estuary precluded making an estimate of catch and effort for this fishery.



### Angler Origin

Approximately 85% of the anglers interviewed were residents of Oregon living outside of Tillamook County, 8% were Tillamook County residents, and 7% were out-of-state residents. The large number of out of county residents using the estuary reflects the popularity of this bay to Portland area residents.

	Angler Origin		
	County	State	Non-State
Boat	1,076	14,593	1,282
Shore	378	2,432	129
Tideflat	218	201	19
<b>Total</b>	<b>1,672</b>	<b>17,226</b>	<b>1,430</b>
<b>Percentage</b>	<b>8.2</b>	<b>84.7</b>	<b>7.0</b>

### Combined Recreational Fisheries

A total of 20,300 resource user trips (17,000 boat, 2,900 shore, and 400 tideflat) were expended on the Nehalem River Estuary during the study (Table 14). The 20,300 user trips represented 65,700 hours of effort (57,600 boat, 7,600 shore, and 500 tideflat). The peak month of activity for the boat, shore, and tideflat fisheries was September, August, and July, respectively. Combining all fisheries, Table 15 shows that September was the peak month of activity.

Anglers of the three fisheries harvested 30,700 marine animals (18,000 crabs, 7,400 fish, 4,400 clams, and 900 shrimp). Dungeness crab comprised 84% of the boat anglers' total catch. Fish were the principal animals harvested by shore anglers and represented 84% of their total take. Pacific staghorn sculpin and shiner perch were the principal species caught. Softshell clams and ghost shrimp were the only species caught by tideflat users. Comparing the catch for all three fisheries revealed that boat anglers harvested 20,500 or 67% of the total animals taken. Shore anglers and tideflat users harvested 4,900 and 5,300 marine animals, respectively. Peak month of catch for the boat, shore, and tideflat fisheries was July, August, and July, respectively. Combining all fisheries, the principal catch occurred in July.

### Commercial Fishery

Commercial landings of shellfish caught in the Nehalem River Estuary in 1971 totaled 589 pounds of littleneck clams valued at \$206 (fisherman's level) according to Fish Commission landing statistics.

### Eel Grass Beds

Eel grass beds are found scattered throughout the Nehalem River Estuary up to Wheeler at river mile 5 (Figure 5). These beds are usually found in areas of shallow water and high salinities. Clams and other important marine fauna are usually an integral part of the eel grass beds.

### **Food Production Areas, Fish Feeding Areas, and Fish Migration Routes**

Figure 6 shows the food production areas, fish feeding areas, and fish migration routes in the estuary.

Estuaries are some of the most productive lands on earth. The productivity of estuarial areas is directly related to length of shore line, depth of water, and geographical location. Within each estuary tidelands are generally more productive than deep water channel areas.

Production of food organisms occurs throughout the entire Nehalem River Estuary. These food organisms include the microscopic phytoplankton and other algae, zooplankton, small crustaceans, mollusks, annelids, and fish which are all important in the estuarine food chain.

The fish feeding areas of the Nehalem River Estuary (for finfish and shellfish) include all areas of the estuary under tidal influence. Tideflats as well as deep water channels and rocky areas provide a variety of rearing habitat. Species of fish, numbers, and distribution within each area are generally related to type of food organisms, bottom type, water depth, and water quality.

Fish and shellfish typically found associated with the estuary tideflats include flounder, sole, perch, rockfish, salmon, crabs, shrimp, and clams. These same species reside in the estuary channels; period of residency is dependent on species, season, and location. A taxonomic list of the species of marine animals observed in this study is contained in Table 16.

Rocky areas in the estuary are the preferred feeding and rearing areas of perch, rockfish, greenling, and sculpins. These fish reside near the jetties and rock groins of the lower bay.

Fish migration routes are those areas traveled by fish to and from spawning, feeding, or rearing areas. Fish migration routes through the Nehalem River Estuary are as varied as the fish that use them. Species and age class of fish, season, water depth, and water quality all play an important role in fish migration patterns.

The use of channel areas throughout the estuary by salmon, trout, perch, and flounder is well known. In addition during high tide these same fish frequently swim across tideflats to reach their destination.

**Table 1. LOCATION OF SAMPLING STATIONS  
Nehalem River Estuary, 1971**

<b>Fishing Activity</b>	<b>Station Number</b>	<b>Location</b>
Boat	B-1	Mouth to head of tide.
Shore	S-1	South Jetty
	S-2	Docks (Jetty Fishery -- George's Dock -- Easton's Dock -- Paradise Cove)
	S-3	State Park (Nehalem Bay State Park boat ramp)
Tideflat	T-1	Highway 101 tideflat
	T-2	State Park tideflat

**Table 2. NUMBER OF BOAT ANGLER TRIPS  
By Month and Area, Nehalem River Estuary  
March 1 through October 31, 1971**

<b>Month</b>	<b>Boat Fishing Area and Station Number</b>		<b>Percentage</b>
	<b>Mouth to Head of Tide Total (B-1 Only Station)</b>		
March	113		0.7
April	595		3.5
May	2,108		12.4
June	1,672		9.9
July	3,013		17.8
August	3,977		23.4
September	4,592		27.1
October	881		5.2
<b>Total</b>	<b>16,951</b>		<b>100.0</b>

**Table 3. HOURS OF BOAT ANGLER USE  
By Month and Area, Nehalem River Estuary  
March 1 through October 31, 1971**

Month	Boat Fishing Area and Station Number		Percentage
	Mouth to Head of Tide Total (B-1 Only Station)		
March	218		0.4
April	2,034		3.5
May	7,893		13.7
June	5,378		9.3
July	11,347		19.7
August	11,798		20.5
September	15,242		26.4
October	3,724		6.5
Total	57,634		100.0

**Table 4. MARINE ANIMALS CAUGHT BY BOAT ANGLERS  
Nehalem River Estuary, by Species and Area  
March 1 through October 31, 1971**

Species	Boat Fishing Area and Station Number		Percentage
	Mouth to Head of Tide Total (B-1 Only Station)		
Dungeness crab	17,166		83.5
Starry flounder	1,581		7.7
Coho salmon (adult)	407		2.0
Redtail surfperch	356		1.7
Striped seaperch	254		1.2
Pile perch	227		1.1
Chinook salmon (adult)	122		0.6
Shiner perch	108		0.5
Chinook salmon (juvenile)	97		0.5
White seaperch	47		0.2
Buffalo sculpin	44		0.2
Walleye surfperch	32		0.2
Pacific staghorn sculpin	30		0.1
Kelp greenling	21		0.1
Cutthroat trout	21		0.1
Coho salmon (juvenile)	13		0.1
Silver surfperch	10		0.1
Rock greenling	10		0.1
Total	20,546		100.0

Table 5. SPORT BOAT FISHING DATA  
Nehalem River Estuary, All Areas  
1971

	March	April	May	June	July	Aug.	Sept.	Oct.	Total	Percentage
Angler trips (number)	113	595	2,108	1,672	3,013	3,977	4,592	881	16,951	—
Fishing effort (hours)	218	2,034	7,893	5,378	11,347	11,798	15,242	3,724	57,634	—
Fishing success (catch/hr.)	0.02	0.29	0.36	0.43	0.57	0.26	0.23	0.48	0.36	—
Catch (number)										
Dungeness crab	4	583	1,706	1,641	5,750	2,742	2,955	1,785	17,166	83.5
Starry flounder	0	0	862	517	163	21	13	5	1,581	7.7
Coho salmon (adult)	0	0	0	0	0	148	259	0	407	2.0
Redtail surfperch	0	11	164	59	43	52	27	0	356	1.7
Striped seaperch	0	0	19	29	185	21	0	0	254	1.2
Pile perch	0	0	25	39	54	0	109	0	227	1.1
Chinook salmon (adult)	0	0	0	29	0	52	41	0	122	0.6
Shiner perch	0	0	0	0	108	0	0	0	108	0.5
Chinook salmon (juvenile)	0	0	0	0	87	10	0	0	97	0.5
White seaperch	0	0	38	9	0	0	0	0	47	0.2
Buffalo sculpin	0	0	44	0	0	0	0	0	44	0.2
Walleye surfperch	0	0	0	9	10	0	13	0	32	0.2
Pacific staghorn sculpin	0	0	0	0	10	10	0	10	30	0.1
Kelp greenling	0	0	0	0	21	0	0	0	21	0.1
Cutthroat trout	0	0	0	0	21	0	0	0	21	0.1
Coho salmon (juvenile)	0	0	0	0	0	0	13	0	13	0.1
Silver surfperch	0	0	0	0	10	0	0	0	10	0.1
Rock greenling	0	0	0	0	0	10	0	0	10	0.1
Total	4	594	2,858	2,332	6,462	3,066	3,430	1,800	20,546	100.0
Percentage	<0.1	2.9	13.9	11.3	31.5	14.9	16.7	8.8	100.0	

**Table 6. NUMBER OF SHORE ANGLER TRIPS  
By Month and Area, Nehalem River Estuary  
March 1 through October 31, 1971**

Month	Shore Fishing Area and Station Number			Total	Percentage
	South Jetty S-1	Docks S-2	State Park S-3		
March	0	12	2	14	0.5
April	0	215	6	221	7.5
May	18	457	0	475	16.2
June	99	297	15	411	14.0
July	9	517	24	550	18.7
August	154	448	17	619	21.1
September	168	368	0	536	18.2
October	3	110	0	113	3.8
<b>Total</b>	<b>451</b>	<b>2,424</b>	<b>64</b>	<b>2,939</b>	<b>100.0</b>
<b>Percentage</b>	<b>15.3</b>	<b>82.5</b>	<b>2.2</b>	<b>100.0</b>	

**Table 7. HOURS OF SHORE ANGLER USE  
By Month and Area, Nehalem River Estuary  
March 1 through October 31, 1971**

Month	Shore Fishing Area and Station Number			Total	Percentage
	South Jetty S-1	Docks S-2	State Park S-3		
March	0	32	6	38	0.5
April	0	552	16	568	7.5
May	47	1,178	0	1,225	16.2
June	254	763	39	1,056	14.0
July	24	1,320	63	1,407	18.7
August	395	1,148	45	1,588	21.1
September	430	939	0	1,369	18.1
October	10	283	0	293	3.9
<b>Total</b>	<b>1,160</b>	<b>6,215</b>	<b>169</b>	<b>7,544</b>	<b>100.0</b>
<b>Percentage</b>	<b>15.4</b>	<b>82.4</b>	<b>2.2</b>	<b>100.0</b>	

**Table 8. MARINE ANIMALS CAUGHT BY SHORE ANGLERS  
Nehalem River Estuary, by Species and Area  
March 1 through October 31, 1971**

Species	Shore Fishing Area and Station Number			Total	Percentage
	South Jetty S-1	Docks S-2	State Park S-3		
Dungeness crab	0	796	0	796	16.4
Pacific staghorn sculpin	72	1,066	9	1,147	23.6
Shiner perch	103	1,018	9	1,130	23.2
Starry flounder	10	541	6	557	11.5
Pile perch	0	508	0	508	10.4
Striped seaperch	29	233	0	262	5.4
Redtail surfperch	44	185	0	229	4.7
Kelp greenling	49	44	0	93	1.9
Buffalo sculpin	28	59	0	87	1.8
Walleye surfperch	0	20	0	20	0.4
Coho salmon (adult)	18	0	0	18	0.4
Black rockfish	0	10	0	10	0.2
Rock greenling	0	7	0	7	0.1
Total	353	4,487	24	4,864	100.0
Percentage	7.3	92.2	0.5	100.0	

**Table 9. SHORE FISHING DATA**  
**Nehalem River Estuary, All Areas**  
**1971**

	March	April	May	June	July	Aug.	Sept.	Oct.	Total	Percentage
Angler trips (number)	14	221	475	411	550	619	536	113	2,939	—
Fishing effort (hours)	38	568	1,225	1,056	1,407	1,588	1,369	293	7,544	—
Fishing success (catch/hr.)	0.00	0.48	0.71	0.79	0.63	0.77	0.49	0.37	0.64	—
Catch (number)										
Dungeness crab	0	114	48	167	75	144	139	109	796	16.4
Pacific staghorn sculpin	0	0	5	97	279	297	469	0	1,147	23.6
Shiner perch	0	0	48	180	233	640	29	0	1,130	23.2
Starry flounder	0	67	298	117	75	0	0	0	557	11.5
Pile perch	0	0	213	139	120	36	0	0	508	10.4
Striped seaperch	0	0	122	47	75	18	0	0	262	5.4
Redtail surfperch	0	93	63	54	0	0	19	0	229	4.7
Kelp greenling	0	0	16	19	22	27	9	0	93	1.9
Buffalo sculpin	0	0	36	6	0	45	0	0	87	1.8
Walleye surfperch	0	0	5	6	0	0	9	0	20	0.4
Coho salmon (adult)	0	0	0	0	0	18	0	0	18	0.4
Black rockfish	0	0	10	0	0	0	0	0	10	0.2
Rock greenling	0	0	0	0	7	0	0	0	7	0.1
Total	0	274	864	832	886	1,225	674	109	4,864	100.0
Percentage	0.0	5.6	17.8	17.1	18.2	25.2	13.9	2.2	100.0	



**Table 10. NUMBER OF TIDEFLAT USER TRIPS  
By Month and Area, Nehalem River Estuary  
March 1 through October 31, 1971**

Month	Tideflat and Station Number		Percentage
	Highway 101 Tideflat and State Park Tideflat	T-1 and T-2	
March		12	2.7
April		0	0.0
May		121	27.6
June		36	8.2
July		212	48.4
August		49	11.2
September		8	1.8
October		0	0.0
<b>Total</b>		<b>438</b>	<b>99.9</b>

1/ Data for T-1 and T-2 tideflats combined due to light digging effort in each area.

**Table 11. HOURS OF TIDEFLAT USE  
By Month and Area, Nehalem River Estuary  
March 1 through October 31, 1971**

Month	Tideflat and Station Number		Percentage
	Highway 101 Tideflat and State Park Tideflat	T-1 and T-2	
March		25	4.6
April		0	0.0
May		81	15.0
June		47	8.7
July		324	60.0
August		56	10.4
September		7	1.3
October		0	0.0
<b>Total</b>		<b>540</b>	<b>100.0</b>

**Table 12. MARINE ANIMALS CAUGHT BY TIDEFLAT USERS  
Nehalem River Estuary, by Species and Area  
March 1 through October 31, 1971**

Species	Tideflat and Station Number		Percentage
	Highway 101 Tideflat and State Park Tideflat	T-1 and T-2	
Softshell clam		4,353	82.8
Ghost shrimp		907	17.2
Total		5,260	100.0

**Table 13. TIDEFLAT FISHING DATA  
Nehalem River Estuary, All Areas  
1971**

	March	April	May	June	July	Aug.	Sept.	Oct.	Total	Percentage
Angler trips (number)	12	0	121	36	212	49	8	0	438	—
Fishing effort (hours)	25	0	81	47	324	56	7	0	540	—
Fishing success (catch/hr.)	0.6	0.0	20.8	14.4	5.4	20.0	2.6	0.0	9.7	—
Catch (number)										
Softshell clam	16	0	1,682	0	1,749	888	18	0	4,353	82.8
Ghost shrimp	0	0	0	675	0	232	0	0	907	17.2
Total	16	0	1,682	675	1,749	1,120	18	0	5,260	100.0
Percentage	0.3	0.0	32.0	12.8	33.2	21.3	0.3	0.0	99.9	

**Table 14. SUMMARY**  
**Number of Angler Trips, Hours of Effort, and Animals Caught**  
**Nehalem River Estuary, by Station**  
**March 1 through October 31, 1971**

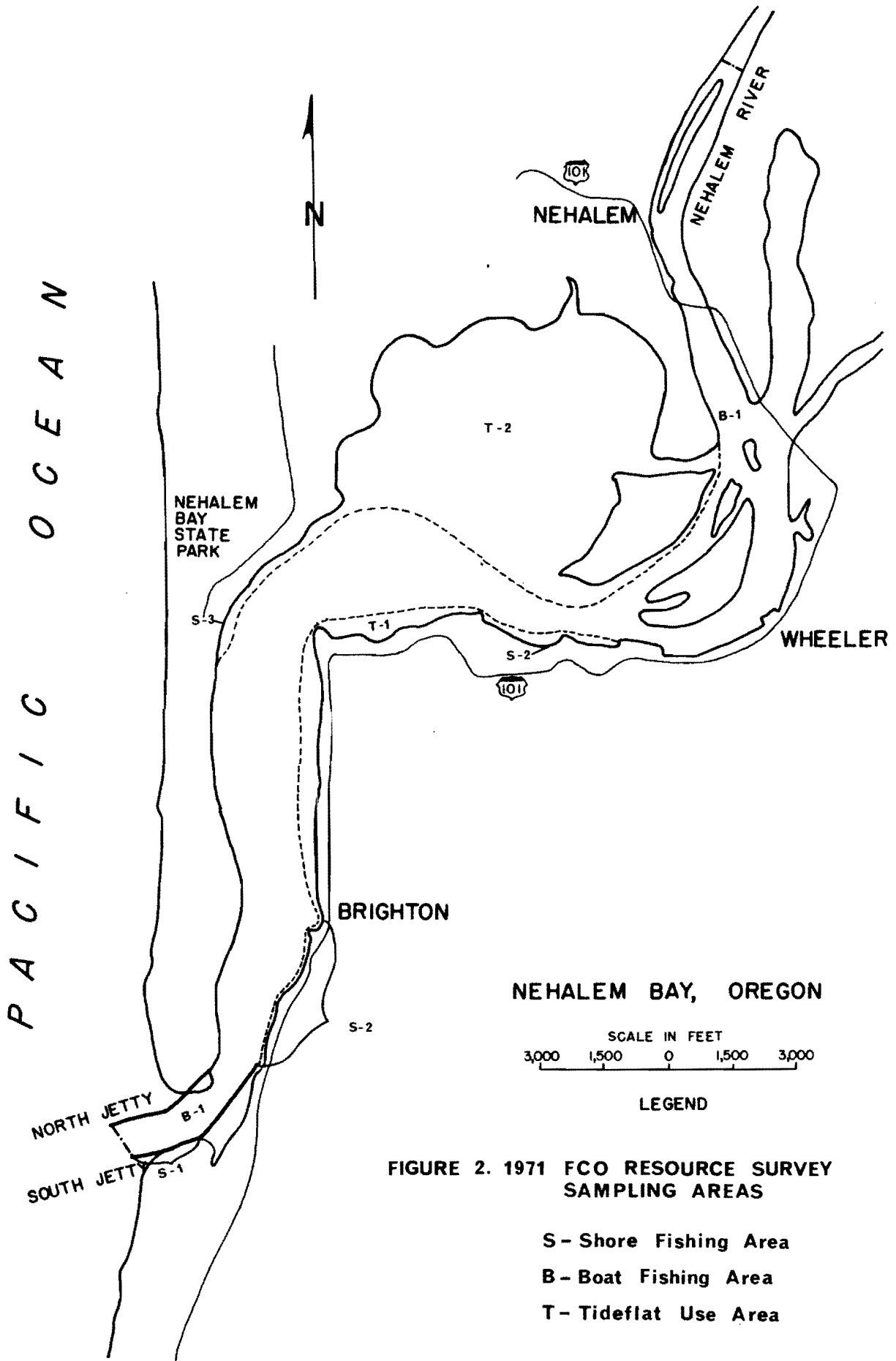
Station Number	No. Angler Trips	Angler Hours	Catch				Total
			Fish	Crabs	Clams	Shrimp	
B-1	16,951	57,634	3,380	17,166	0	0	20,546
Total	16,951	57,634	3,380	17,166	0	0	20,546
S-1	451	1,160	353	0	0	0	353
S-2	2,424	6,215	3,691	796	0	0	4,487
S-3	64	169	24	0	0	0	24
Total	2,939	7,544	4,068	796	0	0	4,864
T-1 & T-2	438	540	0	0	4,353	907	5,260
Total	438	540	0	0	4,353	907	5,260
Grand Total	20,328	65,718	7,448	17,962	4,353	907	30,670

**Table 15. SUMMARY**  
**Number of Angler Trips, Hours of Effort, and Animals Caught**  
**Nehalem River Estuary, by Month**  
**March 1 through October 31, 1971**

Fishery	Month	No. Angler Trips	Angler Hours	Catch				Total
				Fish	Crabs	Clams	Shrimp	
Boat	March	113	218	0	4	0	0	4
	April	595	2,034	11	583	0	0	594
	May	2,108	7,893	1,152	1,706	0	0	2,858
	June	1,672	5,378	691	1,641	0	0	2,332
	July	3,013	11,347	712	5,750	0	0	6,462
	August	3,977	11,798	324	2,742	0	0	3,066
	September	4,592	15,242	475	2,955	0	0	3,430
	October	881	3,724	15	1,785	0	0	1,800
	Total	16,951	57,634	3,380	17,166	0	0	20,546
Shore	March	14	38	0	0	0	0	0
	April	221	568	160	114	0	0	274
	May	475	1,225	816	48	0	0	864
	June	411	1,056	665	167	0	0	832
	July	550	1,407	811	75	0	0	886
	August	619	1,588	1,081	144	0	0	1,225
	September	536	1,369	535	139	0	0	674
	October	113	293	0	109	0	0	109
	Total	2,939	7,544	4,068	796	0	0	4,864
Tideflat	March	12	25	0	0	16	0	16
	April	0	0	0	0	0	0	0
	May	121	81	0	0	1,682	0	1,682
	June	36	47	0	0	0	675	675
	July	212	324	0	0	1,749	0	1,749
	August	49	56	0	0	888	232	1,120
	September	8	7	0	0	18	0	18
	October	0	0	0	0	0	0	0
	Total	438	540	0	0	4,353	907	5,260
Combined	March	139	281	0	4	16	0	20
	April	816	2,602	171	697	0	0	868
	May	2,704	9,199	1,968	1,754	1,682	0	5,404
	June	2,119	6,481	1,356	1,808	0	675	3,839
	July	3,775	13,078	1,523	5,825	1,749	0	9,097
	August	4,645	13,442	1,405	2,886	888	232	5,411
	September	5,136	16,618	1,010	3,094	18	0	4,122
	October	994	4,017	15	1,894	0	0	1,909
Grand Total		20,328	65,718	7,448	17,962	4,353	907	30,670

**Table 16. TAXONOMIC LIST OF SPECIES HARVESTED  
By Estuarine Resource Users, Nehalem River Estuary  
March 1 through October 31, 1971**

Common Name	Local Names	Scientific Name
<b>Fish</b>		
Black rockfish	Black sea bass, black snapper	<i>Sebastes melanops</i>
Buffalo sculpin	Bullhead	<i>Enophrys bison</i>
Chinook salmon	King salmon, salmon	<i>Oncorhynchus tshawytscha</i>
Coho salmon	Silver salmon	<i>Oncorhynchus kisutch</i>
Cutthroat trout	Blueback, harvest trout, sea run	<i>Salmo clarki</i>
Kelp greenling	Seatrout	<i>Hexagrammos decagrammus</i>
Pacific staghorn sculpin	Bullhead	<i>Leptocottus armatus</i>
Pile perch		<i>Rhacochilus vacca</i>
Redtail surfperch		<i>Amphistichus rhodoterus</i>
Rock greenling	Seatrout	<i>Hexagrammos lagocephalus</i>
Shiner perch	Shiner	<i>Cymatogaster aggregata</i>
Silver surfperch		<i>Hyperprosopon ellipticum</i>
Starry flounder		<i>Platichthys stellatus</i>
Striped seaperch	Rainbow perch	<i>Embiotoca lateralis</i>
Walleye surfperch		<i>Hyperprosopon argenteum</i>
White seaperch		<i>Phanerodon furcatus</i>
<b>Crabs</b>		
Dungeness crab	Market crab	<i>Cancer magister</i>
<b>Clams</b>		
Softshell clam	Bay clam, mud clam	<i>Mya arenaria</i>
<b>Shrimp</b>		
Ghost shrimp	Sand shrimp	<i>Callinassa californiensis</i>



**FIGURE 2. 1971 FCO RESOURCE SURVEY SAMPLING AREAS**

- S - Shore Fishing Area**
- B - Boat Fishing Area**
- T - Tideflat Use Area**

PACIFIC OCEAN

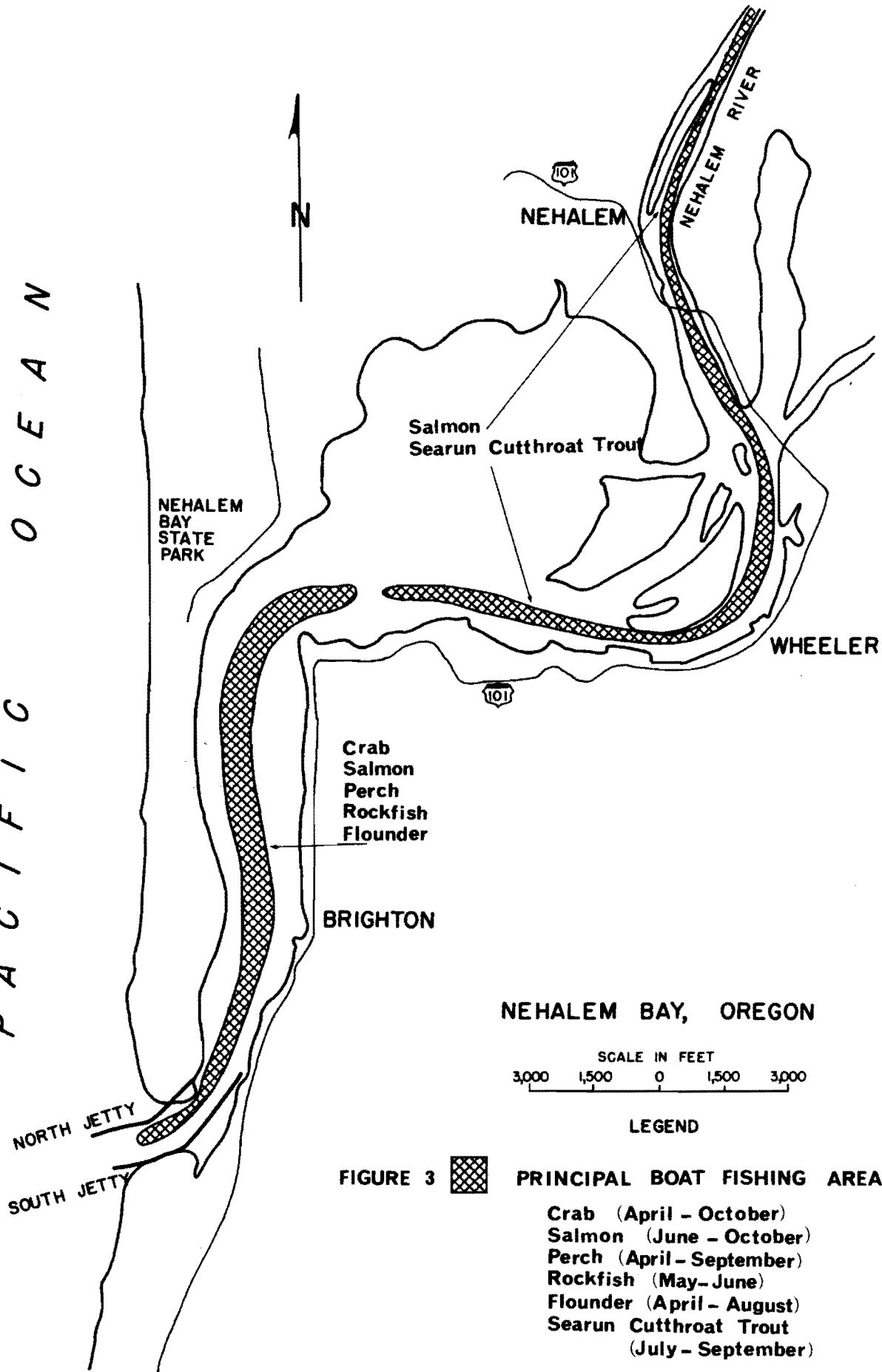
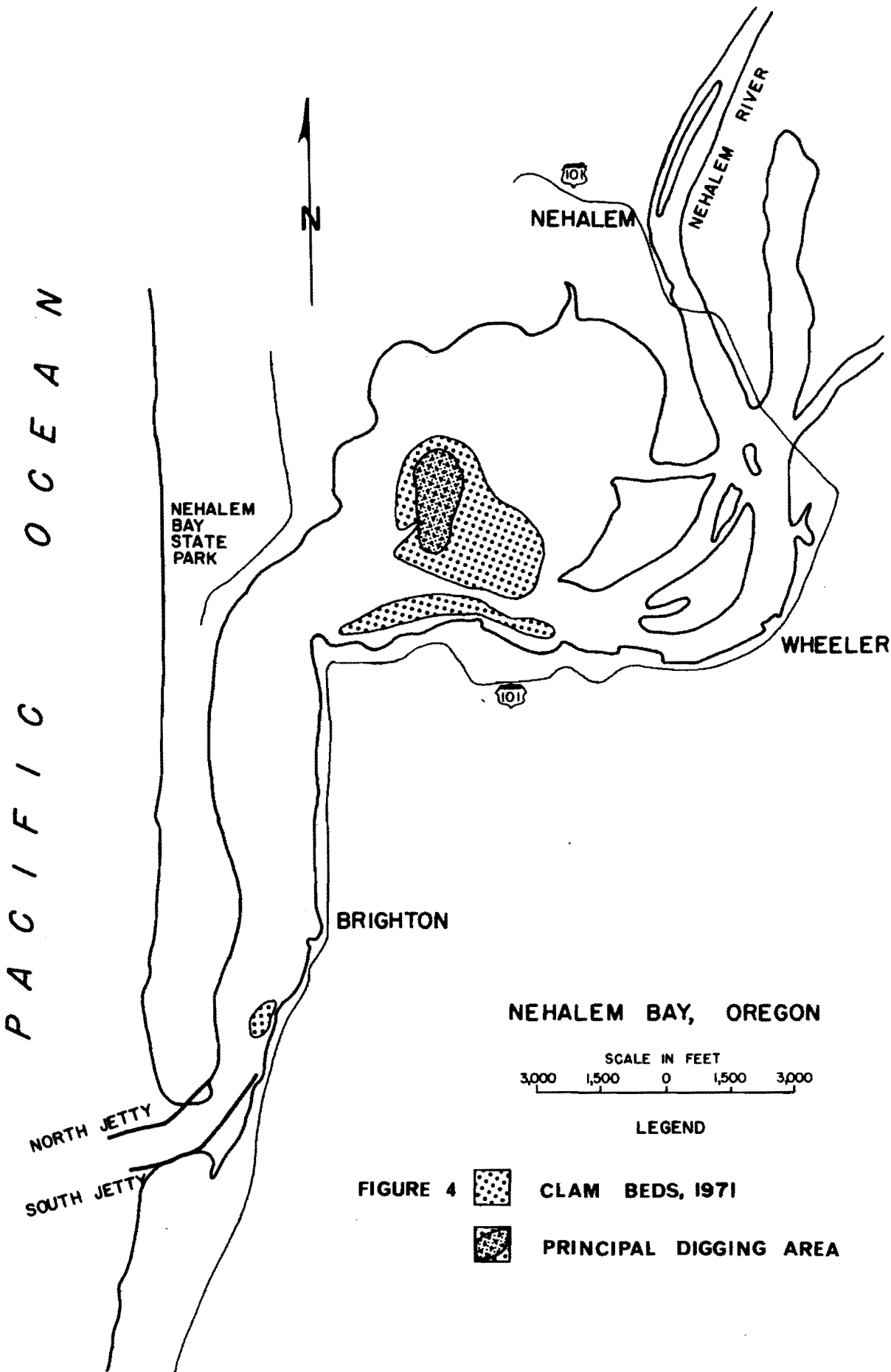
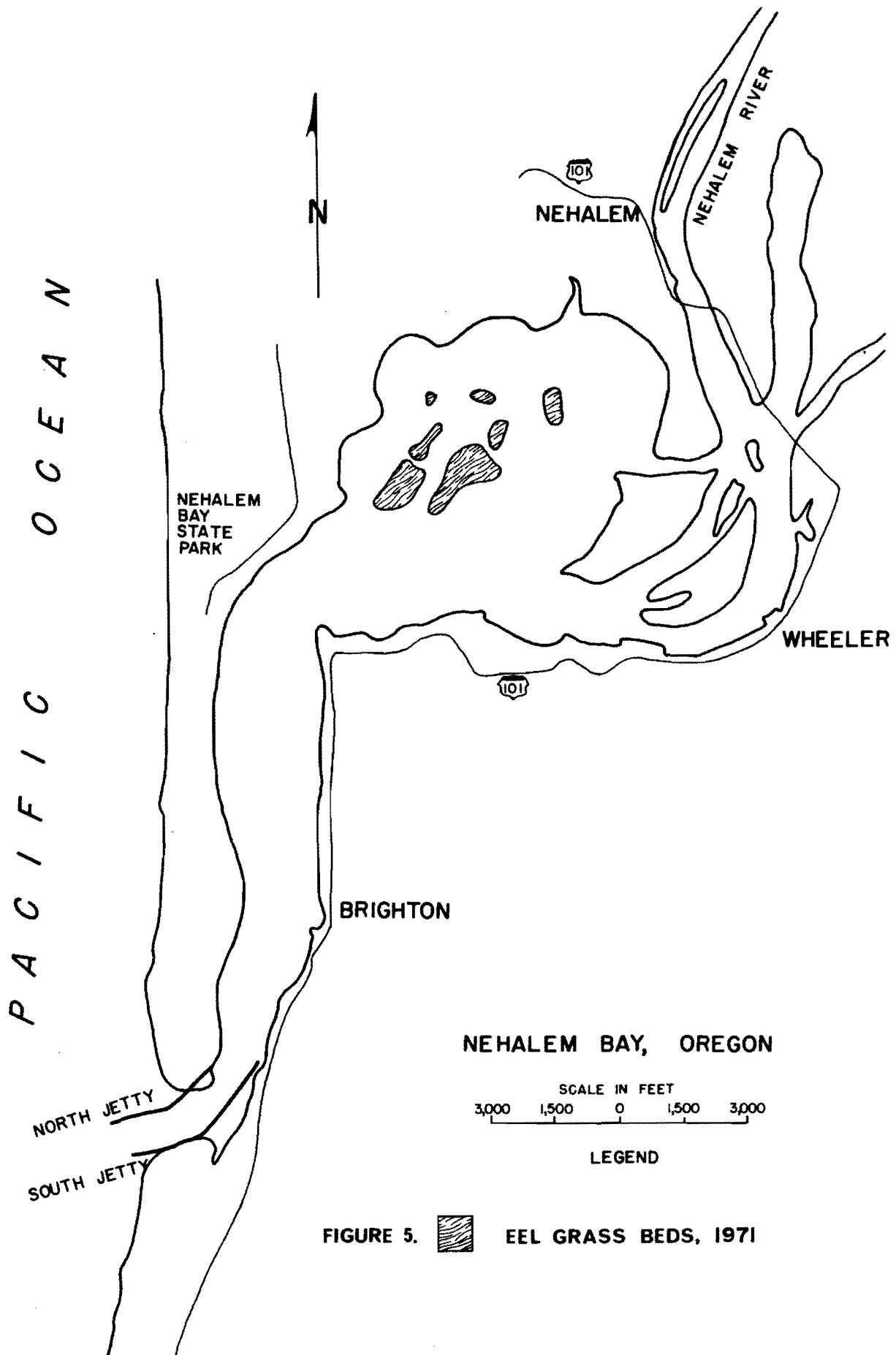


FIGURE 3  PRINCIPAL BOAT FISHING AREAS, 1971

- Crab (April - October)
- Salmon (June - October)
- Perch (April - September)
- Rockfish (May - June)
- Flounder (April - August)
- Searun Cutthroat Trout (July - September)







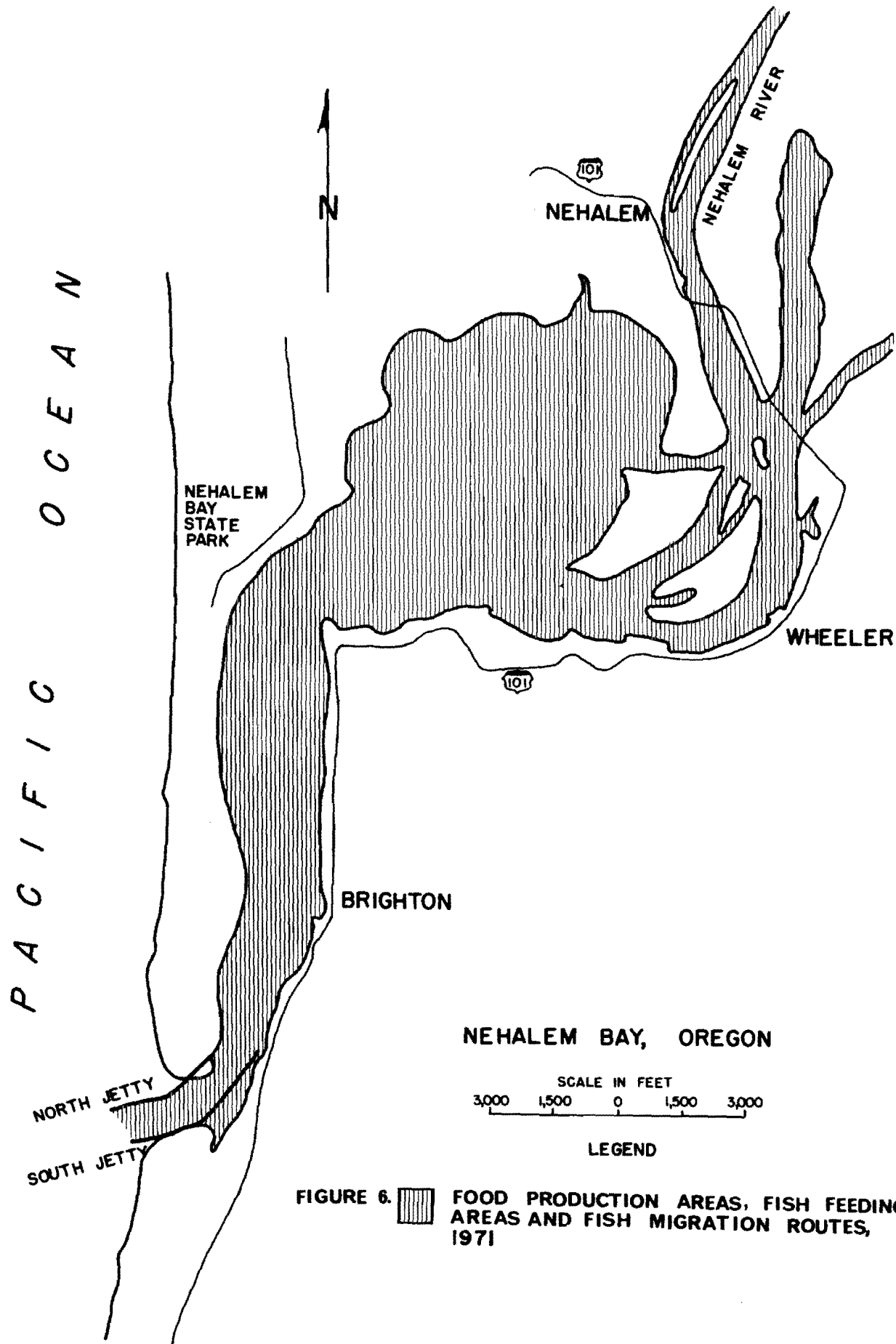


FIGURE 6.  FOOD PRODUCTION AREAS, FISH FEEDING AREAS AND FISH MIGRATION ROUTES, 1971

#### **ACKNOWLEDGMENTS**

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