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Coastal Engineering Technical Note

VALUE OF PACIFIC NORTHWEST SALT MARSHES

PROBLEM: Studies of the value of Atlantic salt marshes for coastal fisheries in many instances have been used to evaluate the impact of constructing projects on Pacific Northwest salt marshes. The evaluator has been assuming that the east and west coast marshes function in a similar manner. A recent study has shown that such inferences may not be totally justified. This note provides information on two Oregon salt marshes for use in preparing environmental assessments and statements for projects in the Pacific Northwest.

APPROACH: A study was conducted from 1978 through 1980 to determine the animal communities and their food chains in the marshes in Siletz and Netarts Bays, Oregon (Figure 1). The approach was to sample major habitat types in the marsh and adjacent estuary and to compare the animal species and their feeding habits to determine the value of the various estuarine and marsh habitats. The sampling was conducted principally in the spring and summer.

RESULTS: This study describes the community structure and aquatic food chains in two Oregon estuaries and their adjacent salt marshes for comparison with other estuarine and marsh communities. The study identifies both similarities and differences between communities of the Pacific Northwest marshes and those studies elsewhere on the Pacific and Atlantic coasts. The invertebrate fauna collected in the Oregon marshes are summarized by habitat type in Tables 1 and 2. The variety of invertebrates was highest in the high-level marsh, slightly lower in the low-level marsh and lowest in the debris line (Table 1). Many of the invertebrates of the aquatic habitats (Table 2) were also similar to those found in the marshes (Table 1), but the number of kinds of invertebrates was not as great as in the marsh. An unexpected observation was the scarcity of gastropod mollusks in the Oregon marshes, which are common to Southern California and Atlantic coast marshes.

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Study Area No.	Major Habitat Type
1.	Low sand marsh (about +2.4m MLLW)
2.	Low silt marsh
3.	Sedge marsh (about +2.3m MLLW)
4.	Immature high marsh (about +3.2m MLLW)
5.	Mature high marsh
6.	Netarts low sand marsh seine site
7.	Silets low sand marsh seine site
8.	Open bay otter trawl sites (indicated by ▲)

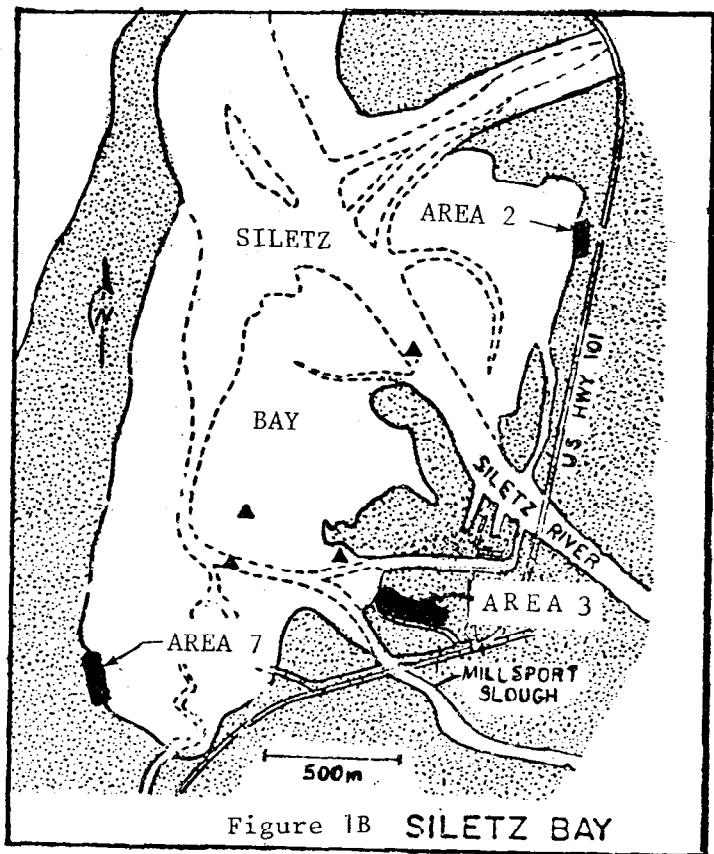
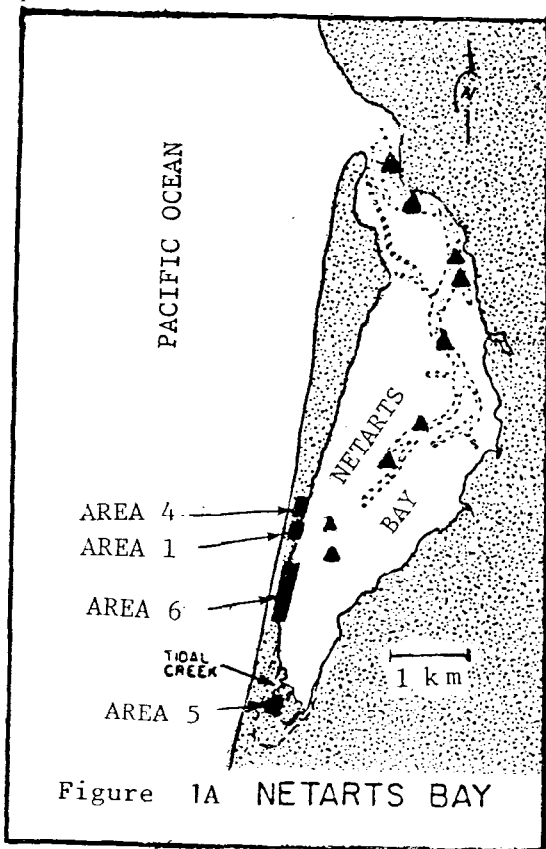
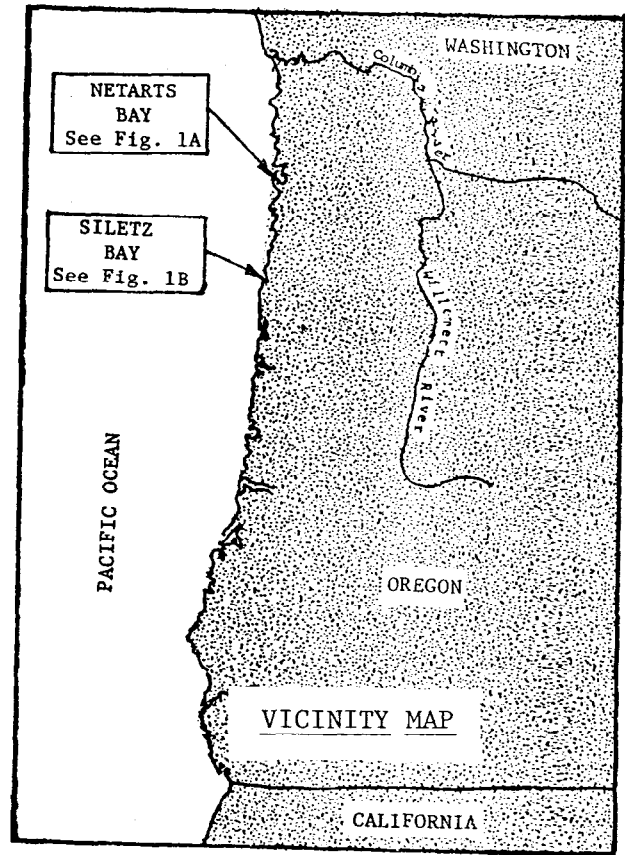


Figure 1. Location of Study Areas in Netarts and Siletz Bays

Table 1. Invertebrates Characteristic of Terrestrial Habitats 1/

CLASSIFICATION	HABITAT			CLASSIFICATION	HABITAT		
	High Level Marsh	Debris Line <u>2/</u>	Low Level Marsh		High Level Marsh	Debris Line <u>2/</u>	Low Level Marsh
Cnidaria				Coleoptera			
<i>Hydractinia</i> sp. <u>3/</u>			A	Carabidae	A	A	A
Turbellaria	A			Limnobiidae	A	A	A
Nematoda	A		A	Staphylinidae	A	A	A
Polychaeta				Psephenidae	A		
Capitellidae			A	Ptiliidae	A		
<i>Hobsonia florida</i>			A	Heteroceridae	A		
Oligochaeta	A		A	Coccinellidae	A		A
Araneae	A	A	A	Corylophidae	A		
Acarina	A	A	A	Chrysomelidae	A		
Cirripedia				Trichoptera			
Balanidae			A	Limnephilidae			L
Cumacea				Lepidoptera	A	A	
<i>Cumella</i> sp.			A	Pyrilidae			L
Isopoda				Diptera			
<i>Gnathosphaeroma lutea</i>			A	Tipulidae	L		A,L
<i>Ligidium gracilis</i>	A			Psychodidae	A		A,L
<i>Porcellio scaber</i>	A			Ceratopogonidae	A,L		A,L
Amphipoda				Chironomidae	A,L	A	A,L
<i>Ampithoe</i> sp.			A	Culicidae	A		A
<i>Corophium</i> sp.			A	Mycetophilidae	L		
<i>Anisogammarus confervicolus</i>			A	Scatopsidae	A		
<i>Orchestia traskiana</i>	A	A	A	Sciariidae	A	A	A
Collembola				Cecidomyiidae		A	
Entomobryidae	A			Dolichopodidae	A,L		A,L
Isotomidae	A	A		Longchopteridae	A		
Onychiuridae	A	A		Phoridae	A		
Poduridae	A			Sepsidae	A		
Sminthuridae	A	A		Sciomyzidae	A		
Diplura			A	Spaeroceridae	A	A	A
Orthoptera	A			Ephydriidae	A		A
Thysanoptera	A	A	A	Chloropidae	A		A
Hemiptera				Muscidae	A		A,L
Saldidae		A,N	A,N	Hymenoptera	A	A	A
Lygaeidae			A	Chilopoda	A		
Miridae	A		A				
Pentatomidae	A		A				
Homoptera							
Cercopidae	A		A				
Cicadellidae	A		A				
Delphacidae	A		A				
Aphididae	A		A				

1/ Letters indicate stage of invertebrates' growth: A = adults, L = larvae, N = Nymphs

2/ A line of dead grass between the low level or regularly flooded marsh and the high or irregularly flooded marsh.

3/ Species (sp.) identification uncertain.

Table 2. Invertebrates Characteristic of Aquatic Habitats 1/

CLASSIFICATION	Habitat				CLASSIFICATION	Habitat			
	Panne 2/	Tidal Creek	Tidal Sandy	Flat Muddy		Panne 2/	Tidal Creek	Tidal Sandy	Flat Muddy
Cnidaria		A		A	Tanaidacea				
Nemertea		A	A		Paradeidae sp.		A	A	
Nematoda		A	A	A	Leptochelia sp.		A	A	
Polychaeta					Isopoda				
<i>Hyplosetoloplos</i> sp.			A		<i>Gnotinosphaeroma lutea</i>	A	A		
<i>Polydora</i> sp.		A			<i>Idotea resicata</i>		A		
<i>Pseudopolydora</i> sp.		A	A	A	Amphipoda				
<i>Pygospio</i> sp.		A	A	A	<i>Ampithoe</i> sp.	A	A		
<i>Streblospio</i> sp.		A		A	<i>Corophium</i> sp.	A	A		
Capitellidae	A	A	A	A	<i>Anisogammarus confervicolus</i>	A	A		A
<i>Neanthes limnicola</i>		A			<i>Eohaustorius</i> sp.			A	A
<i>Etcone</i> sp.		A	A	A	<i>Parapsixus</i> sp.			A	
Arabellidae			A		Talitridae		A		A
<i>Hobsonia florida</i>	A	A		A	Decapoda				
Spirorbidae		A			<i>Callinassa</i> sp.			A	
Oligochaeta	A	A	A	A	<i>Hemigrapsus oregonensis</i>		A		A
Gastropoda					Collembola				
<i>Alderia</i> sp. 3/		A		A	Isotomidae			A	
Bivalvia					Odonata	N			
<i>Cryptomya californica</i>			A		Hemiptera				
<i>Macoma balthica</i>		A		A	Saldidae		A,N		
Araneae		A			Corixidae	A	A		
Acarina		A			Homoptera				
Ostracoda		A	A		Aphididae		A	A	
Copepoda					Coleoptera				
Calanoida	A	A			Hydrophilidae	A			
Cyclopoida		A	A		Limnbiidae	A			
Harpacticoida	A	A		A	Staphylinidae		A		
Cirripedia					Trichoptera				
Balanidae		A			Limnephilidae	L			
Cumacea					Diptera				
<i>Cumella</i> sp.	A	A		A	Tipulidae		A,L		
<i>Hemileucon</i> sp.		A		A	Physchodidae		A,L		
					Ceratopogonidae	L	A,L	A	
					Chironomidae	L	A,L		
					Culicidae	L	A		
					Tabanidae	L			
					Dolichopodidae	L	A,L		L
					Ephydriidae	L	A		
					Muscidae	L	L		

1/ Letters indicate stage of invertebrates' growth: A = adult, L = larvae, N = nymphs.

2/ Shallow depression in the marsh.

3/ Species (sp.) identification uncertain.

Terrestrial and aquatic invertebrate communities fed heavily on detritus and/or were scavengers. However, the number of animals that feed on plants increased from low marsh to high marsh and was the dominant type of animal in higher portion of the vegetation in the high marsh.

Twenty-seven species of fish were collected in the various habitat types to determine their distribution and food habitats (Table 3). Of these, six species were captured in the marsh habitats. Two species, staghorn sculpin and the threespined stickle back dominated the catches in both the high and low marshes. Juvenile surf smelt and juvenile chum salmon (a commercial species) were also captured in the marsh habitat, primarily over submerged low marshes. In the sloughs adjoining the marshes, 13 fish species were caught. The shiner surfperch was the most abundant. The largest variety of fish, 18 species, was

caught in the bay channel. Only four of the 18 species were also caught in the marsh. Juvenile English sole was the predominant marine species caught in the estuary but was missing from the marsh.

The stomach contents of fish captured in both the marsh and estuarine habitats indicate relatively little use of marsh animals for food. Of those fish caught over the submerged level marshes, terrestrial prey were observed only in the stomachs of chum salmon. In the marsh pannes (shallow depressions in the marsh), little of the fishes' food was of terrestrial origin. In the bay channels terrestrial animals were also of minor importance. It appears that, in the Oregon estuaries, the major food pathway from the marsh to the aquatic community is primarily through a detrital (composed of disintegrated material) pathway and is supplemented by benthic and planktonic plants and animals.

Table 3. Occurrence of Fish Species in Several Marsh and Aquatic Habitats 1/

Fish Species	High Marsh 2/		Low Marsh 3/			Other		
	Panne 4/	Creek	Level	Panne 4/	Creek	Slough	Tidal Flat	Bay Channel
Number of Samples	3	5	5	2	8	4	4	11
Pacific sand lance (<i>Ammodytes hexapterus</i>)								////
Topsmelt (<i>Atherinops affinis</i>)					////			
Speckled sanddab (<i>Citharichthys stigmaeus</i>)								oooooooo
Staghorn sculpin (<i>Leptocottus armatus</i>)	oooooooo	oooooooo	oooooooo	oooooooo	oooooooo	oooooooo	oooooooo	oooooooo
Buffalo sculpin (<i>Enophrys bison</i>)								////
Cabezon (<i>Scorpaenichthys marmoratus</i>)								////
Prickly sculpin (<i>Cottus asper</i>)					////	////		
Coastal sculpin (<i>Cottus aleuticus</i>)					////			
Shiner surfperch (<i>Cymatogaster aggregata</i>)			////		////	oooooooo		
White surfperch (<i>Phanerodon furcatus</i>)						////		
Northern anchovy (<i>Engraulis mordax</i>)						////		
Pacific tomcod (<i>Microgadus proximus</i>)						////		
Tubesnout (<i>Auloghynchus flavidus</i>)								////
Threespine stickleback (<i>Gasterosteus aculeatus</i>)	oooooooo	oooooooo	oooooooo	oooooooo	oooooooo	oooooooo	////	////
Lingcod (<i>Ophiodon elongatus</i>)								oooooooo
Kelp greenling (<i>Hexagrammos decagrammus</i>)								oooooooo
Surf smelt (<i>Hypomesus pretiosus</i>)		////	oooooooo		////	oooooooo	////	////
Saddleback gunnel (<i>Pholis ornata</i>)						////	////	////
Starry flounder (<i>Platichthys stellatus</i>)			////			////	oooooooo	////
English sole (<i>Parophrys vetulus</i>)							////	oooooooo
Sand sole (<i>Psettichthys melanostictus</i>)							////	////
Chum salmon (<i>Oncorhynchus keta</i>)		////	oooooooo			////		////
Chinook salmon (<i>Oncorhynchus tshawytscha</i>)						////		////
Steelhead trout (<i>Salmo gairdnerii</i>)						////		////
Rockfish spp. (<i>Sebastes</i> spp.) 5/								////
Snake prickleback (<i>Lumpenus sagitta</i>)								////
Bay pipefish (<i>Syngnathus leptorhynchus</i>)								////

1/ Results are based on seine samples (most habitats) and otter trawl samples (bay channel) collected in June, September, and November in 1978 and in April 1979 in Netarts and Siletz Bays; XXX = abundant, /// = present.

2/ Irregularly flooded marsh.

3/ Low marsh refers to regularly flooded sand and silt and sedge marshes.

4/ Shallow depressions in the marsh.

5/ Spp. = more than one species.

CONCLUSIONS:

1. Oregon coastal marshes appear to function differently from those on the east coast. Very few juvenile marine species were observed using the Oregon marshes as nursery habitat during this study, whereas on the east coast the marshes are extensively used as nursery habitat.
2. The Oregon marshes provide a direct food source to the chum salmon through terrestrial prey.
3. It appears that the major food pathway from the marsh to the aquatic community is through the detrital pathway and is supplemented by benthic and planktonic plants and animals.

ADDITIONAL INFORMATION: Contact the CERC Coastal Ecology Branch (202) 325-7393.

REFERENCE:

HIGLEY, D.L., and HOLTON, R.L., "A Study of the Invertebrates and Fishes of Salt Marshes in Two Oregon Estuaries," Draft Final Report, CERC Contract DACW72-77-C-0013, Jan 1981.