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A Study of the Invertebrates and Fishes of Salt Marshes in Two Oregon Estuaries

by

Duane L. Higley and Robert L. Holton

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along with fish stomach contents, are presented as relative frequency histograms and pie charts. Dominant invertebrate taxa in terrestrial collections were Acarina, Homoptera, and Diptera, and in aquatic collections were Capitellidae (polychaeta), Oligochaeta, *Gnoringosphaeroma* (Isopoda), and *Anisogammarus* and *Corophium* (Amphipoda). Three-spine stickleback and young staghorn sculpin were by far the most common fish species throughout the marsh zone; juvenile salmonids and other species were captured only in submerged level marshes and in a slough. Trophic structure of terrestrial and aquatic invertebrate communities was generally heavily weighted to detritivores and scavengers. The herbivore component increased from low marsh to high marsh and was the dominant trophic type in the higher vegetation (sweep net collections) of the high marsh. Araneae was the dominant invertebrate carnivore in the terrestrial communities. Fish consumed primarily aquatic animals, even those captured in tidal creek and submerged level marsh habitats where tidal inundation would be expected to make terrestrial foods available. The detritus food chain appears more important than the grazing food chain in the terrestrial communities, and transfer of marsh products to aquatic food chains apparently is predominantly through the export of detritus rather than by the direct consumption of terrestrial animals.

PREFACE

This report provides base-line and food-chain data on the invertebrate and fish fauna of several marsh habitats located in Siletz and Netarts Bays, Oregon. The study, sponsored by the U.S. Army Coastal Engineering Research Center (CERC) under CERC Contract No. DACW72-77-C-0013, evaluates the trophic value of Pacific coast salt marshes to provide information for assessing the impact of Corps of Engineers projects on these resources in the bay areas and in other marshland along the Oregon coast. Results and conclusions presented here are those of the authors and are not necessarily accepted by CERC or the Corps of Engineers.

The report was prepared by Duane L. Higley, Research Assistant, and Dr. Robert L. Holton, Assistant Professor of Oceanography, School of Oceanography, Oregon State University, Corvallis, Oregon, with the assistance of the following members of the staff of the School of Oceanography, Oregon State University: K. Chalopka, K. Jones, J. Morgan, J. Shaffer, and F. Stilwell. In addition, several students in the College Work Study Program worked on the project.

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Comments on this publication are invited.

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Colonel, Corps of Engineers
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CONVERSION FACTORS, U.S. CUSTOMARY TO METRIC (SI) UNITS OF MEASUREMENT

U.S. customary units of measurement used in this report can be converted to metric (SI) units as follows:

Multiply	by	To obtain
inches	25.4	millimeters
	2.54	centimeters
square inches	6.452	square centimeters
cubic inches	16.39	cubic centimeters
feet	30.48	centimeters
	0.3048	meters
square feet	0.0929	square meters
cubic feet	0.0283	cubic meters
yards	0.9144	meters
square yards	0.836	square meters
cubic yards	0.7646	cubic meters
miles	1.6093	kilometers
square miles	259.0	hectares
knots	1.852	kilometers per hour
acres	0.4047	hectares
foot-pounds	1.3558	newton meters
millibars	1.0197×10^{-3}	kilograms per square centimeter
ounces	28.35	grams
pounds	453.6	grams
	0.4536	kilograms
ton, long	1.0160	metric tons
ton, short	0.9072	metric tons
degrees (angle)	0.01745	radians
Fahrenheit degrees	5/9	Celsius degrees or Kelvins ¹

¹To obtain Celsius (C) temperature readings from Fahrenheit (F) readings, use formula: $C = (5/9) (F - 32)$.

To obtain Kelvin (K) readings, use formula: $K = (5/9) (F - 32) + 273.15$.

A STUDY OF THE INVERTEBRATES AND FISHES OF SALT MARSHES IN TWO OREGON ESTUARIES

by
Duane L. Higley and Robert L. Holton

I. INTRODUCTION

North American salt marsh ecosystems have been intensively studied because of their high productivity and relatively simple structure. However this attention has been mainly directed to the Atlantic coast marshes. Prior studies have investigated community structure and population energy flow (Odum and Smalley, 1959; Teal, 1962; Nixon and Oviatt, 1973), nutrient pathways using radionuclide tracers (Marple, 1966), and faunal distribution (Barnes, 1953; Davis and Gray, 1966). Studies centered in the Chesapeake Bay region, the Carolina coast, Sapelo Island (Georgia), and Barataria Bay (Louisiana) have produced the following information on salt marsh characteristics: (a) Primary productivity is high (about 445 to 2,883 grams dry weight per square meter per year), comparable to the most fertile natural and agricultural systems; (b) little of the marsh production is grazed (<10 percent), most ending up in detritus food webs of the estuary; and c) the nutritional content of detrital particles consumed is enhanced by adhering decomposer organisms (summarized by de la Cruz, 1973). Because of the major importance of detritus food chains in marsh and other estuarine habitats, recent work has emphasized determining the rates and outputs of marsh detritus (Reimold, et al., 1975), and the structure of the dependent heterotrophic food chains (Odum and Heald, 1975).

Floral composition and zonation of salt marshes on the Pacific coast have been documented (MacDonald, 1977). The major study of Oregon salt marsh vegetation is by Jefferson (1974), who characterized and mapped essentially all Oregon's coastal marshes except those in the Columbia River. Her descriptions of species composition and community structure, succession, and distribution apply to Washington marshes (MacDonald, 1977). Further description of marsh composition and zonation is provided by Frenkel, Boss, and Schuller (1978). They studied the transition zone between intertidal marshes and contiguous upland vegetation in Oregon and Washington.

Eilers (1979) conducted an intensive study of the salt marshes of Nehalem Bay, Oregon. He determined plant associations and zonation relations, and measured primary production and detrital output. Net primary production varied between 518 and 1,936 grams per square meter per year. An excess of 90 percent of the intertidal net production was transported into the estuary as detritus.

The Environmental Protection Agency (EPA) is currently studying salt marsh plant productivity in Siletz and Netarts Bays, Oregon. The EPA study is part of a larger program concerned with defining wetland boundaries, the reactions of wetlands to perturbation, and the effects of wetlands on water quality (H. Kibby, Corvallis Environmental Research Laboratory, EPA, Corvallis, Oregon, personal communication, 1979).

Information on the structure and ecology of the animal communities of Pacific coast salt marshes is incomplete. MacDonald (1969) studied the local, seasonal, and latitudinal variations in molluscan fauna in level marsh and tidal creek habitats along the Pacific coast from Baja, California, to Washington. He found *Assiminea translucens*, a small prosobranch, to be ubiquitous in level marshes of this region, with *Littorina newcombiana* (Prosobranchia) and *Phytia myosotis* (Pulmonata) joining *Assiminea* to form a characteristic Oregonian assemblage. Tidal creek mollusks were mostly bivalves, a *Macoma-Mya* assemblage characterizing the Oregonian Province. The number of species recorded from each habitat increased from north to south. Level marsh mollusks fed predominantly on algae or plant detritus by rasping; tidal creek forms included deposit and suspension feeders as well as predators and scavengers.

Whitlatch (1974) observed the growth, production, and seasonal abundance patterns of *Batillaria zonalis*, a small introduced prosobranch, in pans, tidal creeks, mudflats, and *Salicornia* level marshes of Tomales Bay, California. Abundance was greatest in pans and creeks, but recruitment was lacking in the creeks which apparently resulted in the relative stability of the populations there. Influx was likely due to immigration from the pans where recruitment was successful.

Two studies have been made of insect populations of San Francisco Bay marshes. Using a sweep net for collecting, Lane (1969) identified 124 species in *Spartina-Salicornia* marshes. The majority of species were in the orders Diptera (flies) and Homoptera (planthoppers); Delphacidae (Homoptera), and Chloropidae, Ephydriidae, and Chironomidae (all Diptera) were the dominant families. Cameron (1972) used a clip-quadrat method in a similar marsh to study insect trophic diversity and its relation to resource availability (living and dead plant materials). He found that herbivore diversity increased with primary production, and that saprovores diversity increased during periods of detrital input. In general, trophic diversity showed seasonal patterns relating to physical factors and (more clearly) to resource availability. Cameron hypothesized that seasonal increases in diversity occurred as seasonal species joined persistent species in exploiting expanding resources.

The only major study of trophic relations in a Pacific coast salt marsh ecosystem is the Coos Bay, Oregon, study sponsored by the National Science Foundation (Hoffnagle, et al., 1976). Short-term field and laboratory studies were used to measure net primary production, detrital production, decomposition rate, nutrition of key species, and the composition of insect and fish populations of several marsh sites.

In recent years, interest has increased in the role of estuarine food chains in the growth and survival of seaward-migrating juvenile salmonids along the Pacific Northwest coast. There is evidence that those juveniles which benefit from favorable estuarine conditions have a better chance at sea (e.g., Reimers, 1971). These fish seem to adjust their habitat and feeding strategies to exploit freshwater and marine as well as estuarine food chains while making the transition to marine life (Mason, 1974). The fish are found in some marsh habitats, especially tidal creeks. Dunford (1975) found juvenile chum salmon (*Oncorhynchus keta*) and chinook salmon (*O. tshawytscha*) residing in sloughs and creeks of the Fraser River estuary

marshlands (British Columbia) in the spring and summer. The salmon consumed a variety of terrestrial, planktonic, and benthic foods. Dunford identified 13 other fish species in these habitats.

Juvenile salmonids in nonmarsh habitats may exploit marsh-based food chains. In the Squamish River estuary (British Columbia), Cliff and Stockner (1973) discovered heavy feeding by salmon on amphipods (principally *Anisogammarus* spp.) which are largely marsh-dependent. Juvenile chum salmon in the Nanaimo estuary (British Columbia) heavily exploit harpacticoid copepods and thus have a food chain that depends on detritus from the marshlands (Healey, 1979).

Although past studies of Pacific coast salt marshes have been limited, the data collected suggest similarities of structure and function between these marshes and the Atlantic coast marshes; e.g., levels of primary production, contribution to detritus-based food chains, and some aspects of community composition. Important questions remain regarding the value of Pacific coast marsh habitats and food chains for various fish species, especially juveniles. The trophic structure and function of these marshes should be determined, especially to evaluate the human use of marshlands.

This study characterizes the animal communities and food chains of marshes in Siletz and Netarts Bays, Oregon. The objectives were to develop taxonomic lists, to characterize the trophic structure of marsh invertebrate communities, and to identify the principal fish species using the marsh and marsh-related habitats. In addition, food habits of these fish were studied to determine marsh food-chain relations.

II. DESCRIPTION OF STUDY AREAS

1. General.

Salt marshes of the Pacific Northwest are of recent origin and, in comparison to the Atlantic marshes, are limited in size and distribution. The steep and rocky coastlines of Washington, Oregon, and California restrict suitable marsh habitats to a few bays, estuaries, and lagoons. These marshes generally lack the thick peat layers which reflect long-term accretion (MacDonald, 1969).

In Oregon, interglacial deposits filled river mouths, and post-Pleistocene drowning produced extensive tidelands in the northern and central bays. More rapid sediment deposition in the southern bays matched rises in sea level and thus restricted tideland development. All the 27 estuaries in Oregon are presently accumulating sediment. Fires in the mid-19th century and the Tillamook fire in 1933, augmented by logging and other detrimental land-use practices, have increased the erosional sources of bay deposits (Jefferson, 1974).

The climate of the Oregon coast is wet-temperate. Annual precipitation averages about 180 centimeters and temperature about 10° Celsius. The frost-free season lasts 250 to 300 days, and freezing weather is infrequent. Pacific winter storms accompanied by gale-force winds are common, but generally lack the destructive force of tropical and convective storms common to the Atlantic coast. Winter freshets in coastal rivers

and the diluting effects of the Columbia River discharge may substantially reduce estuarine salinities. In light of this, Kistritz (1978) suggests that the term "salt marsh" may often be inappropriate in describing tidal marshes of the Pacific Northwest.

Mixed diurnal tidal fluctuations result in abrupt changes of immersion and exposure times at about 2.7 meters or mean higher high water (MHHW), where mean lower low water (MLLW) is the zero datum. Below MHHW a distinctive salt marsh vegetation characterized by pickleweed (*Salicornia virginica*), commonly known as "low marsh," extends down to about mean lower high water (MLHW). Above MHHW, a "high marsh," characterized by tufted hair grass (*Deschampsia caespitosa*), grades into terrestrial vegetation at about extreme high water (EHW). Jefferson (1974) lists six vegetation types for Oregon saline-brackish intertidal marshes: (a) low sand marsh, (b) low silt marsh, (c) sedge marsh, (d) immature high marsh, (e) mature high marsh, and (f) bulrush and sedge marsh. One to seven vegetative communities may occur within each vegetation type. These communities and marshes form complex and somewhat variable relations with each other and with tidal level which Jefferson treats as successional. Three successional patterns occur, depending on substrate (sand versus silt) and freshwater influence. Lyngbye's sedge (*Carex lyngbyei*) is intermediate in all three patterns, widely distributed, and considered by Jefferson to typify Oregon salt marshes.

Low marshes typically advance through coalescing colonies of seaside arrowgrass (*Triglochin maritima*) or rhizomous mats of pickleweed. The lower edges of the marsh are also commonly lined with three-square bulrush (*Scirpus americanus*). Transitions from low to high marsh may be gradual or abrupt across an eroded bank. Tidal flat to high marsh eroded banks may be 1 meter high. Extensive diking, landfills, and other man-induced effects have significantly changed the marshlands. Jefferson (1974) states that undiked old, high marsh is nearly nonexistent in Oregon.

2. Siletz and Netarts Bays.

Siletz Bay, a spit-protected estuary of about 4.8 square kilometers, is located on the central Oregon coast (Fig. 1). The bay receives runoff from the Siletz River and two creeks. The average winter and summer Siletz River discharge is 45 and 6 cubic meters per second, respectively. Logging has caused extensive sedimentation, and diking, roadbuilding, and filling projects have restricted flushing, causing tidelands to increase; therefore, the marshes are expanding. Salinity varies widely according to discharge and tide stage. During winter freshets, the salinity of surface waters is often less than 5 parts per thousand where the Siletz River enters the bay; summer surface salinities exceed 20 parts per thousand (Rauw, 1975). Temperatures generally vary from 7° to 15° Celsius (Rauw, 1975), but may exceed 18° Celsius in some habitats (Table 1).

Netarts Bay, a shallow, bar-built estuary of about 10.4 square kilometers, is located on the north-central Oregon coast (Fig. 1). The bay has a very small watershed, which drains through 13 small creeks, and is therefore usually completely mixed and marine-dominated. Salinities usually exceed 25 parts per thousand. Bay temperatures generally reflect ocean temperatures (about 8° to 15° Celsius); however, temperatures greater

STUDY AREAS

- 1 Low sand marsh
- 2 Low silt marsh
- 3 Sedge marsh
- 4 Immature high marsh
- 5 Mature high marsh
- 6 Netarts open bay otter trawl sites (indicated by ▲)
- 7 Netarts low sand marsh seine site
- 8 Siletz low sand marsh seine site
- 9 Siletz open bay otter trawl sites (indicated by ▲)

Figure 1. Location of study areas in Netarts and Siletz Bays.

Table 1. Salinity and temperature readings.

Area	Habitat	Date	Salinity (‰)	Temperature (°C)
Netarts Bay				
1	Level marsh	18 Jan. 78	--	9.0
1	Level marsh	7 Feb. 78	26	9.8
4	Tidal flat	7 Apr. 78	29	17.0
4	Large pan	7 Apr. 78	12	--
1	Level marsh	7 Apr. 78	29	--
6	Bay channel	3 June 78	31	--
1	Level marsh	22 July 78	36	27.0
1	Level marsh	17 Oct. 78	33	20.0
5	Tidal creek	17 Oct. 78	33	20.0
5	Marsh channel	1 Nov. 78	18-30	7.0-11.8
5	Pan	1 Nov. 78	13	--
7	Tidal flat	29 Aug. 78	33	21.0
5	Tidal creek	12 Apr. 79	15	11.0
5	Pan	12 Apr. 79	19	11.0
7	Tidal flat	12 Apr. 79	28	11.0
Siletz Bay				
3	Level marsh	18 Jan. 78	--	9.5
3	Level marsh	6 Feb. 78	28	10.5
3	Level marsh	6 Apr. 78	9	12.5
2	Level marsh	6 Apr. 78	9	12.5
3	Slough	24 June 78	21	--
3	Tidal creek	21 July 78	26	28.0
2	Level marsh	21 July 78	30	25.0
3	Tidal creek	21 July 78	26	23.0
9	Tidal flat	18 Sept. 78	18-20	18.0
3	Level marsh	16 Oct. 78	25	15.5
2	Level marsh	16 Oct. 78	23	16.0
3	Tidal creek	26 Apr. 79	18	17.0
8	Level marsh	26 Apr. 79	27	14.0
3	Pan	26 Apr. 79	15	18.0

than 26° Celsius may occur in the summer over tidal flats and marshlands (Table 1). Logging on the watershed from 1951 to 1971 caused extensive siltation in the bay, but sediment input now is apparently low and stable (Kreag, 1979).

High and low marshes fringe the inner shore of the spit, and a large area of high marsh occupies the southern end of the bay. This marsh was once diked and used for pasture; however, the marsh has since reverted to nearly natural drainage patterns under State ownership.

3. Bay Study Areas.

Nine study areas were established in the two estuaries (Fig. 1). Areas 1 to 5 were chosen to represent the specific vegetation types listed by Jefferson (1974), and were sampled most thoroughly. Substrate characteristics of the marsh soil in these areas are given in Table 2. The other areas are open bay and low marsh habitats, sampled once for fish. Elevation data for areas 1, 3, and 4 are based on nearby EPA study sites (H. Kibby, personal communication, 1979).

a. Area 1, Low Sand Marsh (Netarts Spit). This sandy beach (Table 2) supports a mixed cover of pickleweed and saltgrass (*Distichlis spicata*). The lower edge of the marsh is lined with three-square bulrush. Invertebrate samples were taken in the pickleweed-saltgrass zone (about 2.4 meters above MLLW), and fish samples in the three-square bulrush zone and the adjacent tidal flat (≤ 2.1 meters above MLLW). A debris line of dead eelgrass (*Zostera marina*) frequently forms at varying levels along this marsh.

b. Area 2, Low Silt Marsh (North of Siletz River). This is an area of prograding low marsh along Highway 101. The substrate in the marsh and the adjoining tidal flat is mud (Table 2). The lower edge of the marsh is composed of interrupted colonies of seaside arrowgrass invaded by Lyngbye's sedge, which is the dominant species at higher elevations. Aquatic invertebrate samples were taken in this transition zone which is characterized by frequent flooding, pools of standing water among the plants, and dense populations of amphipods and isopods. Terrestrial invertebrate samples were collected higher in the sedge stand. Fish samples were collected about 100 meters south of these sites in a series of small tidal creeks that extend from high marsh through the sedge community and through the bulrush community at the edge of the marsh.

c. Area 3, Sedge Marsh (South of the Siletz River). This marsh has muddy soil (Table 2) with vegetation dominated by sedge, but floods less frequently than the low silt sedge marsh. Elevation in the region of level marsh invertebrate sampling site is about 2.3 meters above MLLW. A dendritic system of small tidal creeks laces the marsh and apparently receives some seepage through earthen dikes. A major creek (maximum 10 meters wide, 0.7 meter deep) dissects the marsh in an east-west direction. The channel is deep at both marsh edges and shallow at the marsh center. Therefore marsh drainage water in the channel flows in both directions away from the center. Fish and aquatic invertebrate samples were taken in various creek, pan, and tidal flat habitats, as well as in Millport Slough which borders the marsh on the southwest. All these habitats have muddy substrates.

Table 2. Substrate characteristics of marsh soil at level marsh sampling sites.¹

River Marsh	Netarts Low sand (area 1)	Siletz Low silt (area 2)	Siletz Sedge (area 3)	Netarts Immature high (area 4)	Netarts Mature high (area 5)
Debris	3.3%	10.1%	15.6%	66.1%	23.0%
Sediment	96.7%	89.9%	84.4%	33.9%	77.0%
Sand	92.5%	12.8%	1.1%	67.8%	87.0%
Mud	7.5%	87.2%	98.9%	32.2%	13.0%
Sediment Size Class (mm)					
>1.00	0.0%	0.2%	0.2%	0.0%	0.0%
0.500-1.00	0.0%	0.3%	0.3%	0.1%	0.0%
0.250-0.500	71.8%	3.2%	0.3%	2.7%	5.6%
0.125-0.250	19.5%	2.3%	0.3%	57.6%	80.6%
0.063-0.125	1.2%	7.0%	0.1%	7.4%	0.8%
< 0.063	7.5%	87.2%	98.9%	32.2%	13.0%

¹Sample cores were processed in the following manner: (a) The whole sample was wet-sieved on a 2-millimeter screen (>2 mm = debris, <2 mm = sediment); (b) the sediment fraction was wet-sieved on a 0.063-millimeter screen (>0.063 mm = sand, <0.063 mm = mud); (c) the sand fraction was dry-sieved on 1.0-, 0.5-, 0.25-, and 0.125-millimeter screens; and (d) all fractions were dry-weighed. The debris fractions included roots, shells, and similar materials.

d. Area 4, Immature High Marsh (Netarts Spit). This marsh, located slightly north of the low sand marsh, has an elevation of about 3.2 meters above MLLW and is bordered by an eroded bank. The dominant vegetation is tufted hairgrass and Pacific silverweed (*Potentilla pacifica*). The soil is peaty with an underlayer of fine sand (Table 2). A large pan (40 by 10 meters) retains tidal and runoff water during the winter and spring but dries up by midsummer.

e. Area 5, High Marsh (South End of Netarts Bay). A branch of Jackson Creek, which flows directly into the ocean, flows through this 40-hectare marsh. The marsh is dissected by numerous deep tidal creeks with several openings into the bay. These creeks and the northern edge of the marsh have steep eroded banks. The marsh soil is peaty with a sand underlayer. The creek bottom and adjoining tidal flats vary from brown sandy mud to black mud. Marsh vegetation is primarily tufted hairgrass but the composition varies; some areas are dominated by Pacific silverweed, pickleweed, rush, and other plants. The creeks are often clogged with rotting eelgrass. Several pans are scattered throughout the marsh. Those connected to creeks retain water, while others tend to dry out in midsummer.

f. Area 6, Netarts Open Bay. This designates the bay channel and tidal flat regions in which otter trawls were used to obtain estuarine fish samples. The channels are mostly shallow, many of them having eelgrass beds.

g. Area 7, Low Sand Marsh Seine Site (Netarts Bay). This 1-kilometer section of low sand marsh, located immediately south of area 1, is a narrow strip (about 3 to 20 meters wide) that is mostly vegetated by pickleweed. Plant cover is variable, and the shoreline is irregular due to erosion.

h. Area 8, Low Sand Marsh Seine Site (Siletz Bay). This 0.4-kilometer strip of low marsh, located on the southeast edge of the Siletz spit, has high marsh along eroded banks.

i. Area 9, Siletz Open Bay. This designates tidal flats and channels which were sampled for estuarine fish using an otter trawl.

Selection of the study areas was partly based on EPA use of areas 1, 3, and 4 for their productivity studies. The intent was to establish site-specific data on the animal communities of marshes where the EPA studies were being conducted. The EPA work focused on determining primary productivity and decomposition rates for selected, nearly monospecific vegetation types (pure stands) and determining the availability of marsh production to detritus-based food chains. The results of this work are currently being compiled (H. Kibby, personal communication, 1979). Initial conclusions are that primary productivity rates range from about 500 to 1,800 grams per square meter per year, with Lyngbye's sedge having the highest productivity. Biomass of this sedge peaks in June-July at about 1,200 grams per square meter per year. Seaside arrowgrass apparently decomposes more rapidly than other species studied, and is the only species which showed evidence of grazing (probably by deer).

The marshlands provide a variety of habitats and subhabitats whose properties change daily with tidal and seasonal conditions. Animal populations respond with zonations and marked fluctuations which reflect life cycles, tidal exchange, and migrations to escape inundation. In this study, it was impossible to fully characterize these fluctuating populations over the variety of marshes and habitats studied. The approach was to sample the major habitat types in the marsh ecosystem (Fig. 2), and to collect comparative samples from other estuarine habitats such as tidal flats and bay channels. Extensive sampling was conducted in level marshes, the most widely distributed, and tidal creeks, the most likely contributors to aquatic food chains of the marsh habitats.

III. METHODS

1. General.

The basic objective of this research was to characterize the invertebrate and fish life of the Siletz Bay and Netarts Bay marshes. Sampling, which varied with weather and tidal conditions, was conducted at approximately 2-month intervals. The greatest sampling effort was made in the spring and summer. Most collections were either one-time surveys or repeated surveys as opportunities arose. The only habitat for which seasonal data were collected was the submerged marshes (invertebrate fauna). On some occasions, two work crews were used to exploit a brief sampling time frame (e.g., a single high tide). Table 3 lists the various sampling devices and their uses. Appendix A provides suggestions for gear improvement.

2. Invertebrate Studies.

Aquatic invertebrate samples from level marsh, pan, tidal creek, and adjacent tidal flat habitats were routinely processed and preserved in the field using a 5- to 10-percent buffered seawater formalin solution. Occasionally, it was necessary to process samples in the laboratory after storage in an ice chest for a day. Such treatment had no observable effect on the stored animals. Except for terrestrial and certain core samples, all samples were sieved on 0.5-millimeter screens or were obtained with 0.5-millimeter-mesh nets.

After several days storage in formalin solution, the samples were transferred to a 70-percent isopropanol solution and stained with rose bengal or a similar stain to enhance visibility of the animals during sorting. Samples were sorted, under a 3-diopter illuminated lens, to broad taxonomic groups, and later identified. Usually, crustaceans, polychaetes, and bivalves were identified to genus or species, insects to family, and other groups to higher taxa (order, class, etc.). When appropriate, life stage (e.g., adult, larva, pupa) was recorded. Invertebrate classification follows Barnes (1974) and Borror, DeLong, and Triplehorn (1976).

The aquatic samples varied widely in quantity of debris and number of animals collected. To facilitate processing, the samples were separated by stacked sieves into two size groups (0.5 to 2 millimeters and >2 millimeters) or split quantitatively with a Folsom plankton splitter. This

Figure 2. Habitats of the salt marsh ecosystem (adapted from Ranwell, 1972).

Table 3. Description of sampling gear and methods.

<u>Device</u>	<u>Description</u>	<u>Use</u>
Small corer	5.1-cm-diameter tube with handles	Quantitative infauna sampling; also sediment sampling
Medium corer	10.2-cm-diameter tube with handles	Quantitative infauna sampling
Large corer	15.2-cm-diameter tube with handles	Quantitative infauna sampling
Small enclosure	27-cm-diameter by 30-cm-high plastic cyliner	Quantitative sampling of invertebrates of strand line
Large enclosure	1-m-diameter by 1-m-high canvas cylinder with lead-line and floats	Quantitative sampling of invertebrates in submerged level marsh
Aquatic sweep net	0.5-mm-mesh nitex	Quantitative (with large enclosure) and nonquantitative sampling of submerged invertebrates
Terrestrial sweep net	Fine mesh muslin	Semiquantitative sampling of invertebrates on exposed vegetation
Small drift net	0.5-mm-mesh nitex net on 12.5-cm-diameter frame	Nonquantitative sampling of drift organisms in small tidal creeks
Large drift net	0.5-mm-mesh nitex net on 25- by 50-cm frame	Nonquantitative sampling of drift organisms in large tidal creeks
Clip quadrat	25- by 25-cm wooden frame within which plant material was clipped loose from the soil	Quantitative sampling of invertebrates on exposed level marsh
3-m seine	Common-sense seine with 0.6-cm mesh	Fish collection in small tidal creeks and pans
15-m seine	1.3-cm-mesh body and 0.6-cm-mesh bag	Fish collection in large tidal creeks and over low (level) marshes
52-m seine	2.5-cm-mesh body and 1.3-cm-mesh bag	Fish collection over low marshes and adjacent tidal flats and sloughs
Otter trawl	5-m trawl with 3.2-cm-mesh body and 0.6-cm-mesh cod end	Fish collection in bay channels and mudflats

process was especially useful for samples collected with the large enclosure in the fall when detached vegetation was present.

a. Level Marsh. The principal method for collecting submerged invertebrates in the level marshes was the large enclosure (Table 3). It was dropped over a preselected sample point and secured at the soil by standing on the leadline, which closely conformed to the soil contours. The 0.5-millimeter-mesh aquatic sweep net was then repeatedly swept within the enclosure until capture rates were very low or zero. The animals and debris were concentrated and preserved. This method provides a semiquantitative measure of the aquatic and terrestrial animals found near or in submerged vegetation, although in a few cases it was difficult to remove all of the highly abundant isopods found in the low silt marsh (Siletz Bay) study site.

Large enclosure studies were designed primarily for the low marshes although a single sample set was collected in the immature high marsh during an extremely high winter tide. Samples from the low marshes were collected on three to four occasions.

Large enclosure sample sites were established where a stand of selected type of vegetation occurred in a reasonably accessible location. Each site was a 10- by 10-meter grid divided into 100 sampling areas. On each sampling day, four randomly preselected areas were sampled. Each area was sampled only once during the study.

A similar sampling plan was established to study the infauna of level marshes. A plug of soil and roots 10.2 centimeters in diameter and up to 25 centimeters deep was removed at selected sampling areas in a grid (separate from but near the large enclosure grid). The plug was disaggregated by hand under water and then sieved on a 0.5-millimeter screen. Early results showed that the majority of the animals were near the surface, so later samples were only 5 to 10 centimeters deep. It was also decided that the few animals collected and the relative unlikelihood of their directly entering aquatic food chains did not warrant the time and effort required for extensive sampling. Therefore, only one set of four samples per marsh was collected and completely processed.

Sampling of terrestrial invertebrates of the level marsh was conducted during low tides with the terrestrial sweep nets, clip-quadrat method, and small enclosure (Table 3). One set of samples was taken at each marsh. Collections were planned during the warmest and driest period of the year, but an unusually wet season forced the postponement of several collecting trips. The collections were finally accomplished during favorable tides and weather on 29 August 1978 (low sand and immature high marshes of Netarts Bay), of September 1978 (low silt and sedge marshes of Siletz Bay), and 25 September 1978 (mature high marsh of Netarts Bay). On these dates, the air temperature was 19° to 24° Celsius, the wind 0 to 16 kilometers per hour, and the sky sunny to overcast.

All samples were taken at low tide. The wind was minimal, the air temperatures were moderate, and the marsh vegetation was slightly damp. Within each level marsh type, sample sites met the following criteria: (1) selected vegetation community, (2) uniform vegetational cover, (3)

level ground, (4) easy accessibility, and (5) no evidence of recent disturbance. A 10- by 10-meter grid at each site was measured and marked off by corner stakes.

The terrestrial sweep net sampling method (Table 3) was adapted from Davis and Gray (1966). The net was vigorously swept back and forth across the upper parts of the vegetation through an horizontal arc of about 1 meter. Following each sweep, one step was taken and the direction of the net was reversed. Four samples, each consisting of 20 strokes (10 in each direction), were obtained, one along each edge of the perimeter of the grid.

After each sample, the contents of the net were placed in a large ethyl acetate-charged killing jar and later transferred to a wide-mouth specimen jar. The samples were cooled in an ice chest for processing in the laboratory where they were then stored in a cold room until the damp and sometimes succulent plant debris could be removed. The insects were sorted and stored dry except for soft-bodied species which were preserved in 70-percent isopropanol solution.

At each marsh grid, four randomly preselected points were sampled by the clip-quadrat method (Table 3). The vegetation was first clipped off 15 centimeters above the ground. The remaining vegetation was then sliced off at the ground level with a sharp knife and placed in a heavy plastic bag along with any plant litter that could be gathered at the base of the plant. Roots were not collected. Insects seen crawling on the ground inside the quadrat frame were also deposited in the bag. The bags were inflated and securely fastened to avoid crushing the collected plants and insects. The inflated bags were packed in an ice chest for transport to the laboratory. In the laboratory, the plant material was processed in a Berlese-Tullgren apparatus for 7 days. The insects were preserved in small specimen jars filled with 70-percent isopropanol solution.

b. Debris Line. Invertebrate life of a 40- by 1-meter (approximate) debris line in the low sand marsh was sampled using the small enclosure method (Table 3). Four randomly chosen areas in the line were sampled by pushing the small enclosure through the debris (principally eelgrass) and removing the enclosed plants and invertebrates. The samples were processed in the same manner as the clip-quadrat samples.

All the terrestrial samples were sorted in a flat container under a binocular dissecting scope. Terrestrial sweep net samples, which often contained considerable plant debris, were sorted in a white enamel pan. Samples processed in the Berlese-Tullgren apparatus were sorted in a petri dish. Larvae and the animals less than 0.5 millimeter were not included in the data.

c. Pan. Several samples were taken in pans in immature and mature high marsh using the aquatic sweep net method (Table 3). Some laboratory observations of living animals were also made.

d. Tidal Creeks. Tidal creeks were sampled using small corer, large corer, and aquatic sweep net methods along transects in the mature high marsh in Netarts Bay (1 November 1978) and sedge marsh in Siletz Bay

(24 June 1978). In each bay, the creeks were sampled at equal intervals as measured along the curves of the creeks, using the small corer (four samples per station), the large corer (one sample per station), and the aquatic sweep net (one sample per station). The small corer samples were 10 centimeters deep and captured small surface crustaceans and worms. Large corer samples penetrated 30 centimeters to sample larger and deeper dwelling species such as bivalves. Small corer samples were screened on a 0.5-millimeter sieve and the large corer samples on a 2-millimeter sieve.

The mature high marsh transect was 480 meters long and included five stations spaced at 120-meter intervals. Station 1 was located at the creek mouth, where the bottom is 28 meters wide and 0.8 meter below the level marsh. Stations 1, 2, and 3 were located below a dike, and stations 4 and 5 above the dike in a tributary creek. The creek at station 5 was 1.1 meter deep and 0.7 meter wide. Aquatic sweep net samples were taken only at stations 1, 2, and 4.

The sedge transect was 400 meters long with eight stations spaced at 50-meter intervals. The creek bisects the sedge marsh, and drains in opposite directions from a shallow center area (station 5). Maximum creek width was 10 meters, and maximum depth was 0.7 meter (station 8). At station 5, the creek forms an 8-centimeter-wide depression in a sparsely vegetated, dark muddy area. Because of time constraints, stations 4 and 7 were not sampled. Two small tidal creeks in the sedge marsh were sampled by aquatic sweep net on 6 April 1978. The creeks are about 0.5 meter wide and 0.5 meter deep and form part of the dendritic system that flows into the major creek.

Drift nets (Table 3) were set in the lower regions of the creeks in the sedge and mature high marshes to collect animals that represent available fish food. Large drift net samples were collected in a small, dendritic creek in the sedge marsh on 19 December 1977, and at the bayward mouth of the large tidal creek on 16 October 1978 and 26 April 1979. A small creek was also sampled on 6 February 1978 using the small drift net. Large drift net samples in the mature high marsh were collected at a single location in the lower region of a major tidal creek on 17 October 1978, 1 November 1978, and 12 April 1979. A small drift net sample was obtained in a small tributary on 12 April 1979.

e. Tidal Flats. Infaunal samples were collected by large and medium corers (Table 3) over 30- by 60-meter grids located on tidal flats adjoining the low sand (Netarts Bay) and sedge (Siletz Bay) marshes. The grids were marked at 1-meter intervals producing 1,800 potential sample areas. Ten of these were randomly selected for each set of samples. At each area, a 10-centimeter-deep medium corer sample and a 30-centimeter-deep larger corer sample were collected. Medium corer samples were screened on 0.5-millimeter sieve and the large corer samples on a 2-millimeter sieve.

3. Fish Studies.

Fish were collected with seines and an otter trawl from several marsh habitats and in the open bay of each estuary. A comparison was made of the species composition and food habits of the bay fauna and the marsh fauna.

Figure 3. Taxonomic structure of level marsh soil invertebrate community. n = average for replicate samples on dates shown. * = <1 percent. Life stage is adult unless otherwise indicated.

Figure 4. Taxonomic structure of level marsh low vegetation invertebrate community. n = average for replicate samples on dates shown. * = <1 percent. Life stage is adult unless otherwise indicated.

Figure 5. Taxonomic structure of level marsh high vegetation invertebrate community. n = average for replicate samples on dates shown. * = <1 percent. Life stage is adult unless otherwise indicated.

[illegible]

Figure 7. Taxonomic structure of level marsh submerged vegetation invertebrate community. n = average for replicate samples on dates shown. * = <1 percent. Life stage is adult unless otherwise indicated.

Figure 8. Taxonomic structure of level marsh submerged vegetation invertebrate community. n = average for replicate samples on dates shown. * = <1 percent. Life stage is adult unless otherwise indicated.

Figure 11. Taxonomic structure of tidal creek water invertebrate community. n = average of replicate samples on dates shown. * = <1 percent. Life stage is adult unless otherwise indicated.

terrestrial animals in the creek. The amphipods were washed in during tidal submergence. Insects in the sedge flats were quite different, being quite diverse in the sedge flat as limited to a few taxa in the mature high creek. This was due to the comparatively large amounts of filamentous algae occurring in the sedge flat at the time of sampling. The algae appeared to be a suitable food of dipterous larvae and other taxa captured in the sedge flat and the river. The grapsid crab, *Herbstia*, was present in the sedge flat although it was not quite as common as in the creek.

The infauna of the sedge flats was quite different in many respects to the infauna of the sedge flats in the creek. The tidal flat is located near the bayward mouth of the creek, and both the creek and the tidal flat have many similarities. The tidal flat infauna was relatively poor in Diptera, having only low densities of dolichopodid larvae. Other differences included a lower density of a burrowing cnidarian, and the addition of a scapulostran gastrod, *Alderia*.

The infauna of the sandy tidal flat located below the low sand marsh (Netarts Bay) differed from the sedge flat in having a relatively greater abundance of polychaetes (principally *Haploscoloplos*) and an *Eurytemora*-dominated amphipod fauna, in contrast to the *Corophium*-dominated fauna of the sedge mudflat. The decapod shrimp, *Callinectes*, was absent from the sandy tidal flat, an inhabitant of *Callinectes* burrows were also present in the sandy tidal flat.

Figure 12. Taxonomic structure of benthic invertebrate community. n = average for replicates; samples on dates shown. * = <1 percent. Life stage = adult unless otherwise indicated.

3. Trophic Structure of Invertebrate Communities.

The trophic structure of the major terrestrial and aquatic marsh communities is presented in Figures 13 to 18. Data from large enclosure and aquatic sweep net collections have been omitted because these collections include both submerged terrestrial and aquatic species. An analysis of the trophic structure of such assemblages would be misleading, since they do not represent communities as such.

The major feature of these figures is the predominance of detritivores and scavengers in most of the communities. Oligochaetes, amphipods (*Corophium*), and Acarina were the principal detritivores of the soil communities; Acarina were the most abundant detritivores in low vegetation, high vegetation, and debris line communities. Herbivore populations (mostly homopterans) were abundant in the high vegetation especially in high marshes, where their densities exceeded those of the detritivores. Scavengers were numerous in the soil marsh (ceratopogonid and chironomid larvae), in the low vegetation of the low marsh (isopods, amphipods, limnebiid beetles), and in the debris line (amphipods, limnebiids).

Carnivores generally comprised a small fraction of the animal life in soil and low vegetation habitats. However, dolichopodid (Diptera) larvae were abundant in high marsh soils, and also occurred in low marsh soils. The carnivore populations of low vegetation were composed primarily of Araneae and staphylinid beetles. High vegetation carnivores tended to be more numerous, and included several types of dipterous adults (Dolichopodidae, Ceratopogonidae and Muscidae) and Araneae. The debris line carnivores were Araneae and Saldidae (Hemiptera) which occurred in moderate abundance.

The trophic structure of infaunal communities of the tidal creeks and tidal flats was heavily weighted to the detritivorous components (Figs. 17 and 18). In all creek and tidal flat communities, oligochaetes and capitellid polychaetes were among the dominant detritivores. Other detritivores were *Haploscoloplos* (Polychaeta) and *Corophium* (Amphipoda). Common carnivores were the Polychaete *Eteone* and a small cnidarian polyp. Although algae covered much of the sedge creek and tidal flat substrate surface at the time of sampling, macrofaunal herbivores were rare.

4. Composition of Fish Communities.

Of 26 species of fish captured in seine and trawls, 2 species (staghorn sculpin, *Leptocottus armatus*, and the threespine stickleback, *Gasterosteus aculeatus*) dominated the catches in both high and low marshes (Table 4). The two species were common in creeks, pans, and submerged vegetation at the marsh edge, as well as in nonmarsh habitats. However, staghorn sculpin were not captured in low marsh pans. Threespine stickleback captured in marsh habitats were juveniles

Figure 13. Trophic structure of level marsh soil invertebrate community. * = <1 percent.

Figure 14. Trophic structure of level marsh low vegetation invertebrate community. * = <1 percent.

Figure 15. Trophic structure of level marsh high vegetation community. * = <1 percent.

Figure 16. Trophic structure of level marsh debris line community. * = <1 percent.

Figure 17. Trophic structure of tidal creek soil invertebrate community. * = <1 percent.

Figure 18. Trophic structure of tidal flat soil invertebrate community. * = <1 percent.

Table 4. Occurrence of fish species in several marsh and nonmarsh habitats.¹

FISH	High Marsh		Low Marsh ²		Other			
	Pan	Creek	Level	Pan	Creek	Slough	Tidal flat	Bay channel
Number of Samples	3	5	5	2	8	4	4	11
Pacific sandlance (<i>Ammodytes hexapterus</i>)								///
Topsmelt (<i>Atherinops affinis</i>)					///			///
Speckled sanddab (<i>Citharichthys stigmatus</i>)								XXXXXXX
Staghorn sculpin (<i>Leptocottus armatus</i>)	XXXXXXXX	XXXXXXXX	XXXXXXXX		XXXXXXXX	XXXXXXXX	XXXXXXXX	XXXXXXXX
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>)			///		///	XXXXXXX	XXXXXXX	
White surfperch (<i>Phanerodon furcatus</i>)						///	///	
Northern anchovie (<i>Engraulis mordax</i>)						///	///	
Pacific tomcod (<i>Microgadus proximus</i>)						///	///	
Tubenout (<i>Aulorhynchus flavidus</i>)								///
Threespine stickleback (<i>Gasterosteus aculeatus</i>)	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	XXXXXX	///	///
Lingcod (<i>Ophiodon elongatus</i>)								XXXXXXX
Kelp greenling (<i>Hexagrammos decagrammus</i>)								XXXXXXX
Surf smelt (<i>Hypomesus pretiosus</i>)		///	XXXXXXX		///	XXXXXXX	///	///
Saddleback gunnel (<i>Photis ornata</i>)						///	///	///
Starry flounder (<i>Platichthys stellatus</i>)			///			///	XXXXXXX	///
English sole (<i>Parophrys vetulus</i>)							///	XXXXXXX
Sand sole (<i>Psettichthys melanostictus</i>)							///	///
Chum salmon (<i>Oncorhynchus keta</i>)		///	XXXXXXX			///	///	///
Chinook salmon (<i>Oncorhynchus tshawytscha</i>)						///	///	///
Steelhead trout (<i>Salmo gairdnerii</i>)						///	///	///
Rockfish spp. (<i>Sebastes</i> spp.)								///
Snake pricklyback (<i>Lumpenus sagitta</i>)								///
Bay pipefish (<i>Syngnathus leptorhynchus</i>)								///

¹Results are based on seine samples (most habitats) and otter trawl samples (bay channel) collected on several dates in the two days; XXX=abundant, ///=present.

²Low marsh refers to low sand, low silt, and sedge marshes.

to adults (12 to 76 millimeters); staghorn sculpin were juveniles and young adults (17 to 173 millimeters) (Table 5).

Other species in marsh habitats were juvenile surf smelt (*Hypomesus pretiosus*) and juvenile chum salmon, captured primarily in low level marshes (Tables 4 and 5). The young chum salmon were seined along sparsely vegetated low marshes in both Netarts and Siletz Bays. In Netarts Bay, these salmon are occasionally abundant in the spring because of natural reproduction and the release of hatchery-reared juveniles. Those in Siletz Bay apparently result from a small natural run.

The most abundant fish species in the slough adjoining the sedge marsh were the shiner surfperch (*Cymatogaster aggregata*) and the three-spine stickleback (Table 4). Nine other species were captured although in much lower numbers. These species included staghorn sculpin, northern anchovie (*Engraulis mordax*), starry flounder (*Platichthys stellatus*), and juvenile chinook salmon.

The largest variety of fish occurred in the bay channel, which contained species similar to those collected in marsh habitats and several juvenile marine species (Tables 4 and 5). The most abundant marine species in Netarts Bay were juvenile English sole (*Parophrys vetulus*), which invade northwest estuaries in large numbers during the spring.

Table 5. Size (fork length in millimeters) of fish species collected in several marsh and nonmarsh habitats.¹

SPECIES	High Marsh		Low Marsh ²	
	Pen	Creek	Level	Creek
Pacific sand lance (<i>Ammodytes hexapterus</i>)				38:2(32-44)
Topsmelt (<i>Atherinops affinis</i>)				
Speckled sandbar (<i>Citharichthys stigmatus</i>)	3 4 5			44:97(17-124)
Staghorn sculpin (<i>Leptocottus armatus</i>)	56:29(44-76)	49:88(35-82)	38:115(18-67)	
Buffalo sculpin (<i>Enophrys bison</i>)				
Cabezon (<i>Scorpaenichthys marmoratus</i>)				36:4(34-41)
Prickly sculpin (<i>Cottus asper</i>)				37:1(37)
Coastal sculpin (<i>Cottus aleuticus</i>)				72:1(72)
Shiner surfperch (<i>Cymatogaster aggregata</i>)			75:1(75)	
White surfperch (<i>Phanerodon furcatus</i>)				
Northern anchovy (<i>Engraulis mordax</i>)				
Pacific tomcod (<i>Microgadus proximus</i>)				
Tubenout (<i>Aulorhynchus flavidus</i>)				
Threespine stickleback (<i>Gasterosteus aculeatus</i>)	41:146(31-62)	39:216(22-58)	41:88(30-60)	22:46(12-33)
Longcod (<i>Ophiodon elongatus</i>)				30:301(20-76)
Kelp greenling (<i>Hegagnomus decagrammus</i>)				
Surf smelt (<i>Hypomesus pretiosus</i>)		42:1(42)	53:97(40-64)	
Saddleback gunnel (<i>Pholis ornata</i>)				
Starry flounder (<i>Platichthys stellatus</i>)				
English sole (<i>Parophrys vetulus</i>)				
Sand sole (<i>Psettichthys melanostictus</i>)				
Chum salmon (<i>Oncorhynchus keta</i>)		39:1(39)	44:57(36-66)	
Chinook salmon (<i>Oncorhynchus tshawytscha</i>)				
Steelhead trout (<i>Salmo gairdnerii</i>)				
Rockfish spp. (<i>Sebastes</i> spp.)				
Snake prickieback (<i>Lumpenus sagitta</i>)				
Bay pipefish (<i>Symphodus leptocnuchus</i>)				

SPECIES	Other		
	Slough	Tidal flat	Bay Channel
Pacific sand lance (<i>Ammodytes hexapterus</i>)			74:8(61-85)
Topsmelt (<i>Atherinops affinis</i>)			
Speckled sandbar (<i>Citharichthys stigmatus</i>)			57:63(28-115)
Staghorn sculpin (<i>Leptocottus armatus</i>)	57:59(28-173)	90:16(36-193)	73:66(37-171)
Buffalo sculpin (<i>Enophrys bison</i>)			82:6(34-214)
Cabezon (<i>Scorpaenichthys marmoratus</i>)			53:5(46-66)
Prickly sculpin (<i>Cottus asper</i>)	142:1(142)		
Coastal sculpin (<i>Cottus aleuticus</i>)			
Shiner surfperch (<i>Cymatogaster aggregata</i>)	82:438(50-154)	35:77(11-119)	68:1(68)
White surfperch (<i>Phanerodon furcatus</i>)	76:1(76)		
Northern anchovy (<i>Engraulis mordax</i>)	83:4(73-110)		
Pacific tomcod (<i>Microgadus proximus</i>)	79:1(79)		
Tubenout (<i>Aulorhynchus flavidus</i>)			
Threespine stickleback (<i>Gasterosteus aculeatus</i>)	35:45(25-60)	67:4(60-73)	100:3(75-139)
Longcod (<i>Ophiodon elongatus</i>)			50:4(32-59)
Kelp greenling (<i>Hegagnomus decagrammus</i>)			96:34(72-120)
Surf smelt (<i>Hypomesus pretiosus</i>)			67:23(59-81)
Saddleback gunnel (<i>Pholis ornata</i>)	69:30(34-172)	39:4(36-42)	75:1(75)
Starry flounder (<i>Platichthys stellatus</i>)	94:2(80-107)	92:9(77-128)	74:11(62-129)
English sole (<i>Parophrys vetulus</i>)	152:6(97-228)	133:27(75-243)	177:17(70-425)
Sand sole (<i>Psettichthys melanostictus</i>)		56:7(33-124)	37:340(20-127)
Chum salmon (<i>Oncorhynchus keta</i>)		100:1(100)	105:5(97-127)
Chinook salmon (<i>Oncorhynchus tshawytscha</i>)	95:14(62-105)		
Steelhead trout (<i>Salmo gairdnerii</i>)	180:1(180)		90:1(90)
Rockfish spp. (<i>Sebastes</i> spp.)			42:1(42)
Snake prickieback (<i>Lumpenus sagitta</i>)			120:2(74-166)
Bay pipefish (<i>Symphodus leptocnuchus</i>)			220:5(156-245)

¹Results are based on seine samples (most habitats) and otter trawl samples (bay channel and tidal flat) collected on several dates in the two bays.

²Low marsh refers to low sand, low silt, and sedge marshes.

³Mean.

⁴Sample size.

⁵Range.

5. Fish Food Habits.

Fish stomach contents data are summarized in Figures 19 to 24, which combines data for all sampling sites and dates for each habitat. Staghorn sculpin, threespine stickleback, and juvenile chum salmon captured in submerged level marshes consumed a variety of predominantly aquatic animals, including amphipods (*Corophium* and *Arisogammarus*), harpacticoid copepods, cumaceans (*Hemileucon*), oligochaetes, and polychaetes (Fig. 19). The diet is diverse partly because data from several samples have been combined. Terrestrial prey were not eaten except by the chum salmon, which ate small amounts of adult insects

Figure 19. Fish stomach contents from submerged level marsh, based on fraction each prey type contributed to total bolus volume. Life stage is adult unless otherwise stated.

Figure 20. Fish stomach contents from pan, based on fraction each prey type contributed to total bolus volume. Life stage is adult unless otherwise stated.

Figure 21. Fish stomach contents from tidal creek, based on fraction each prey type contributed to total bolus volume. Life stage is adult unless otherwise stated.

Figure 22. Fish stomach contents from slough, based on fraction each prey type contributed to total bolus volume. Life stage is adult unless otherwise stated.

Figure 23. Fish stomach contents from tidal flat, based on fraction each prey type contributed to total bolus volume. Life stage is adult unless otherwise stated.

Figure 24. Fish stomach contents from bay channel, based on fraction each prey type contributed to total bolus volume. Life stage is adult unless otherwise stated.

and spiders. They also consumed various dipterous larvae and pupae, especially psychodids, found in marsh habitats. In the chum salmon's stomach, insect foods often formed a surface layer over a ball of flatfish larvae, indicating that the salmon fed subtidally and then fed along the shoreline. The most abundant food organism in the salmon was *Hemileucon*, which comprised 39 percent of the stomach content. Harpacticoids were abundant in the stomachs of staghorn sculpin and stickleback but not in the chum salmon. Starry flounder mostly ate decapod larvae, adult *Callinassa*, and amphipods. Surf smelt mostly consumed *Hemileucon*.

In marsh pans, staghorn sculpin consumed mostly amphipods, aquatic isopods, and small fish, while threespine stickleback ate a large variety of animals, including calanoid and harpacticoid copepods, and ceratopogonid larvae (Fig. 20). Very little of the diet of the two fish could be considered terrestrial, although some of the dipterous larvae live in marsh litter or soils.

Staghorn sculpin and threespine stickleback captured in tidal creeks had diets very similar to fish captured in pans (Fig. 21). Sculpins concentrated on amphipods and isopods; the stickleback diet included a total of 40 prey types dominated by harpacticoids and ceratopogonid larvae.

Several species of fish captured in the slough near the sedge marsh consumed large quantities of amphipods (Fig. 22). Shiner surfperch supplemented this food with the gastropod *Alderia* and polychaetes. Ampharetid polychaetes (probably *Hobsonia florida*) were eaten by both the perch and the starry flounder.

Young staghorn sculpin and English sole captured in the tidal flat below the low sand marsh ate tanaisids, amphipods, harpacticoids, and polychaetes (Fig. 23). These invertebrates are characteristic forms of tidal flat substrates. There is little indication of use of marsh foods by the sculpin or sole.

Among the dozen fish species examined which were captured in bay channels, the dominant foods were decapods (especially *Crangon*), polychaetes, and a variety of amphipods, fish, and other aquatic animals (Fig. 24). Terrestrial foods were of minor occurrence.

V. DISCUSSION

Marsh studies, especially those of vegetation, have concentrated on level marsh habitats due to their prevalence and importance as producers of organic detritus. However, nutrient transfer to aquatic food chains involves both bay detritus transport and secondary production by marsh invertebrates in pans, tidal creeks, and adjoining tidal flats. This study determined community composition, trophic structure, and food-chain relations for fauna in both level marsh and aquatic habitats in two Oregon estuaries.

Broadly viewed, the study revealed similarities between the terrestrial invertebrate communities of the Oregon marshes and those studied elsewhere on the Pacific and Atlantic coasts. The full extent of this similarity can not be assessed since the level of identification varied among the studies. The Oregon marsh study did not study seasonality or identify immature insects collected from exposed vegetation. However, the data provide a sufficiently accurate picture of community structure and aquatic food chains for comparison with other marsh communities. In these comparisons, the collection method is discussed in relation to the part of the community represented.

The invertebrate fauna of the level marsh, debris line, pan, tidal creek, and tidal flat habitats are summarized in Tables 6 and 7. The tables include animals captured by all sampling methods used in each of these habitats. Taxonomic diversity of the level marsh habitats was highest in the high level marsh, slightly lower in the low level marsh, and lowest in the debris line (Table 6). However, the habitats share several taxa. A similar overlap occurred in fauna of aquatic habitats (Table 7). Composition of the tidal creek infauna is similar to that of the muddy tidal flat. Taxa from this community also appear in tidal pans. More extensive sampling of pans, especially in the low marsh, would probably reveal greater similarities of pan and creek faunas than indicated here.

The fauna of the Oregon marsh soils, dominated by oligochaetes and dipterous larvae (Fig. 3), are not diverse partly because samples were collected during the winter and early spring when some insect species presumably rest in the egg state. The high abundance of oligochaetes and near absence of polychaetes contrasts with Cammen's 1976 results on macroinvertebrates of natural and planted salt marshes in North Carolina. In the natural marshes and at one bare soil site, polychaetes dominated (by biomass), while insect larvae and amphipods were dominant in some planted and bare soil sites. Composition of the marsh and creek polychaete fauna was similar. Among the several dipterous families Cammen lists, only Dolichopodidae was abundant in the Oregon marsh soils. High densities of Cera-topogonidae and Chironomidae occurred in the Oregon marshes and were sparse or absent from the North Carolina marshes. Both the North Carolina and Oregon lists are relatively short in comparison to Wall's (1973) list of taxa for Cape Cod marshes. Thus more extensive collections might show greater similarity between Atlantic and Pacific coast soil infauna.

The low vegetation was inhabited by dense populations of Acarina and, in high marshes, moderate populations of Collembola (Fig. 4). Acarina, Homoptera, and Diptera were the most abundant invertebrates in the high vegetation. Lane (1969) also found Homoptera and Diptera the dominant insect orders in the San Francisco Bay marsh. He collected by sweep net, aerial net, and blacklight, so his collections were most similar to the sweep net collections of high vegetation in this study. Cameron (1972), who also studied a San Francisco Bay

Table 6. Invertebrates characteristic of terrestrial habitats.¹

TAXON	HABITAT			TAXON	HABITAT		
	High Level Marsh	Low Level Marsh	Debris Line		High Level Marsh	Low Level Marsh	Debris Line
Cnidaria				Coleoptera			
<i>Halacampa</i> (?) sp.		A		Carabidae	A	A	A
Turbellaria	A			Limnebiidae	A	A	A
Nematoda	A	A		Staphylinidae	A	A	A
Polychaeta				Pselaphidae	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		Pyralidae		L	
Isopoda				Diptera			
<i>Gnorimosphaeroma 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, L	A
<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		Sphaeroceridae	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					

¹A = adults, L = larvae, N = nymphs.

Table 7. Invertebrates characteristic of aquatic habitats.¹

TAXON	HABITAT				TAXON	HABITAT			
	Pan	Tidal Creek	Tidal Sandy	Flat Muddy		Pan	Tidal Creek	Tidal Sandy	Flat Muddy
Cnidaria		A		A	Tanaidacea				
Nemertea		A	A		<i>Pancolus</i> sp.		A	A	
Nematoda		A	A	A	<i>Leptochelia</i> sp.		A	A	
Polychaeta					Isopoda				
<i>Haploscoloplos</i> sp.			A		<i>Gnorimosphaeroma 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	A	<i>Corophium</i> sp.	A	A		A
Capitellidae	A	A	A	A	<i>Anisogammarus confervicolus</i>	A	A		A
<i>Neanthes limnicola</i>		A			<i>Eohaustorius</i> sp.			A	
<i>Eteone</i> sp.		A	A	A	<i>Paraphoxus</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.		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		Limnobiidae	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	Psychodidae		A, L		
					Ceratopogonidae	L		A	
					Chironomidae	L	A, L		
					Culicidae	L	A		
					Tabanidae	L			
					Dolichopodidae	L	A, L		L
					Ephydriidae	L	A		
					Muscidae	L	L		

¹A = adult, L = larvae, N = nymphs.

marsh, used a clip-quadrat method to harvest animals from the total aboveground plant. Thus his method approximates a combination of the sweep net and clip-quadrat methods used in Siletz and Netarts Bays. He found that the orders Diptera, Coleoptera, and Hymenoptera contributed the most species, but that a pseudococcid homopteran was the most abundant species throughout the year. The dominant homopterans in Lane (1969) were delphacids and psyllids. In the Oregon marshes, aphidids, delphacids, and cicadellids varied as the most abundant homopterans, depending on marsh and collection method.

Adult dipterans in the Oregon marshes were almost absent in the low vegetation, and both abundant and varied in the high vegetation, where ceratopogonids, dolichopodids and muscids were common (Figs. 4 and 5). Dominant dipterans in Lane (1969) were Chloropidae, Ephydriidae, and Chironomidae. Cameron (1972) did not provide abundance information for Diptera.

Davis and Gray (1966) used a sweep net to collect insects from the North Carolina salt marshes where the dominant orders were also Homoptera and Diptera. The most abundant homopterans were cicadellids and delphacids, and the most abundant dipterans were chloropids, dolichopodids, and ephydriids.

Collembolans were concentrated in the low vegetation of the Oregon high level marshes (Fig. 4). The most abundant family, Isotomidae, also occurred in Lane's (1969) core samples but were not abundant in his other samples. Davis and Gray (1966) did not list Collembola as abundant. In Cameron (1972), a podurid was extremely abundant in *Spartina foliosa* (a low marsh), especially after high tides. Paviour-Smith (1956) indicated that an isotomid was very abundant in the high marsh zone of a New Zealand salt meadow which she sampled using a cylindrical enclosure. She points out that collembolan densities can be erratic due to rapid summer reproductive cycles and the fact that the animals float onshore with the incoming tide where they remain in dense colonies when the tide recedes.

The coleopterous families Coccinellidae and Chrysomellidae were collected in the Oregon marshes (Fig. 5), as well as in the Atlantic coast marsh (Davis and Gray, 1966) and in San Francisco marshes (Lane, 1969). Paviour-Smith (1956) does not list these families. The mention of several other families (e.g., Carabidae, Staphylinidae, Curculionidae) varied in these studies, but there was no consistent pattern to their occurrence. Limnebiidae, abundant in the low sand marsh of Netarts Bay, was not mentioned in the other studies.

Of four terrestrial families of Hemiptera found in the Oregon marshes (Table 6), Lygaeidae, Miridae, and Pentatomidae were described by Davis and Gray (1966) as the most abundant hemipterans in North Carolina marshes. The remaining Oregon family, Saldidae, was listed by Lane (1969) as occurring in the San Francisco marsh along with Miridae, Pentatomidae, and two other families not found in the Oregon marshes.

The order Hymenoptera was relatively low in abundance in the low marshes and of moderate abundance in the high marshes (Fig. 3). Few ants (Formicidae) were captured, even in the high marshes, possibly because of the small sampling areas. The majority of the hymenopterans collected were wasps and similar flying forms, which were not further identified. Davis and Gray (1966) stated that all the common Hymenoptera in the North Carolina marsh were ants; Lane (1969) reported that although an ant species was the most prevalent soil insect in his study, several wasp species were also collected.

Thysanoptera were common only in the high marshes (high vegetation) of the present study (Fig. 5). Few were identified in Paviour-Smith (1956), Davis and Gray (1966), Lane (1969) and Cameron (1972).

Other terrestrial insect orders collected in the Oregon marshes were Lipidoptera, Diplura, and Orthoptera (Table 6). These were all of low occurrence in the San Francisco marshes (Lane, 1969; Cameron, 1972). However, Teal (1962), Davis and Gray (1966), and Marples (1966) indicated that grasshoppers (*Orechelimum*) may be common and trophically important in Atlantic coast marshes. The scarcity of orthopterans in Pacific coast collections may be both a matter of chance and the animal's ability to escape collection. However, large populations were not observed in the Oregon marshes.

The high Acarina populations found in the Oregon low marshes (Fig. 7) have received little attention elsewhere. In contrast, however, Paviour-Smith's (1956) kite diagrams showed a strong zonation of mites by family, and indicated that highest population density occurred in higher marshes.

Araneae populations were relatively low in abundance in the low vegetation and, except in the low sand marsh, moderate in abundance in the high vegetation (Figs. 4 and 5). Barnes (1953) provides a thorough description of maritime spider communities in North Carolina.

A striking feature of the Oregon marsh collections is the scarcity of gastropods, especially in light of MacDonald's (1977) observation that *Assimerea translucens* is ubiquitous across Pacific coast marshes, and that gastropod densities often reach several thousand per square meter. Gastropods are common members of level marsh fauna on the Atlantic coast (Teal, 1962; Nixon and Oviatt, 1973), although Paviour-Smith (1956) apparently found few or no gastropods in New Zealand marshes. It seems unlikely that gastropods were common in the Oregon marsh study areas, since several sites were investigated with varying techniques. More likely, these differences illustrate high variability in faunal composition.

The fauna of the debris line (Table 2) on the low sand marsh is an interesting blend of taxa found in other habitats. Like other level marsh habitats, the debris line contained large numbers of Acarina and low numbers of Araneae. The collembolan family Isotomidae

was abundant, as in the high marsh low vegetation suggesting that the debris line of the low sand marsh provides a rich, but unstable, habitat comparable to the accumulated litter found in high marshes. Other debris line taxa were the amphipod *Orechestia traskiana*, found in all the marshes, Saldidae (Hemiptera), found principally in the low marshes, and Limnebiidae (Coleoptera) found mostly in the low sand marsh. Dipterous adults were not abundant; most were spaerocerids, which occurred in both high and low marshes.

Several terrestrial taxa were collected from inundated vegetation during high tide (Figs. 7 and 8). Adult Coleoptera, Homoptera, Hemiptera, and Collembola appeared in many of the submerged marsh samples, where several beetle families were collected. Limnebiid beetles were as abundant in the submerged low sand marsh as they were during tidal exposure. Adult Diptera were rare except in the low sand marsh. The data suggest that more active flying animals (Diptera) are less apt to be inundated than animals less likely to fly (Coleoptera, Homoptera, Collembola, Hemiptera). Opinions differ as to the ability of terrestrial insects in salt marshes to escape submergence. Cameron (1972) tested the response of adult insects to submergence in several strata of salt marsh plants during different phases of exposure and submergence. He detected no differences to the animal communities that would suggest exodus or upward migration on the plants. He did not provide the taxonomic composition for his samples. Since Cameron used the clip-quadrat sampling technique, it is unlikely that adult dipterans were adequately sampled. Thus, he probably studied the less active orders of insects, such as those found in the submerged vegetation in the Oregon marshes.

The infauna of pans and tidal creeks include estuarine animals (e.g., Polychaeta, Amphipoda, Tanaidacea, Isopoda) and animals of terrestrial origin (dipterous larvae) (Table 7). Many of the taxa found in the Oregon tidal creeks also occur in Atlantic coast tidal creeks or embayments. These include *Neanthes*, *Streblospio*, *Polydora*, *Hobsonia*, Capitellidae, Eteone, *Corophium*, *Orechestia*, Dolichopodidae, Ephydriidae, and Muscidae (Nixon and Oviatt, 1973; Cammen, 1976). The polychaete, *Hobsonia florida*, is common on the east coast and is apparently widespread in the Pacific Northwest estuaries, where it has only recently been identified (Banse, 1979). The Atlantic coast tidal creeks apparently are inhabited by a greater variety of decapods, including fiddler crabs (*Uca*), the green crab (*Carcinides maenas*), and the blue crab (*Callinectes sapidus*) (Nixon and Oviatt, 1973). Only one decapod, *Hemigrapsus oregonensis*, was found in the sedge and mature high tidal creeks, although it is possible that estuarine decapods, such as *Crangon*, *Callinassa*, and *Cancer*, occur in other Oregon tidal creeks. Molluscan diversity was also low in the Oregon tidal creeks. Only two taxa were abundant, *Alderia* and *Macoma balthica*. MacDonald (1969) found *Macoma inconspicua* (considered here to be synonymous with *M. balthica*) and *Mya arenaria* in a marsh tidal creek of Coos Bay, a southern Oregon estuary. He found these species plus *Macoma nasuta* and *Cryptomya californica* in Grays Harbour, Washington. All four species are common in the Pacific Northwest estuaries. Fewer species of tidal creek mollusks tended to occur in the Oregonian Province than in the Californian Province. These tidal creek mollusks

were not mentioned in Nixon and Oviatt (1973) or Cammen (1976), although both *Macoma balthica* and *Mya arenaria* occur in Atlantic coast estuaries.

The trophic structure of invertebrate communities in the Oregon marshes is strongly oriented to the detritus food chain. In the marsh soil, low vegetation, debris line, tidal creek substrate, and tidal flat habitats, numbers of detritivores and scavengers far exceeded the number of herbivores (Figs. 13 to 18). Only the upper vegetation sampled by sweep net contained a large proportion of herbivores, and this proportion increased from low marsh to high marsh. Herbivores were concentrated on growing plant tissues where their food resources are greatest; detritivores and scavengers were abundant in surface debris and in the soil where their food accumulates. Overall animal abundance appears to favor detritivores and scavengers and thus the detritus food chain. This is consistent with the observation that energy flow in salt marshes is greater through detritus than through grazing food chains (Teal, 1962), and that marsh plants produce surpluses of organics that are both incorporated into marsh food chains and exported to other estuarine food chains (Teal, 1962; Cameron, 1972; Eilers, 1979).

As in other studies (Davis and Gray, 1966; Cameron, 1972), spiders were found to be the dominant invertebrate carnivore in terrestrial food chains.

Few fish species were collected in the marsh habitats. Threespine stickleback, staghorn sculpin, and fewer numbers of prickly sculpin (*Cottus asper*), coastal sculpin (*C. aleuticus*), shiner surfperch, surf smelt, and chum salmon were found in the tidal creeks. In tidal creeks of marshes in the Fraser River estuary, Dunford (1975) collected juvenile chum and chinook salmon, threespine stickleback, and small numbers of prickly sculpin. In slough habitats he collected a much greater variety of fish, including juvenile salmon, starry flounder, threespine stickleback, prickly sculpin, staghorn sculpin, peamouth (*Mylocheilus caurinus*), squawfish (*Ptychocheilus oregonensis*), and several species of the minnow family (*Cyprinidae*). Although the two studies agree that fish diversity is higher in sloughs than in tidal creeks, species composition tended toward freshwater species in the Fraser River sloughs and marine species in the Siletz River slough.

Daiber (1977), working in Delaware marshes, and Shenker and Dean (1979), working in South Carolina marshes, observed high usage of Atlantic coast tidal creeks by larval and juvenile fishes. Their results emphasize the high diel and seasonal variability in catch composition. Also, while more species used creeks in the lower more marine parts of the estuary, variation in use from creek to creek was high (Daiber, 1977). A total of 22 species and 16 families of larval, juvenile, and adult fish used the South Carolina Creeks. Many of these are marine species.

Based on Dunford's (1975) study and the Oregon study, the fish fauna of marsh tidal creeks in the Pacific Northwest estuaries are low in diversity and does not include large or diverse larval and

juvenile populations. The following explanations are possible:

(1) The studies did not adequately represent the fauna studies, which may vary greatly, by season, by day, and from creek to creek; (2) the low salinity regime of the estuaries studied prevented the influx of marine species; and (3) the relatively simple and spatially restricted nature of Pacific coast marshes has not encouraged extensive exploitation of the tidal creek habitats by juveniles of marine species such as has occurred on the Atlantic coast.

Dunford's (1975) study of fish communities in slough and tidal creek habitats of the Fraser River estuary provides comparative information to the Oregon study. Juvenile chum, chinook, and sockeye (*Oncorhynchus nerka*) salmon, which he collected in these habitats, consumed mostly aquatic foods. However, there appeared to be more terrestrial animals consumed in the tidal creeks than in sloughs, and more of these animals were consumed in late May than in April. The principal prey organisms were Homoptera and Collembola, although other terrestrial animals were eaten. In some incidences, terrestrial animals accounted for more than 40 percent of the prey biomass. The implication is that the young salmon fed opportunistically on available prey, which included increasing amounts of terrestrial insects as populations increased during early spring. More insects presumably wash into the marsh-lined tidal creeks than into sloughs. In other studies of northwest estuaries, juvenile salmon consumed predominantly benthic amphipods (Cliff and Stockner, 1973), harpacticoids (Healey, 1979), and a mixture of amphipods, isopods, dipterous larvae, and copepods (Mason, 1974). The diurnal variation in juvenile chum and coho (*O. kisutch*) salmon foods observed by Mason in a small coastal creek is an excellent illustration of the dietary flexibility exhibited by young salmonids.

Other fish species in the slough habitat in Dunford's (1975) study consumed mostly aquatic foods: (1) longfin smelt (*Spirinchus thaleichthys*)--mysids; (2) peamouth--cladocera and ostracods; (3) starry flounder--benthic amphipods and isopods, oligochaetes, polychaetes, and chironomid larvae; (4) prickly sculpin--benthic isopods, chironomid and tabanid larvae, and benthic amphipods; (5) staghorn sculpin--benthic amphipods and isopods, and juvenile salmon; and (6) threespine stickleback--chironomid larvae, oligochaetes, benthic amphipods, tabanid larvae, copepods, cladocerans, and terrestrial insects. In the tidal creek, threespine stickleback ate copepods and amphipods, and prickly sculpin ate mostly benthic isopods and amphipods.

In Siletz and Netarts Bays, small amounts of terrestrial invertebrates were consumed by fish collected in marsh habitats, and an adjoining slough, and in bay channels. Amphipods, isopods, tanais, polychaetes, cumaceans, copepods, dipterous larvae and pupae, and fish were the dominant food items. Thus, it appears that energy flows into the aquatic communities primarily through the detrital

pathway, where it is augmented by inputs from benthic and planktonic primary producers. This conclusion is consistent with the results of Teal (1962), Odum and Heald (1975), and similar studies of estuarine food chains.

VI. CONCLUSIONS

The structure and trophic relations of fish and invertebrate communities were studied in several marsh and estuarine habitats of Siletz and Netarts bays, Oregon. These marshes do not appear to directly play a dominant role in aquatic food chains of these estuaries. Fish diversity was low in marsh habitats (tidal creek, pan, slough, and submerged level marsh), although juvenile chum salmon, staghorn sculpin, and threespine stickleback were occasionally abundant. In other Pacific Northwest marshes, several freshwater species plus additional species of juvenile Pacific salmon occur. Fish in the Oregon marshes consumed minor amounts of terrestrial foods in comparison to aquatic foods. Only juvenile chum salmon feeding over submerged level marshes consumed substantial amounts of terrestrial insects and spiders. In general, these marshes apparently do not form a nursery area for a high diversity of marine species as occurs in Atlantic coast marshes. The paucity of marine species may relate to low salinity or to a lack of extensive marsh aquatic habitats.

Detritivores dominated the food chains in most of the Oregon marsh habitats, although herbivores were dominant in the upper vegetation of high marshes. This overall emphasis of detritus-based food chains coincides with conclusions based on studies of Atlantic coast marshes. The study of Oregon marshes indicates that many invertebrate taxa are common to both Atlantic and Pacific coast marshes, and that there is a tendency among the marshes for similar taxa to be numerically dominant. However, enough differences exist in invertebrate and especially fish communities to suggest that assessments of the trophic value of western marshes should be based on direct study of these marshes rather than on inferences made from marshes located elsewhere.

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APPENDIX A

CRITIQUE OF METHODS

An adequate study of faunal seasonality requires site-intensive study with summer sampling at 1- or 2-week intervals, a schedule beyond the resources of this study. Travel among the study areas was time-consuming and the number of habitats under study was large. These factors combined with weather and tidal patterns to prevent an adequate study of seasonality. In retrospect, effort should have been concentrated in fewer visits so that the survey aspects could have been emphasized and thus provide a more evenly distributed data base covering the various habitats.

Of the sampling methods used, only the corer samples provided quantitative estimates of animal abundance. The enclosure and clip-quadrat samples were semiquantitative; terrestrial sweep net, drift net, seine, and aquatic sweep net samples provided estimates of relative abundance. Because of these varying characteristics, comparisons among habitats and samplers have necessarily emphasized relative rather than absolute abundance. The large enclosure method could be made more quantitative by using a device which severs the enclosed vegetation, which could then be rinsed in a dilute formalin solution to remove attached animal life. This method, as with the one used here, does not account for organisms such as oligochaetes and insects which live within living and dead plant tissues and are likely important factors in detrital and grazing food chains. The enclosure apparently could be smaller than the 1-meter diameter used, since sample counts in some cases exceeded several thousand for dominant species. However, this decision should consider the fact that sample counts varied greatly according to season and site.

Based on the low sample counts obtained for level marsh infauna, a larger sampler than the 918-centimeter-diameter corer used would be desirable, although core depths apparently can be limited to about 5 centimeters. This assumes first that the study of this fauna is warranted, and second that an efficient method for separating animals from the soil is available. The silty soils of Siletz Bay were compacted and root-bound and thus resistant to simple methods of animal extraction such as provided by the Berlese funnel. The mostly sandy and peaty nature of soils at Netarts study sites likely would have allowed use of the Berlese funnel, although such use would have created differences of methodology between the two bays. Other methods tend to be time-consuming, arduous, or selective for certain taxa, and also may require special washing racks (Edwards, Dukes, and Axtell, 1974; Kline, Dukes, and Axtell, 1975).

Measurements of invertebrate drift in tidal channels were non-quantitative principally because water speeds were too low to operate the net flow meter (General Oceanics Model 2030). Use of a more sensitive meter or direct measurement of waterflow rate appears necessary if drift is to be quantified. Quantification of fish populations in tidal creeks apparently can be approached through use of nets described by Shenker and Dean (1979).

APPENDIX B

TAXONOMIC LIST OF INVERTEBRATES

Phylum Protozoa	Subclass Malacostraca
Subphylum Sarcomastigophora	Superorder Peracarida
Class Rhizopodea	Order Mysidacea
Order Foraminifera	Family Mysidae
Phylum Cnidaria	<i>Neomysis mercedis</i>
Class Anthozoa	Order Cumacea
Subclass Zoantharia	Family Nannastacidae
Order Actinaria	<i>Cumella</i> sp.
<i>Halacampa</i> (?) sp.	Family Hemileuconidae
Phylum Platyhelminthes	<i>Hemileucon</i> sp.
Class Turbellaria	Order Tanaidacea
Class Trematoda	Family Tanaidae
Phylum Nemertea	<i>Pancolus</i> sp.
Phylum Nematoda	Family Paratanaidae
Phylum Annelida	<i>Leptocheilia</i> sp.
Class Polychaeta	Order Isopoda
Order Orbiniida	Suborder Flabellifera
Family Orbiniidae	Family Sphaeromataidae
<i>Haploscoloplos</i> sp.	<i>Gnorimosphaeroma lutea</i>
Order Spinoida	Suborder Valvifera
Family Spionidae	Family Idoteidae
<i>Polydora</i> sp.	<i>Idotea foveolata</i>
<i>Pseudopolydora</i> sp.	<i>Idotea resicata</i>
<i>Pygospio</i> sp.	Suborder Oniscoidea
<i>Streblospio</i> sp.	Family Ligilidae
Order Capitellida	<i>Capitulum gracilis</i>
Family Capitellidae	Family Oniscidae
Order Phyllodocida	<i>Porcellio scaber</i>
Family Glyceridae	Order Amphipoda
<i>Glycera</i> sp.	Suborder Gammaridea
Family Nereidae	Family Ampithoidae
<i>Nereis limicola</i>	<i>Ampithoe</i> sp.
Family Phyllodocidae	Family Corophiidae
<i>Eteone</i> sp.	<i>Corophium</i> sp.
Order Eunicida	Family Gammaridae
Family Arabellidae	<i>Anisogammarus confervicolus</i>
Order Terebellida	Family Haustoriidae
Family Ampharetidae	<i>Hauastorius</i> sp.
<i>Hobsonia florida</i>	Family Phoxocephalidae
Family Terebellidae	<i>Paraphoxus</i> sp.
<i>Amasena</i> sp.	Family Talitridae
Order Sabellida	<i>Orchestia tuskiana</i>
Family Spirobridae	Suborder Caprellidea
Class Oligochaeta	Family Caprellidae
Phylum Mollusca	Superorder Eucarida
Class Gastropoda	Order Decapoda
Subclass Opisthobranchia	Suborder Natantia
Order Sacoglossa	Family Crangonidae
Class Bivalvia	<i>Crangon franciscorum</i>
Order Myoida	<i>Crangon nigricauda</i>
Family Myidae	Family Pandalidae
<i>Cryptomya californica</i>	<i>Pandalus danae</i>
Order Veneroida	Suborder Reptantia
Family Tellinidae	Family Callinassidae
<i>Macoma balthica</i>	Family Paguridae
Phylum Arthropoda	Family Cancridae
Subphylum Chelicerata	<i>Cancer magister</i>
Class Arachnida	<i>Cancer productus</i>
Order Pseudoscorpiones	Family Grapsidae
Order Araneae	<i>Hemigrapsus oregonensis</i>
Order Acarina	Family Majidae
Subphylum Mandibulata	<i>Pugetta producta</i>
Class Crustacea	Class Insecta
Subclass Branchiopoda	Subclass Apterygota
Order Diplostroca	Order Collembola
Suborder Cladocera	Family Entomobryidae
Family Polyphemidae	Family Isotomidae
<i>Podon</i> sp.	Family Onychiuridae
<i>Evadne</i> sp.	Family Poduridae
Subclass Ostracoda	Family Sminthuridae
Subclass Copepoda	Order Diplura
Order Calanoida	Order Odonata
Order Cyclopoida	Suborder Anisoptera
Order Harpacticoida	Order Orthoptera
Subclass Cirripedia	Order Thysanoptera
Order Thoracica	Order Hemiptera
Suborder Balanomorpha	Suborder Amphibicorizae
Family Balanidae	Family Saldidae
	Suborder Geocorizae
	Family Lygaeidae
	Family Miridae
	Family Pentatomidae

- Suborder Hydrocorizae
 - Family Corixidae
- Order Homoptera
 - Suborder Auchenorrhyncha
 - Family Cercopidae
 - Family Cicadellidae
 - Family Delphacidae
 - Suborder Sternorrhyncha
 - Family Aphididae
- Order Coleoptera
 - Suborder Adephaga
 - Family Carabidae
 - Suborder Polyphaga
 - Family Hydrophilidae
 - Family Limnebiidae
 - Family Staphylinidae
 - Family Silphidae
 - Family Psephenidae
 - Family Ptilidae
 - Family Heteroceridae
 - Family Coccinellidae
 - Family Corylophidae
 - Family Chrysomelidae
- Order Trichoptera
 - Family Limnephilidae
- Order Lepidoptera
 - Suborder Frenatae
 - Family Pyralidae
- Order Diptera
 - Suborder Nematocera
 - Family Tipulidae
 - Family Psychodidae
 - Family Ceratopogonidae
 - Family Chironomidae
 - Family Culicidae
 - Family Mycetophilidae
 - Family Scatopsidae
 - Family Sciaridae
 - Family Cecidomyiidae
 - Family Stratiomyidae
 - Family Tabanidae
 - Family Doilichopodidae
 - Suborder Cyclorrhapha
 - Family Longchopteridae
 - Family Phoridae
 - Family Syrphidae
 - Family Sepsidae
 - Family Sciomyzidae
 - Family Sphaeroceridae
 - Family Ephydriidae
 - Family Chloropidae
 - Family Muscidae
- Order Hymenoptera
 - Suborder Apocrita
 - Family Formicidae
- Class Chilopoda
- Class Diplopoda
- Phylum Echinodermata
 - Class Stellerioidea
 - Subclass Asteroidea
 - Order Forcipulatida
 - Leptasterias hexactis*

APPENDIX C
TAXANOMIC LIST OF FISH

<u>Family</u>	<u>Scientific Name</u>	<u>Common Name</u>
Ammodytidae	<i>Ammodytes hexapterus</i>	Pacific Sandlance
Atherinidae	<i>Atherinops affinis</i>	Topsmelt
Bothidae	<i>Citharichthys stigmaeus</i>	Speckled Sanddab
Cottidae	<i>Leptocottus armatus</i>	Staghorn Sculpin
Cottidae	<i>Enophrys bison</i>	Buffalo Sculpin
Cottidae	<i>Scorpaenichthys marmoratus</i>	Cabezon
Cottidae	<i>Cottus asper</i>	Prickly Sculpin
Cottidae	<i>Cottus aleuticus</i>	Coastal Sculpin
Embiotocidae	<i>Cymatogaster aggregata</i>	Shiner Surfperch
Embiotocidae	<i>Phanerodon furcatus</i>	White Surfperch
Engraulidae	<i>Engraulis mordax</i>	Northern Anchovy
Gadidae	<i>Microgadus proximus</i>	Pacific Tomcod
Gasterosteidae	<i>Aulorhynchus flavidus</i>	Tubesnout
Gasterosteidae	<i>Gasterosteus aculeatus</i>	Threespine Stickleback
Hexagrammidae	<i>Ophiodon elongatus</i>	Lingcod
Hexagrammidae	<i>Hexagrammos decagrammus</i>	Kelp Greenling
Osmeridae	<i>Hypomesus pretiosus</i>	Surf Smelt
Pholidae	<i>Pholis ornata</i>	Saddleback Gunnel
Pleuronectidae	<i>Platichthys stellatus</i>	Starry Flounder
Pleuronectidae	<i>Parophrys vetulus</i>	English Sole
Pleuronectidae	<i>Psettichthys melanostictus</i>	Sand Sole
Salmonidae	<i>Oncorhynchus keta</i>	Chum Salmon
Salmonidae	<i>Oncorhynchus tshawytscha</i>	Chinook Salmon
Salmonidae	<i>Salmo gairdnerii</i>	Steelhead Trout
Scorpaenidae	<i>Sebastes spp</i>	Rockfish spp
Stichaetidae	<i>Lumpenus sagitta</i>	Snake Prickleback
Syngnathidae	<i>Syngnathus leptorhynchus</i>	Bay Pipefish

APPENDIX D

INVERTEBRATE SAMPLE DATA

Abbreviations used for gear in this appendix are

AN = aquatic sweep net
CQ = clip-quadrat
LC = large corer
LD = large drift net
LE = large enclosure
MC = medium corer
SC = small corer
SD = small drift net
SE = small enclosure
TN = terrestrial sweep net

Table D-1. Density (number per square meter) of infauna captured by MC in the exposed level marsh of the low sand area, 7 February 1978. The samples were 20 centimeters deep.

AREA SAMPLER SITE SAMPLE		L SANG MC	L SAND MC	L SAND MC	L SAND MC	
TAXON	LIFE STAGE	01 0015	01 0023	01 0048	01 0075	MEAN(SD)
INVERTEBRATES						
POLYCHAETA AMPHARETIIDAE SPP	ADULTS	123				30.8 (53.4)
OLIGOCHAETA OLIGOCHAETA SPP	ADULTS	370	2960	2220	2467	2004.4 (980.5)
GASTROPODA GASTROPODA SPP	ADULTS		247	370		154.2 (160.2)
ARANEAE ARANEAE SPP	ADULTS		247	123		92.5 (102.3)
ACARINA ACARINA SPP	ADULTS	4317	2837	6908	247	3577.2 (2412.4)
CUMACEA CUMACEA SPP	ADULTS		123		740	215.9 (306.0)
AMPHIPODA COROPHIDAE SPP	ADULTS				2097	524.2 (901.0)
GAMMARIDAE SPP	ADULTS		123			39.8 (51.4)
ANISOGAMMARUS CONFERVICOLUS	ADULTS				987	246.7 (427.3)
TARSIIDAE SPP	ADULTS			247		61.7 (106.8)
AMPHIPODA SPP	ADULTS				123	30.8 (51.4)
ORLHESTIA TRASKIANA	ADULTS				1604	400.9 (694.4)
COLEOPTERA LIMNEBIIDAE SPP	ADULTS	123	123	1110		339.2 (447.9)
OIP TEKA	LARVAE			493		123.3 (213.6)
ODOLCHOPODIDAE SPP	LARVAE		2344	20353		5734.9 (8508.2)
GERATOPODONIDAE SPP	LARVAE	123	8511	1234	54521	17238.2 (21679.5)
CHIRONOMIDAE SPP	LARVAE	4687	1854	987		647.6 (683.3)
TIPULIDAE SPP	LARVAE					
TOTAL		9743	19119	34045	62786	

Table D-2. Density (number per square meter) of infauna captured by MC in the exposed level marsh of the low silt area, 6 February 1978. The samples were 20 centimeters deep.

AREA SAMPLER SITE SAMPLE		L SILT MC	L SILT MC	L SILT MC	L SILT MC	
TAXON	LIFE STAGE	01 0000	01 0023	01 0090	01 0093	MEAN(SD)
INVERTEBRATES						
CHIRONOMIA CHIRONOMIA SPP	ADULTS	247	247			123.3 (123.3)
NEMATODA NEMATODA SPP	ADULTS			247	123	92.5 (102.3)
POLYCHAETA GARTILLIDAE SPP	ADULTS	123	740			30.8 (51.4)
MJESONIA FLORIDA	ADULTS					185.0 (320.5)
OLIGOCHAETA OLIGOCHAETA SPP	ADULTS	4317	987	14185	2467	5489.1 (5157.5)
ISOPODA GNURIMOSPHAERDIA LUTEA	ADULTS			123	2960	770.9 (1265.1)
AMPHIPODA AMPHIPODA SPP	ADULTS			123		30.8 (51.4)
COROPHIDAE SPP	ADULTS	4194	34661	1480	740	10268.9 (14141.6)
ANISOGAMMARUS CONFERVICOLUS	ADULTS	2344	2344	123		1202.7 (1141.5)
INSECTA INSECTA SPP	NYMPHS		247			61.7 (106.8)
OIP TEKA	LARVAE			123	123	30.8 (51.4)
ODOLCHOPODIDAE SPP	LARVAE	123		123	123	92.5 (51.4)
GERATOPODONIDAE SPP	LARVAE	21833	3207	2837	123	7000.1 (8646.1)
CHIRONOMIDAE SPP	LARVAE				123	30.8 (51.4)
PTERODIDAE SPP	LARVAE			247		61.7 (106.8)
TIPULIDAE SPP	LARVAE				1357	339.2 (587.5)
TOTAL		33428	42186	19468	8139	

Table D-3. Density (number per square meter) of infauna captured by MC in the exposed level marsh of the sedge area, 6 February 1978. The samples were 20 centimeters deep.

AREA SAMPLER SITE SAMPLE	TAXON	LIFE STAGE	SEEDGE	SEEDGE	SEEDGE	SEEDGE	MEAN(SD)
			NC 01 0048	MC 01 0051	MC 01 0061	MC 01 0083	
	INVERTEBRATES						
	NEMATODA SPP	ADULTS	863		493		339.21 363.61
	OLIGOCHAETA SPP	ADULTS	2344	3577	2837	3084	2960.46 444.71
	ACARINA SPP	ADULTS	493			370	215.91 220.21
	CIRRIPEDIA SPP	ADULTS				123	30.81 53.41
	CUNACEA SPP	ADULTS	1604	370		123	493.41 659.51
	ISOPODA SPP	ADULTS				123	30.81 53.41
	GNATHOPHILIDAE SPP	ADULTS	987	123	370	863	585.91 353.01
	AMPHIPODA SPP	ADULTS	1604	370		247	462.61 666.41
	ANISOGAMMARUS CONFERVICOLUS	ADULTS		740		123	308.41 282.61
	TRICHOPTERA SPP	LARVAE				123	30.81 53.41
	DIPTERA SPP	LARVAE				123	30.81 53.41
	EPHYRIDAE SPP	LARVAE			247	123	61.71 106.81
	MULLUSCIDA SPP	LARVAE		247		123	92.51 182.21
	OLIGOCHAETA SPP	LARVAE	8264	4811	2220	1113	4101.41 2751.21
	ACARINA SPP	LARVAE	123				30.81 53.41
	ISOPODA SPP	LARVAE			740		185.01 320.51
	TOTAL		16652	9668	6907	6412	

Table D-4. Density (number per square meter) of infauna captured by MC in the exposed level marsh of the immature high area, 7 February 1978. The samples were 20 centimeters deep.

AREA SAMPLER SITE SAMPLE	TAXON	LIFE STAGE	IM	HI	IM	HI	IM	HI	MEAN(SD)
			MC	01	MC	01	MC	01	
			0050	0083	0095	0097			
	INVERTEBRATES								
	TURBELLARIA TURBELLARIA SPP	ADULTS	1357						339.21 587.51
	NEMATODA NEMATODA SPP	ADULTS					123		30.81 53.41
	OLIGOCHAETA OLIGOCHAETA SPP	ADULTS	3287	4194	2468	7771			4533.11 1925.61
	ARTRHOPODA ARTRHOPODA SPP	UNSPECIFIED		123			123		61.71 61.71
	ARANEAE ARANEAE SPP	ADULTS	123	123			123		92.51 93.41
	ACARINA ACARINA SPP	ADULTS		370					92.51 168.21
	ISOPODA POCELLID SCABER LIGULUM GRACILIS	ADULTS ADULTS		123			123		30.81 53.41 30.81 53.41
	AMPHIPODA OLIGCHAETA TRASKIANA	ADULTS					123		30.81 53.41
	INSECTA INSECTA SPP	LARVAE					247		61.71 186.81
	HOLOPTERA HOLOPTERA SPP	ADULTS		123					30.81 53.41
	COLEOPTERA COLEOPTERA SPP	LARVAE		493			493		246.71 246.71
	DIPTERA DIPTERA SPP	PUPAE		123			123		61.71 61.71
	DIPTERA DIPTERA SPP	LARVAE		493			123		185.01 254.11
	OLIGOCHAETA OLIGOCHAETA SPP	LARVAE	247	740	123		417		431.71 254.11
	ACARINA ACARINA SPP	LARVAE	123	1110	370		1727		832.61 611.21
	ISOPODA ISOPODA SPP	LARVAE		247	493				185.01 320.51
	MYRIAPODA MYRIAPODA SPP	LARVAE		123					30.81 53.41
	CHILPODA CHILPODA SPP	ADULTS		247					61.71 186.81
	TOTAL		5057	4675	3946	12087			

Table D-7. Density (number per square meter) of animals captured by CQ in the exposed level marsh of the low silt area, 7 September 1978.

AREA SAMPLER SITE SAMPLE	TAXON	LIFE STAGE	L SILT	L SILT	L SILT	L SILT	MEAN (SD)
			CQ	CQ	CQ	CQ	
			13 0001	13 0002	13 0003	13 0004	
INVERTEBRATES							
ARANEAE							
ARANEAE SPP	ADULTS	32			16	12.0 (13.3)	
ACARINA							
ACARINA SPP	ADULTS	496	848	1744	1264	1088.0 (466.2)	
ISOPODA							
ISOPODA SPP	ADULTS	48	128	416	288	220.0 (142.4)	
HEMIPTERA							
SALDIOAE SPP	NYMPHS		16			4.0 (6.9)	
HOMOPTERA							
DELPHACIDAE SPP	ADULTS			16	16	8.0 (8.0)	
APHIDIOAE SPP	ADULTS	48	224	480	64	204.0 (173.6)	
HYMENOPTERA							
HYMENOPTERA SPP	ADULTS		48	16	64	32.0 (25.3)	
TOTAL		624	1264	2672	1712		

Table D-8. Density (number per square meter) of animals captured by CQ in the exposed level marsh of the sedge area, 7 September 1978.

AREA SAMPLER SITE SAMPLE		SEdge CQ	SEdge CQ	SEdge CQ	SEdge CQ	
		13 0001	13 0002	13 0003	13 0004	
TAXON	LIFE STAGE					MEAN (SD)
INVERTEBRATES						
ARANEAE ARANEAE SPP	ADULTS	48	32			20.0 (20.8)
ACARINA ACARINA SPP	ADULTS	5184	3024	2240	4672	3780.0 (1194.8)
CIRRIPIEDIA CIRRIPIEDIA SPP	ADULTS				320	80.0 (138.6)
AMPHIPODA AMPHIPODA SPP	ADULTS	32	112	16		40.0 (43.1)
THYSANOPTERA THYSANOPTERA SPP	AQULTS				64	16.0 (27.7)
HOMOPTERA DELPHACIDAE SPP	ADULTS	16				4.0 (6.9)
APHIDIOAE SPP	ADULTS	16	16		16	12.0 (13.3)
DIPTERA SCIARIDAE SPP	ADULTS		32		16	12.0 (13.3)
HYMENOPTERA HYMENOPTERA SPP	AQULTS			32		8.0 (13.9)
	TOTAL	5296	3216	2288	5088	

Table D-9. Density (number per square meter) of animals captured by CQ in the exposed level marsh of the immature high area, 29 August 1978.

AREA SAMPLER SITE SAMPLE		IM HI CQ	IM HI CQ	IM HI CQ	IM HI CQ		
		10 0001	10 0002	10 0003	10 0004		
TAXON	LIFE STAGE					MEAN(SD)	
INVERTEBRATES							
ARANEAE							
ARANEAE SPP	ADULTS	32	96		64	48.0(35.8)	
ACARINA							
ACARINA SPP	ADULTS	912	2848	840	2160	1700.0(840.1)	
ISOPODA							
ISOPODA SPP	ADULTS	16	64		32	28.0(23.7)	
COLLEMBOLA							
SM. THURIDAE SPP	ADULTS	80	160	16	128	96.0(54.3)	
ISOTOMIDAE SPP	ADULTS	560	656	30	1248	636.0(415.3)	
ENTOMIDAE SPP	ADULTS		320		48	92.0(133.1)	
PODURIIDAE SPP	ADULTS	32				8.0(13.9)	
THYSANOPTERA							
THYSANOPTERA SPP	ADULTS	48	16			16.0(19.6)	
HEMIPTERA							
HEMIPTERA SPP	ADULTS			16		4.0(6.9)	
HOMOPTERA							
DELPHACIDAE SPP	ADULTS		48	48		24.0(24.0)	
APHIDIDAE SPP	ADULTS	16	32		16	16.0(11.3)	
COLEOPTERA							
COLEOPTERA SPP	ADULTS	16			48	16.0(19.6)	
STAPHYLINIDAE SPP	ADULTS				16	4.0(6.9)	
PSYLAPHIDAE SPP	ADULTS			16		4.0(6.9)	
IMNESTIDAE SPP	ADULTS			32		20.0(13.3)	
PTILIIDAE SPP	ADULTS		16			4.0(6.9)	
CORYLOPHIDAE SPP	ADULTS				48	12.0(20.8)	
METEOCEPHALIDAE SPP	ADULTS						
HYMENOPTERA							
HYMENOPTERA SPP	ADULTS		16			4.0(6.9)	
TOTAL		1712	4272	1104	3920		

Table D-10. Density (number per square meter) of animals captured by CQ in the exposed level marsh of the mature high area, 25 September 1978.

AREA SAMPLER SITE SAMPLE		MAT HI CQ	MAT HI CQ	MAT HI CQ	MAT HI CQ		
		10 0001	10 0002	10 0003	10 0004		
TAXON	LIFE STAGE					MEAN(SD)	
INVERTEBRATES							
ARANEAE							
ARANEAE SPP	ADULTS	144	144	128	80	124.0(26.2)	
ACARINA							
ACARINA SPP	ADULTS	592	3696	2496	3808	2648.0(1293.7)	
ISOPODA							
ISOPODA SPP	ADULTS		16			4.0(6.9)	
AMPHIPODA							
AMPHIPODA SPP	ADULTS				16	4.0(6.9)	
COLLEMBOLA							
SM. THURIDAE SPP	ADULTS		80	112	112	76.0(45.8)	
ISOTOMIDAE SPP	ADULTS	816	848	1840	2352	1464.0(657.5)	
PODURIIDAE SPP	ADULTS		112	32	808	108.0(245.9)	
THYSANOPTERA							
THYSANOPTERA SPP	ADULTS		64	112	96	68.0(42.9)	
HOMOPTERA							
DELPHACIDAE SPP	ADULTS		16	32		12.0(13.3)	
APHIDIDAE SPP	ADULTS	16	48	112	560	184.0(219.8)	
COLEOPTERA							
STAPHYLINIDAE SPP	ADULTS			16		4.0(6.9)	
PSYLAPHIDAE SPP	ADULTS	16	16			8.0(8.0)	
CARABIDAE SPP	ADULTS				16	4.0(6.9)	
IMNESTIDAE SPP	ADULTS	32	16	16		16.0(11.3)	
PTILIIDAE SPP	ADULTS	32	48	16	16	28.0(13.3)	
CORYLOPHIDAE SPP	ADULTS		128	48	16	48.0(49.3)	
LEPIDOPTERA							
LEPIDOPTERA SPP	ADULTS				32	8.0(13.9)	
DIPTERA							
CHIRONOMIDAE SPP	ADULTS		16	128	16	40.0(51.2)	
PSYCHOIDAE SPP	ADULTS	16				4.0(6.9)	
HYMENOPTERA							
HYMENOPTERA SPP	ADULTS		16		16	8.0(8.0)	
TOTAL		1664	5264	5088	7744		

Table D-11. Number of animals captured in standardized TN collections (nonquantitative) in the exposed level marsh vegetation of the low sand area, 29 August 1978.

AREA SAMPLER SITE SAMPLE		L SAND TN 10 0001	L SAND TN 10 0002	L SAND TN 10 0003	L SAND TN 10 0004	MEAN (SD)	
TAXON	LIFE STAGE						
INVERTEBRATES							
ARANEAE							
ARANEAE SPP	ADULTS	1	1		1	.8(	.4)
ACARINA							
ACARINA SPP	ADULTS	29	43	40	10	30.5(	12.9)
THYSANOPTERA							
THYSANOPTERA SPP	ADULTS		1	1		.5(	.5)
HEMIPTERA							
SALICIDAE SPP	NYMPHS	2		2		1.0(	1.0)
SALICIDAE SPP	ADULTS	1	1	1		.8(	.4)
HOMOPTERA							
DELPHACIDAE SPP	ADULTS					.3(	.4)
CICADELLIDAE SPP	ADULTS	18		9	11	9.5(	6.4)
COLEOPTERA							
COLEOPTERA SPP	ADULTS		1		1	.5(	.5)
CUCINELLIDAE SPP	ADULTS		1			.3(	.4)
LIMNELLIDAE SPP	ADULTS	1		1	2	1.0(	.7)
DIPTERA							
DIPTERA SPP	ADULTS			1		.3(	.4)
EPHYRIDAE SPP	ADULTS	8	1E	11		9.3(	5.1)
MUSCIDAE SPP	ADULTS	59	31	18	2	30.3(	17.9)
DOLICHOPODIDAE SPP	ADULTS	1		1	13	.5(	.5)
SPHAEROCERIDAE SPP	ADULTS			4		1.5(	1.7)
SYMPIDAE SPP	ADULTS			1		.3(	.4)
HYMENOPTERA							
HYMENOPTERA SPP	ADULTS	9	3	5	3	5.0(	2.4)
TOTAL		129	100	95	44		

Table D-12. Number of animals captured in standardized TN collections (nonquantitative) in the exposed level marsh vegetation of the low silt area, 7 September 1978.

AREA SAMPLER SITE SAMPLE		L SILT TN 13 0001	L SILT TN 13 0002	L SILT TN 13 0003	L SILT TN 13 0004	MEAN (SD)	
TAXON	LIFE STAGE						
INVERTEBRATES							
ARANEAE							
ARANEAE SPP	ADULTS	118	32	31	71	63.0(	35.6)
ACARINA							
ACARINA SPP	ADULTS	1016	392	538	726	668.0(	233.2)
ISOPODA							
ISOPODA SPP	ADULTS			2		.5(	.9)
AMPHIPODA							
AMPHIPODA SPP	ADULTS			6		1.5(	2.6)
THYSANOPTERA							
THYSANOPTERA SPP	ADULTS	5		2		1.8(	2.0)
HEMIPTERA							
HEMIPTERA SPP	UNSPECIFIED	3			1	1.0(	1.2)
HEMIPTERA SPP	ADULTS	7	4	1	5	4.3(	2.2)
PENTATOMIDAE SPP	UNSPECIFIED	3			2	1.3(	1.3)
PENTATOMIDAE SPP	ADULTS	1				.3(	.3)
SALICIDAE SPP	NYMPHS	18		2	15	8.0(	7.9)
SALICIDAE SPP	ADULTS	17	6	1	11	8.2(	6.3)
LYGAIDAE SPP	ADULTS		2	1	9	3.0(	3.5)
HOMOPTERA							
DELPHACIDAE SPP	ADULTS	317	152	186	214	217.3(	61.6)
APHIDIDAE SPP	ADULTS	338	225	452	477	373.0(	100.2)
COLEOPTERA							
CUCINELLIDAE SPP	ADULTS	2	1	1	4	2.0(	1.2)
DIPTERA							
DIPTERA SPP	ADULTS	3			4	4.3(	2.3)
EPHYRIDAE SPP	ADULTS	2	2	8		1.7(	1.7)
MUSCIDAE SPP	ADULTS	16			13	7.3(	7.3)
DOLICHOPODIDAE SPP	ADULTS	1			15	2.0(	2.1)
CEPHALOPODIDAE SPP	ADULTS	22	8	17	18	16.3(	5.1)
CHIRONOMIDAE SPP	ADULTS	5		6	7	4.5(	2.7)
PSYCHODIDAE SPP	ADULTS	1	3	2	12	6.3(	3.4)
CULICIDAE SPP	ADULTS	1		2		1.0(	1.0)
CHLOROPIDAE SPP	ADULTS	4	2		5	2.8(	1.9)
HYMENOPTERA							
HYMENOPTERA SPP	ADULTS	53	39	28	26	36.5(	10.7)
TOTAL		1561	868	1288	1630		

Table D-13. Number of animals captured in standardized TN collections (nonquantitative) in the exposed level marsh vegetation of the sedge area, 7 September 1978.

AREA SAMPLER SITE SAMPLE			SEGE TN 13 0001	SEGE TN 13 0002	SEGE TN 13 0003	SEGE TN 13 0004		
TAXON	LIFE STAGE						MEAN (SD)	
INVERTEBRATES								
ARANEAE								
ARANEAE SPP	ADULTS		120	72	46	94	83.0 (	27.3)
ACARINA								
ACARINA SPP	ADULTS		220	570	456	795	510.3 (	207.3)
THYSANOPTERA								
THYSANOPTERA SPP	ADULTS			2	6	1	2.3 (	2.3)
HEMIPTERA								
SALICIDAE SPP	NYMPHS		2		1		.8 (	.8)
MIKIDAE SPP	UNSPECIFIED				1	1	.5 (	.5)
MIKIDAE SPP	ADULTS				1		.3 (	.4)
HOLOPTERA								
DELPHACIDAE SPP	ADULTS		426	299	215	350	322.0 (	76.1)
CILABELLIDAE SPP	ADULTS		2	3	8	4	4.3 (	2.3)
APHIDIDAE SPP	ADULTS		1	2	1	1	1.3 (	.4)
COLEOPTERA								
COCCINELLIDAE SPP	ADULTS		1			1	.5 (	.5)
CARABIDAE SPP	ADULTS		1				.3 (	.4)
DIPTERA								
DIPTERA SPP	ADULTS		5	9		1	3.8 (	3.6)
EPHYRIDAE SPP	ADULTS		11	9		10	6.8 (	4.9)
MUSCIDAE SPP	ADULTS		34	9	2	15	15.0 (	11.9)
SCYLIMPODIDAE SPP	ADULTS		3				.8 (	1.3)
GERATOPODIDAE SPP	ADULTS		3	2	6	2	3.3 (	1.6)
PSYCHODIDAE SPP	ADULTS		4	2	2	0	3.5 (	1.7)
CULECIDAE SPP	ADULTS		4			1	.8 (	.8)
SPHAGNULIDAE SPP	ADULTS		1			1	1.5 (	2.1)
TIPULIDAE SPP	ADULTS		3			7	.8 (	3.3)
CHLOROPIDAE SPP	ADULTS		3				2.5 (	2.9)
HYMENOPTERA								
HYMENOPTERA SPP	ADULTS		25	5	6	11	11.8 (	8.0)
TOTAL			869	780	752	1301		

Table D-14. Number of animals captured in standardized TN collections (nonquantitative) in the exposed level marsh vegetation of the immature high area, 29 August 1978.

AREA SAMPLER SITE SAMPLE			IM HI TN 10 0001	IM HI TN 10 0002	IM HI TN 10 0003	IM HI TN 10 0004		
TAXON	LIFE STAGE						MEAN (SD)	
INVERTEBRATES								
ARANEAE								
ARANEAE SPP	ADULTS		10	21	13	13	16.3 (	3.4)
ACARINA								
ACARINA SPP	ADULTS		10		34	7	12.8 (	12.8)
THYSANOPTERA								
THYSANOPTERA SPP	ADULTS		1	7		2	2.5 (	2.7)
HEMIPTERA								
HEMIPTERA SPP	UNSPECIFIED		1				.3 (	.4)
HEMIPTERA SPP	ADULTS		1	1			.3 (	.4)
HEMIPTERA SPP	ADULTS		1	1	1	1	.8 (	.8)
HOLOPTERA								
DELPHACIDAE SPP	ADULTS		24	8		10	13.3 (	10.5)
CILABELLIDAE SPP	ADULTS		1	10		1	2.8 (	2.8)
APHIDIDAE SPP	ADULTS		1	1	1	1	1.3 (	1.3)
COLEOPTERA								
COLEOPTERA SPP	ADULTS			3			2.0 (	2.1)
CILABELLIDAE SPP	ADULTS				1		1.8 (	1.2)
CILABELLIDAE SPP	ADULTS		1				.3 (	.3)
CHLOROPIDAE SPP	ADULTS		1	1		1	1.5 (	1.5)
LEPIDOPTERA								
LEPIDOPTERA SPP	ADULTS			1	1		.5 (	.5)
DIPTERA								
DIPTERA SPP	ADULTS		6			1	1.8 (	2.9)
EPHYRIDAE SPP	ADULTS		1				.3 (	.3)
MUSCIDAE SPP	ADULTS		31	12	11	11	17.8 (	17.7)
SCYLIMPODIDAE SPP	ADULTS		1		2		.5 (	.5)
GERATOPODIDAE SPP	ADULTS		1				.3 (	.3)
CULECIDAE SPP	ADULTS		4		2	4	2.8 (	1.9)
SPHAGNULIDAE SPP	ADULTS		2			2	2.5 (	1.6)
TIPULIDAE SPP	ADULTS		2				1.5 (	1.5)
CHLOROPIDAE SPP	ADULTS		2				.8 (	.8)
HYMENOPTERA								
HYMENOPTERA SPP	ADULTS		29	6	22	12	17.3 (	8.9)
TOTAL			162	96	131	78		

Table D-17. Density (number per square meter) of pelagic and epifaunal animals captured by LE in the submerged level marsh of the low sand area, 7 February 1978.

AREA SAMPLER SITE SAMPLE	L SAND LE 8053	L SAND LE 8059	L SAND LE 0070	L SAND LE 01 0080	MEAN(SD)
TAXON	LIFE STAGE				
INVERTEBRATES					
CNICARIA CNICARIA SPP			27	6	8.31 (18.9)
NEMERTEA NEMERTEA SPP		3			.84 (1.1)
NEMATODA NEMATODA SPP			4		1.01 (1.6)
POLYCHAETA AMPHARETIDAE SPP		28			9.21 (A.8)
EPTERODONTIDAE SPP			1	1	2.21 (.8)
HAEMULIDAE SPP	1	3	3	5	3.21 (1.6)
AMPHARETIDAE SPP					.84 (1.1)
OLIGOCHAETA OLIGOCHAETA SPP	94	76	82	117	85.71 (21.4)
ARANEAE ARANEAE SPP	3	6	6	18	7.61 (6.8)
ACARINA ACARINA SPP	8	1998	490	974	867.41 (736.6)
COPEPODA CALANOIDAE SPP		3	9	3	2.51 (1.8)
NAUPACALANOIDAE SPP	1				.31 (.5)
CUMACEA CUMACEA SPP	6	36	84	65	32.71 (28.6)
ISOPODA CHURIMOSPHAEROMA LUTEA				1	.31 (.9)
AMPHIPODA COROPHUM SPP	1	5	1	3	2.51 (1.8)
AMPHIROPHIDAE SPP	13	79	100	8	28.71 (A.2)
CONFERVICOLUS	109	79	90		28.71 (A.2)
TRASKIANA	9	1	1	89	19.01 (28.6)
DECAPODA DECAPODA SPP	4	1	4		2.21 (1.8)
INSECTA INSECTA SPP			1		.31 (.5)
HEMiptera SAIGUOIDE SPP		1			.31 (.9)
COLEOPTERA COLEOPTERA SPP					
LYNCEIDAE SPP		1	10	22	31 (7.8)
MEGALOPTERA SPP		3			.61 (1.1)
OIPTEA OIPTEA SPP		1			.31 (.9)
OIPTEA SPP		1			.31 (.9)
EPTERODONTIDAE SPP					
HAEMULIDAE SPP		1			.31 (.9)
OLIGOCHAETA SPP	1	14	15		7.61 (7.2)
OLIGOCHAETA SPP					
HAEMULIDAE SPP	566	393	71	43	31.21 (18.1)
HAEMULIDAE SPP		137			36.21 (55.4)
HAEMULIDAE SPP					
HAEMULIDAE SPP	22	47	37	24	32.41 (10.2)
HAEMULIDAE SPP					.61 (1.1)
FISH COITIDAE LEPTOCOTTUS ARMATUS			1		.31 (.9)
TOTAL					
	433	2818	840	1770	

Table D-18. Density (number per square meter) of pelagic and epifaunal fauna captured by LE in the submerged level marsh of the low sand area, 21 July 1978.

[illegible]

Table D-19. Density (number per square meter) of pelagic and epifaunal animals captured by LE in the submerged level marsh of the low sand area, 17 October 1978.

AREA SAMPLER SITE SAMPLE	LIFE STAGE	L SANC	L SAND	L SAND	L SAND	MEAN (SD)
		LE 01 0016	LE 01 0031	LE 01 0067	LE 01 0093	
TAXON						
INVERTEBRATES						
POLYCHAETA SPIRORCHIDAE SPP	ADULTS			262		65.4 (113.3)
OLIGOCHAETA OLIGOCHAETA SPP	ADULTS	13	5	20	8	11.4 (5.8)
GASTROPODA ALUEIA SPP	ADULTS			3		.6 (1.1)
ARANEAE ARANERE SPP	ADULTS	75	22	25	81	50.8 (27.4)
ACARINA ACARINA SPP	ADULTS	8711	3909	7531	2657	5702.0 (2494.3)
CUMACEA CUMELLA SPP	ADULTS	3				.6 (1.1)
ISOPODA GNUPHOSPHAEROMA LUTEA	ADULTS			3		.6 (1.1)
AMPHIPODA ORCHESTIA TRASKIANA	ADULTS	30	1	132	131	73.7 (50.7)
HEMIPTEA SAULIDAE SPP	NYMPHS			1		.3 (.5)
	ADULTS			3		1.3 (1.3)
COLEOPTERA STAPHYLINIDAE SPP	ADULTS			3		.6 (1.1)
	ADULTS	27	13	25	132	49.2 (48.2)
DIPTERA DIPTERA SPP	PUPAE			3		.6 (1.1)
	ADULTS			3		.6 (.5)
ODONATOLOGIAE SPP	ADULTS			3		1.9 (3.3)
CHIRONOMIDAE SPP	LARVAE				3	.6 (1.1)
TADANIDAE SPP	LARVAE			1		.5 (.5)
FISH						
GASTROSTEIOAE GASTROSTEUS ACULEATUS	ADULTS	1				.3 (.5)
TOTAL		8860	3973	7998	3015	

Table D-22. Density (number per square meter) of pelagic and epifaunal animals captured by LE in the submerged level marsh of the low silt area, 16 October 1978.

AREA SAMPLER SITE SAMPLE	LIFE STAGE	LE 0001	LE 0005	LE 0010	LE 0015	MEAN (SD)
INVERTEBRATES						
CHIRONOMIDAE SPP	ADULTS				18	2.51 (4.4)
HEMITEUTER SPP	ADULTS				2351	587.71 (1017.9)
POLYCHAETA SPP	ADULTS				357	89.21 (154.5)
OLIGOCHAETA SPP	ADULTS				237	59.71 (103.6)
OLIGOCHAETA SPP	ADULTS	52	226	415	5460	1528.41 (2267.8)
GASTROPODA SPP	ADULTS				41	10.21 (17.6)
ARANEAE SPP	ADULTS		77	8		21.01 (32.7)
ACARINA SPP	ADULTS		18	13	4	8.81 (7.8)
OSTRACODA SPP	ADULTS				1185	270.21 (513.1)
COPEPUDA SPP	ADULTS				28	5.11 (8.8)
CUMACEA SPP	ADULTS	1	3		24	6.81 (10.1)
ISOPODA SPP	ADULTS	5437	5325	4172	4595	5882.41 (1581.1)
AMPHIPODA SPP	ADULTS	168	9	18	183	92.51 (83.2)
AMPHIPODA SPP	ADULTS	378	197	103	483	313.81 (125.1)
DECAPODA SPP	ADULTS				1	.31 (.5)
HEMITEUTER SPP	ADULTS	1				.11 (.2)
HEMITEUTER SPP	ADULTS		1			.31 (.5)
DIPTERA SPP	PUPAE				3	.61 (1.1)
DIPTERA SPP	LARVAE				2	.31 (.5)
DIPTERA SPP	LARVAE		18	4	40	101.21 (175.0)
DIPTERA SPP	LARVAE	1	32	9	33	14.81 (18.7)
DIPTERA SPP	LARVAE		38	4		8.61 (12.7)
DIPTERA SPP	LARVAE		4		3	.81 (1.8)
DIPTERA SPP	LARVAE					.61 (1.1)
TOTAL		6638	5937	4826	19049	

Table D-23. Density (number per square meter) of pelagic and epifaunal animals captured by LE in the submerged level marsh of the sedge area, 19 December 1977.

AREA SAMPLER SITE SAMPLE	LIFE STAGE	SEGE LE 0004	SEGE LE 0019	MEAN (SD)
INVERTEBRATES				
OLIGOCHAETA SPP	ADULTS	152	66	109.21 (43.2)
ARANEAE SPP	ADULTS	18		8.91 (8.9)
ACARINA SPP	ADULTS	29		14.61 (14.6)
CUMACEA SPP	ADULTS	8	4	5.71 (1.9)
ISOPODA SPP	ADULTS	86	15	50.81 (35.6)
AMPHIPODA SPP	ADULTS	42	19	30.51 (11.4)
TRICHOPTERA SPP	LARVAE		3	1.31 (1.3)
LEPIDOPTERA SPP	LARVAE	1		.61 (.6)
DIPTERA SPP	LARVAE	1		.61 (.6)
DIPTERA SPP	LARVAE	143	1	73.01 (71.8)
DIPTERA SPP	LARVAE	4		1.91 (1.9)
TOTAL		486	108	

Table D-26. Density (number per square meter) of pelagic and epifaunal animals captured by LE in the submerged level marsh of the sedge area, 16 October 1978.

AREA SAMPLER SITE SAMPLE		SEGE LE	SEGE LE	SEGE LE	SEGE LE	
TAXON	LIFE STAGE	01 0015	01 0033	01 0078	01 0093	MEAN(SD)
INVERTEBRATES						
OLIGOCHAETA						
OLIGOCHAETA SPP	ADULTS	255	577	532	1334	699.51 196.19
ARENACEA						
ARENACEA SPP	ADULTS	66	83	62	72	76.61 7.71
ACARINA						
ACARINA SPP	ADULTS	669	2584	949	1190	1403.01 691.33
ISOPODA						
ISOPODA SPP	ADULTS	36	58	99	30	1.41 2.71
CHIRONOMIDAE LUTER	ADULTS					56.24 26.61
AMPHIPODA						
AMPHIPODA SPP	ADULTS					1.01 1.43
TALITHIDAE SPP	ADULTS	3	5	6	1	2.21 3.21
ORCHESIA TRASKIANA	ADULTS	5	5	9		4.81 3.21
HEMIPTERA						
SAULIDAE SPP	ADULTS		4			1.01 1.61
HOMOPTERA						
HOMOPTERA SPP	ADULTS				1	.31 .51
DELPHACIDAE SPP	ADULTS	8			10	4.41 4.51
COLEOPTERA						
COLEOPTERA SPP	ADULTS			5		1.31 2.21
CLARIIDAE SPP	ADULTS			1		.31 .51
LEPIDOPTERA						
PTERIDAE SPP	LARVAE		3			.61 1.11
DIPTERA						
DIPTERA SPP	PUPAE	1			23	5.41 8.81
DIPTERA SPP	LARVAE				6	2.21 3.41
DIPTERA SPP	ADULTS		3	1	4	4.41 5.81
EPHYRIDAE SPP	LARVAE				1	.31 .51
EPHYRIDAE SPP	LARVAE	6		5	1	4.41 4.81
DOCKIDAE SPP	LARVAE			3	1	1.11 1.21
DOCKIDAE SPP	LARVAE			3	1	4.41 4.81
EMENDOMIDAE SPP	LARVAE		5	15	3	11.11 9.51
POGONIIDAE SPP	LARVAE	54	1382	87	772	85.11 31.11
TIPULIDAE SPP	LARVAE			5		2.21 2.31
HYMENOPTERA						
HYMENOPTERA SPP	ADULTS	1			3	1.01 1.11
TOTAL		1067	4807	2379	3497	

Table D-27. Density (number per square meter) of pelagic and epifaunal animals captured by LE in the submerged level marsh of the immature high area, 7 February 1978.

AREA SAMPLE SITE	TAXON	LIFE STAGE	IM HI LE		IM HI LE		IM HI LE		IM HI LE		MEAN(SD)
			0000	0015	0033	0078	0078	0078	0078	0078	
INVERTEBRATES											
	TURBELLARIA										
	TURBELLARIA SPP	ADULTS	33		4	1					10.21 13.41
	NEMATODA										
	NEMATODA SPP	ADULTS		4	9						2.21 3.81
	OLIGOCHAETA										
	OLIGOCHAETA SPP	ADULTS	625	229	138	458					65.11 194.71
	GASTROPODA										
	GASTROPODA SPP	ADULTS	11			1					5.21 4.81
	AMPHIPODA										
	AMPHIPODA SPP	UNSPECIFIED	1		25						6.71 10.81
	ARENACEA										
	ARENACEA SPP	ADULTS	91	32	17	28					45.41 29.11
	ACARIINA										
	ACARIINA SPP	ADULTS	38	8	171	19					59.11 85.81
	CUMACEA										
	CUMACEA SPP	ADULTS			3						.81 1.11
	CUMACEA SPP	ADULTS			3						2.21 4.41
	ISOPODA										
	ISOPODA SPP	ADULTS	15	11	30	22					20.61 6.81
	COLEOPTERA										
	COLEOPTERA SPP	ADULTS	30	1		1					.21 .31
	COLEOPTERA SPP	ADULTS	18	1	4						6.71 6.81
	AMPHIPODA										
	AMPHIPODA SPP	ADULTS	9	4	4	15					1.11 2.21
	AMPHIPODA SPP	ADULTS									9.11 4.91
	TALITHIDAE SPP	ADULTS	1			1					4.81 .21
	ORLUSIA TRASKIANA	ADULTS	1	4	8	5					4.81 2.11
	INSECTA										
	INSECTA SPP	UNSPECIFIED									.31 .21
	INSECTA SPP	PUPAE			1	1					.31 .31
	INSECTA SPP	LARVAE	2								.31 .31
	INSECTA SPP	ADULTS									.31 .31
	COLEOPTERA										
	COLEOPTERA SPP	ADULTS	3			1					.21 .21
	COLEOPTERA SPP	ADULTS	4	3	72						10.71 30.51
	HYMENOPTERA										
	HYMENOPTERA SPP	ADULTS	18	3	4	3					6.81 3.21
	HOMOPTERA										
	HOMOPTERA SPP	ADULTS									.31 .31
	HOMOPTERA SPP	ADULTS	2								5.71 6.81
	DELPHACIDAE SPP	ADULTS	3	9	15	3					6.41 6.21
	COLEOPTERA										
	COLEOPTERA SPP	LARVAE	8	5	4	3					5.41 1.31
	COLEOPTERA SPP	LARVAE	4								9.11 3.41
	COLEOPTERA SPP	LARVAE	19	3	4	1					2.21 2.21
	COLEOPTERA SPP	LARVAE									2.21 3.21
	EMENDOMIDAE SPP	ADULTS		1	1	9					2.81 3.21
	POGONIIDAE SPP	ADULTS				17					5.71 6.51
	TALITHIDAE										
	TALITHIDAE SPP	LARVAE				5					1.21 2.21
	LEPIDOPTERA										
	LEPIDOPTERA SPP	LARVAE	1								.31 .51
	DIPTERA										
	DIPTERA SPP	PUPAE	3								1.11 1.11
	DIPTERA SPP	LARVAE		23	1						31.11 36.41
	DIPTERA SPP	ADULTS	1								1.11 1.11
	EPHYRIDAE SPP	LARVAE				17					22.11 15.21
	DOCKIDAE SPP	LARVAE	25	6	17	25					22.11 15.21
	EMENDOMIDAE SPP	LARVAE	48	4	5	100					60.11 40.31
	POGONIIDAE SPP	LARVAE				54					12.41 21.11
	HYMENOPTERA										
	HYMENOPTERA SPP	ADULTS	1								.31 .31
	HYMENOPTERA SPP	ADULTS		1							.31 .31
	COLEOPTERA										
	COLEOPTERA SPP	ADULTS				1					.31 .31
	TOTAL		1193	354	632	884					

Table D-28. Number of animals taken by AN (nonquantitative) in a large pan of the immature high area, 7 April 1978.

AREA SAMPLER SITE SAMPLE	IM HI AN	01 0001
TAXON	LIFE STAGE	
INVERTEBRATES		
OLIGOLMAETA OLIGOLMAETA SPP	ADULTS	118
COPEPODA CALANOIDA SPP	ADULTS	156
MANPACTACOIDA SPP	ADULTS	415
CUMACEA CUMELLA SPP	ADULTS	1
AMPHIPODA CONGPHIUM SPP	ADULTS	1
ANISOGAMMARUS AMPHITHOE SPP	ADULTS	350
ODONATA ODONATA SPP	NYMPHS	4
HEMIPTERA COXALIDAE SPP	ADULTS	1
TRICHOPTERA LIMNETHILIDAE SPP	LARVAE	2
DIPTERA DIPTERA SPP	ADULTS	1
EPHYRIDAE SPP	LARVAE	1
MUCICIDAE SPP	LARVAE	3
CHIRONOMIDAE SPP	LARVAE	14
FISH		
GASTEROSTEIDAE GASTEROSTEUS ACULEATUS	ADULTS	1
TOTAL		1080

Table D-29. Number of animals taken by AN (nonquantitative) in three pans of the mature high area. Site 15 was sampled on 1 November 1978, and sites 17 and 18 on 12 April 1979.

AREA SAMPLER SITE SAMPLE	MAT HI AN	MAT HI AN	MAT HI AN	MEAN (SD)	
TAXON	15 0001	17 0001	18 0001		
INVERTEBRATES					
POLYCHAETA CAPITELLIDAE SPP			1	.31	.51
OLIGONEURATA OLIGONEURATA SPP	11	1290	71	460.01	593.11
COPEPODA CALANOIDA SPP			33	11.01	15.61
CUMACEA HEMILEUCOM SPP			14	4.71	6.61
ISOPODA GAMMAROSPHAEROMA LUTEA	1			.31	.51
AMPHIPODA CONGRIUM SPP	1		29	10.01	13.61
ANISOGAMMARUS CONFERVICOLUS		60	61	40.31	28.51
HEMIPTERA COXIIDAE SPP	96		1	32.31	45.01
COLEOPTERA COLEOPTERA SPP			1	.31	.51
LIMNETHIDAE SPP		40	1	16.31	22.91
MYDOPHILIDAE SPP			1	.31	.51
TRICHOPTERA LIMNETHIDAE SPP			4	1.31	1.91
DIPTERA DIPTERA SPP		6		2.01	2.81
EPHYRIDAE SPP		716	1	239.71	336.01
MUCICIDAE SPP			1	.31	.51
DOLICHOPODIDAE SPP		2		.71	.91
CHIRONOMIDAE SPP	1			1.31	1.91
CHIRONOMIDAE SPP	12	14	3	9.71	14.11
CHIRONOMIDAE SPP		438		140.01	208.51
CHIRONOMIDAE SPP		4		1.31	1.91
FISH					
UNIDENTIFIED FISH SPP			48	16.01	22.61
TOTAL	122	2588	273		

Table D-30. Density (number per square meter) of small infauna in a tidal creek of the sedge area, 24 June 1978. Four SC samples each 10 centimeters deep were collected at sampling point 01, and screened on a 0.5-millimeter sieve.

AREA SAMPLER SITE SAMPLE	TAXON	LIFE STAGE	SEUGE	SEUGE	SEUGE	SEUGE	MEAN (SD)
			SC	SC	SC	SC	
			01 0101	01 0102	01 0103	01 0104	
INVERTEBRATES							
	CNICARIA CNIDARIA SPP	ADULTS	987	2467	1480	1480	1603.5 (537.6)
	NEMATODA NEMATODA SPP	ADULTS	2960	30590	9668		10854.4 (11943.5)
	POLYCHAETA CAPITELLIDAE SPP	ADULTS	23189	20229	40457	493	21092.0 (14181.5)
	NEKEIDAE SPP	ADULTS			907		246.7 (427.3)
	PSUDOPOLYDORA SPP	ADULTS			493		123.3 (213.6)
	MUSSONIA FLORIDA	ADULTS	11641	9374	6907	2467	7647.4 (3492.5)
	OLIGONEURATA OLIGONEURATA SPP	ADULTS	140507	138640	343392	79928	177616.0 (199236.2)
	SIVALLIA MACOMA BALTHICA	ADULTS	493	493			246.7 (246.7)
	ACARINA ACARINA SPP	ADULTS		493			123.3 (213.6)
	COPEPODA MACRACANTHUS SPP	ADULTS	987	23189	3447		7030.7 (9441.3)
	CUMACEA HEMILEUCON SPP	ADULTS	10361	7401	4440	5427	6907.3 (2261.0)
	CUMELLA SPP	ADULTS	493	493	987		493.4 (346.9)
	AMPHIPODA CORUPHIUM SPP	ADULTS	5921	13815	16282	6967	10731.0 (4418.1)
	ANISOGAMMARUS CONFERVICOLUS	ADULTS	987	987	2960	987	1480.1 (958.4)
FISH							
	COTTIDAE ENUPHYS BISON	ADULTS				7894	1973.5 (3418.2)
	TOTAL		206726	248171	432200	105583	

Table D-31. Density (number per square meter) of small infauna in a tidal creek of the sedge area, 24 June 1978. Four SC samples each 10 centimeters deep were collected at sampling point 02, and screened on a 0.5-millimeter sieve.

AREA SAMPLER SITE SAMPLE		SEUGE SC	SEUGE SC	SEUGE SC	SEUGE SC	
		01 0201	01 0202	01 0203	01 0204	
TAXON	LIFE STAGE					MEAN (SD)
INVERTEBRATES						
CNICARIA CNICURIA SPP	ADULTS	1574				493.4 (854.6)
NEMATODA NEMATODA SPP	ADULTS	4440		2467	6414	3330.3 (2375.8)
POLYCHAETA CAPITELLIDAE SPP MUSSONIA FLORIDA	ADULTS ADULTS	13321 7894	1974	6907 8387	11368 2467	7894.1 (5115.5) 5180.5 (2970.5)
OLIGOCHAETA OLIGOCHAETA SPP	ADULTS	189458	4443	72527	146534	103239.8 (70732.8)
COPEPODA MACRACANTHUS SPP	ADULTS	4934		1480	3454	2466.9 (1878.7)
CUMACEA HEMILEUCON SPP CUMELLA SPP	ADULTS ADULTS	13815 493	3947	10361	9869 493	9497.6 (3547.1) 246.7 (246.7)
AMPHIPODA CORUPHUM SPP ANISOGAMMARUS CONFERVICOLUS	ADULTS ADULTS	22202 3947	9374 987	7894 3454	9374 493	12211.2 (5739.8) 2220.2 (1508.0)
DIPTERA CHIRONOMIDAE SPP	LARVAE	493				123.3 (213.6)
TOTAL		262571	20722	113477	190445	

Table D-32. Density (number per square meter) of small infauna in a tidal creek of the sedge area, 24 June 1978. Four SC samples each 10 centimeters deep were collected at sampling point 03, and screened on a 0.5-millimeter sieve.

AREA SAMPLER SITE SAMPLE		SEUGE SC	SEUGE SC	SEUGE SC	SEUGE SC	
		01 0301	01 0302	01 0303	01 0304	
TAXON	LIFE STAGE					MEAN(SD)
INVERTEBRATES						
CNICARIA CNIDARIA SPP	ADULTS		987	493	987	616.7(409.1)
NEMATODA NEMATODA SPP	ADULTS	10854	17762	3454	3447	9034.2(5841.7)
POLYCHAETA CAPITELLIDAE SPP	ADULTS	23169	2960	3454	587	7647.4(9020.2)
ETECNE SPP	ADULTS	987				246.7(427.3)
PSOLUCOPOLYDORA SPP	ADULTS	493				123.3(213.6)
HOSSUNIA FLORIDA	ADULTS	5427	5427	4440		3023.7(2244.1)
OLIGOCHAETA OLIGOCHAETA SPP	ADULTS	137653	111010	129266	60192	109530.4(30069.9)
BIVALVIA MACOMA BALTHICA	ADULTS	493				123.3(213.6)
OSTRACODA OSTRACODA SPP	ADULTS		493	493		246.7(246.7)
COPEPODA CYCLOPOIDA SPP	ADULTS		493			123.3(213.6)
MACFACIACIOLA SPP	ADULTS	8387	16775	17762	1480	11101.0(6642.3)
CUMACEA HEMILEUCON SPP	ADULTS	10854	13815	12334	2467	9867.6(4399.1)
AMPHIRODA COROPHIUM SPP	ADULTS	27136	21709	23189	11348	20845.3(5331.2)
AMISGAMMARUS CONFERVICOLUS	ADULTS		987	4440		1356.8(1825.3)
DIPTERA CERATOPOGONIDAE SPP	LARVAE		987			246.7(427.3)
TOTAL		225473	193485	199325	81408	

Table D-33. Density (number per square meter) of small infauna in a tidal creek of the sedge area, 24 June 1978. Four SC samples each 10 centimeters deep were collected at sampling point 05, and screened on a 0.5-millimeter sieve.

AREA SAMPLER SITE SAMPLE		SEUGE SC	SEUGE SC	SEUGE SC	SEUGE SC	
		01 0501	01 0502	01 0503	01 0504	
TAXON	LIFE STAGE					MEAN(SD)
INVERTEBRATES						
CNICARIA CNIDARIA SPP	ADULTS		4934	4440	6414	3947.0(2391.7)
NEMATODA NEMATODA SPP	ADULTS	1974	9868	9374	3947	6290.6(3407.1)
POLYCHAETA CAPITELLIDAE SPP	ADULTS		4387	2467		2713.6(3427.1)
NEANTHES LIMNICOLA	ADULTS		493			123.3(213.6)
HOSSUNIA FLORIDA	ADULTS	1974	5921	3947	6414	4563.8(1757.4)
OLIGOCHAETA OLIGOCHAETA SPP	ADULTS	201792	286168	116931	133706	184647.5(66669.7)
GASTROPODA GASTROPODA SPP	ADULTS		987		1974	740.1(818.2)
OSTRACODA OSTRACODA SPP	ADULTS		1974	493	493	740.1(740.1)
COPEPODA MACFACIACIOLA SPP	ADULTS	987	1480	4934	1480	2220.2(1579.6)
CUMACEA HEMILEUCON SPP	ADULTS	987		493		370.0(409.1)
ISOPODA GNATHOPHRAENA LUTEA	ADULTS		493			123.3(213.6)
AMPHIRODA COROPHIUM SPP	ADULTS	6414	27136	22202	22095	19611.9(7858.3)
AMISGAMMARUS CONFERVICOLUS	ADULTS	493	2960	1974	493	1480.1(1046.6)
INSECTA INSECTA SPP	PUPAE				493	123.3(213.6)
DIPTERA CERATOPOGONIDAE SPP	LARVAE	493	493		1974	740.1(740.1)
TOTAL		215114	351286	167255	180083	

Table D-34. Density (number per square meter) of small infauna in a tidal creek of the sedge area, 24 June 1978. Four SC samples each 10 centimeters deep were collected at sampling point 06, and screened on a 0.5-millimeter sieve.

AREA SAMPLER SITE SAMPLE	TAXON	LIFE STAGE	SEUGE	SEUGE	SEUGE	SEUGE	MEAN (SD)
			SC 01 0601	SC 01 0602	SC 01 0603	SC 01 0604	
INVERTEBRATES							
CNICARIA	CNICARIA SPP	ADULTS	1974		2467	2960	1850.2 (1123.7)
NEMATODA	NEMATODA SPP	ADULTS	4934	12828	9374	3947	7770.7 (3564.2)
POLYCHAETA	CAPITELLIDAE SPP	ADULTS	26143	15788	22202	18255	20538.6 (3337.4)
	NEANIMES LIMNICOLA	ADULTS	493			493	246.7 (246.7)
	MUSONIA FLORIDA	ADULTS	10154	11348	9668	16775	12211.2 (2688.2)
OLIGOCHAETA	OLIGOCHAETA SPP	ADULTS	236329	239289	174604	158375	203149.2 (35405.6)
BIVALVIA	MALUMA BALTHICA	ADULTS		493			123.3 (213.6)
OSTRACODA	OSTRACODA SPP	ADULTS			493	493	246.7 (246.7)
COPEPODA	MACPACTACOIDA SPP	ADULTS	6414	15788	16775	587	9990.9 (6586.0)
CUMACEA	HEMILEUCON SPP	ADULTS	3547	7401	4440	5427	5303.8 (1322.7)
	CUMELLA SPP	ADULTS				587	246.7 (427.3)
ISOPODA	GNURIMOSPHAEROMA LUTEA	ADULTS			493		123.3 (213.6)
AMPHIPODA	CAOPHIUM SPP	ADULTS	17268	14831	19735	20229	18088.4 (2164.7)
	ANISOGAMMARUS CONFERVICOLUS	ADULTS	1480	1974	6414		2466.3 (2391.7)
TOTAL			309842	319710	270465	228528	

Table D-35. Density (number per square meter) of small infauna in a tidal creek of the sedge area, 24 June 1978. Four SC samples each 10 centimeters deep were collected at sampling point 08, and screened on a 0.5-millimeter sieve.

AREA SAMPLER SITE SAMPLE	SEUGE SC 01 0801	SEUGE SC 01 0802	SEUGE SC 01 0803	SEUGE SC 01 0804		
TAXON	LIFE STAGE				MEAN (SD)	
INVERTEBRATES						
UNSPECIFIED UNSPECIFIED SPP	UNSPECIFIED				493	123.3 (213.6)
CNICARIA CNIGARIA SPP	ADULTS				987	616.7 (640.9)
NEMATODA NEMATODA SPP	987	8801	9374	7894	6784.0 (3389.2)	
POLYCHAETA CAPITELLIDAE SPP	3454	18255	8387	6414	9127.5 (5554.6)	
MUSONIA FLORIDA	5427	4440	7894	4934	5673.9 (1328.5)	
OLIGOCHAETA OLIGOCHAETA SPP	48845	65620	140120	126799	9535.7 (30858.8)	
BIVALVIA MALOMA BALTHICA	ADULTS				493	370.0 (213.6)
ACARINA ACARINA SPP	ADULTS				493	123.3 (213.6)
COPEPODA MACPACTACOIDA SPP	ADULTS				1480	2343.6 (1985.0)
CUMACEA HEMILEUCON SPP	8881	1480	3454	3454	4317.1 (2755.3)	
CUMELLA SPP	493		493		246.7 (246.7)	
ISOPODA GNURIMOSPHAEROMA LUTEA	ADULTS				1480	616.7 (640.9)
AMPHIPODA CAOPHIUM SPP	2467	2960	9368	6414	5427.2 (2980.8)	
ANISOGAMMARUS CONFERVICOLUS	ADULTS				1974	616.7 (888.8)
MONOPTERA APHIDIDAE SPP	ADULTS					123.3 (213.6)
DIPTERA CERATOPOGONIDAE SPP	LARVAE				493	123.3 (213.6)
TOTAL	70554	104102	189951	163308		

Table D-36. Density (number per square meter) of large infauna in a tidal creek of the sedge area, 24 June 1978. A 30-centimeter-deep sample was taken by LC at each of six sampling points. The samples were screened on a 2-millimeter sieve.

AREA	SEUGE	SEUGE	SEUGE	SEUGE	SEUGE	SEUGE	
SAMPLER	LC	LC	LC	LC	LC	LC	
SITE	16	16	16	16	16	16	
SAMPLE	0101	0201	0301	0501	0601	0801	
TAXON	LIFE STAGE						MEAN (SD)
INVERTEBRATES							
BIVALVIA							
MACRURA BALTHICA	ADULTS	55	713	219		55	329 228.4 (244.0)
	TOTAL	55	713	219		55	329

Table D-37. Density (number per square meter) of small infauna in a tidal creek of the mature high area, 1 November 1978. Four samples each 10 centimeters deep were collected at sampling point 01, and screened on a 0.5-millimeter sieve.

AREA SAMPLER SITE SAMPLE		MAT HI SC	14 0101	MAT HI SC	14 0102	MAT HI SC	14 0103	MAT HI SC	14 0104		
TAXON											MEAN (SD)
INVERTEBRATES											
CNIDARIA											
CNIDARIA SPP	ADULTS					1974	493				616.7 (808.8)
NEMERTEA					987						246.7 (427.3)
NEMERTEA SPP	ADULTS										
NEMATODA						987	1480				616.7 (542.9)
NEMATODA SPP	ADULTS										
POLYCHAETA											
CAPITELLIDAE SPP	ADULTS	493	5921	21789	10654						9744.3 (7319.5)
AMPHETRIDAE SPP	ADULTS			1974							493.4 (854.6)
POLYDORA SPP	ADULTS			1480	493						493.4 (604.3)
PYGOSPILO SPP	ADULTS				493						123.3 (213.6)
OLIGOPOLYCHAETA											
OLIGOPOLYCHAETA SPP	ADULTS	11348	12828	13321	28123						16404.9 (6904.1)
TANAIDACEA											
TANAIDACEA SPP	ADULTS					493	493				123.3 (213.6)
PANGLUS SPP	ADULTS										
AMPHIPODA											
CONGHIUM SPP	ADULTS			6414	987		987				1350.2 (2665.5)
ANISOGAMMARUS CONFERTICOLUS	ADULTS			987							246.7 (427.3)
PALFIDAE SPP	ADULTS			2960							740.1 (1281.8)
OIPERA											
GERATOPGOGNIDAE SPP	LARVAE			21215	493		493				5427.2 (9117.5)
CHIRONOMIDAE SPP	LARVAE			493							123.3 (213.6)
TOTAL		11641	19736	74007	43909						

Table D-38. Density (number per square meter) of small infauna in a tidal creek of the mature high area, 1 November 1978. Four SC samples each 10 centimeters deep were collected at sampling point 02 and screened on a 0.5-millimeter sieve.

AREA SAMPLER SITE SAMPLE		MAT HI SC	MAT HI SC	MAT HI SC	MAT HI SC	
		14 0201	14 0202	14 0203	14 0204	
TAXON	LIFE STAGE					MEAN (SD)
INVERTEBRATES						
CNIDARIA						
CNIDARIA SPP	ADULTS	1974	6907		3454	3083.6 (2524.8)
NEMATODA						
NEMATODA SPP	ADULTS		1480			370.0 (640.9)
POLYCHAETA						
CAPITELLIDAE SPP	ADULTS	987	987	6414	987	2343.6 (2350.0)
APHARETIDAE SPP	ADULTS	1974	1480	493		936.8 (780.1)
POLYDORA SPP	ADULTS	987	493	493		493.4 (316.9)
PSEUDOPOLYDORA SPP	ADULTS	987				246.7 (427.3)
PTEOSPIR SPP	ADULTS		493			123.3 (213.6)
STRELOSPIR SPP	ADULTS	3454	2960	493		1726.8 (1509.6)
OLIGOCHAETA						
OLIGOCHAETA SPP	ADULTS	14308	39470	28616	1480	20968.7 (14361.1)
TANAIDACEA						
TANAIDACEA SPP	ADULTS			493		123.3 (213.6)
AMPHIPODA						
CUMOPHIUM SPP	ADULTS	493	493	987	987	740.1 (246.7)
AMPHIODE SPP	ADULTS				493	123.3 (213.6)
TOTAL		25164	54763	37983	7401	

Table D-39. Density (number per square meter) of small infauna in a tidal creek of the mature high area, 1 November 1978. Four SC samples each 10 centimeters deep were collected at sampling point 03 and screened on a 0.5-millimeter sieve.

AREA SAMPLER SITE SAMPLE		MAT HI SC	MAT HI SC	MAT HI SC	MAT HI SC	
		14 0301	14 0302	14 0303	14 0304	
TAXON	LIFE STAGE					MEAN (SD)
INVERTEBRATES						
CNIDARIA						
CNIDARIA SPP	ADULTS			3454	5427	2220.2 (2327.3)
NEMATODA						
NEMATODA SPP	ADULTS				1480	370.0 (640.9)
POLYCHAETA						
CAPITELLIDAE SPP	ADULTS		987	2467	23682	6784.0 (9795.6)
APHARETIDAE SPP	ADULTS		987	5427	19242	6413.9 (7683.1)
SP. KOBAYASHI SPP	ADULTS				7694	1973.5 (3419.2)
PSEUDOPOLYDORA SPP	ADULTS			987		246.7 (427.3)
STRELOSPIR SPP	ADULTS			493		123.3 (213.6)
OLIGOCHAETA						
OLIGOCHAETA SPP	ADULTS	6414	93249	28123	25162	38236.9 (32033.9)
CUMACEA						
HEMILEUCON SPP	ADULTS		493	987		370.0 (409.1)
TANAIDACEA						
PANGLUS SPP	ADULTS		493	987	6414	1973.5 (2587.3)
AMPHIPODA						
CUMOPHIUM SPP	ADULTS		1480	36510	44404	20598.6 (20068.5)
GAMMARIDAE SPP	ADULTS			493	587	370.0 (409.1)
ANISOGAMMARUS CONFERVICOLUS	ADULTS			987		246.7 (427.3)
TALITRIDAE SPP	ADULTS			2467		616.7 (1063.2)
AMPHIODE SPP	ADULTS				493	123.3 (213.6)
OIPHERA						
OIPHERA SPP	ADULTS		493			123.3 (213.6)
ODOLCHOPODIDAE SPP	LARVAE	493				123.3 (213.6)
CERATOPOGONIDAE SPP	LARVAE	493	493		493	370.0 (213.6)
CHARACONIDAE SPP	LARVAE		493		7401	1973.5 (3133.3)
TOTAL		7400	99168	83382	143079	

Table D-40. Density (number per square meter) of small infauna in a tidal creek of the mature high area, 1 November 1978. Four SC samples each 10 centimeters deep were collected at the sampling point 04 and screened on a 0.5-millimeter sieve.

AREA SAMPLER SITE SAMPLE		MAT HI SC	14 0401	MAT HI SC	14 0402	MAT HI SC	14 0403	MAT HI SC	14 0404	
TAXON	LIFE STAGE	MEAN (SD)								
INVERTEBRATES										
OLIGONEURATA ULIGONEURATA SPP	ADULTS			987				2960		986.8 (1208.5)
TANALACEA PANCULUS SPP	ADULTS							987		246.7 (427.3)
	TOTAL			987				3947		

Table D-41. Results of sampling for large infauna in a tidal creek of the mature high area, 1 November 1978. No large infauna were found in any of five 30-centimeter-deep samples taken by LC. Samples were screened on a 2-millimeter sieve.

AREA SAMPLER SITE SAMPLE		MAT HI LC	14 0101	MAT HI LC	14 0201	MAT HI LC	14 0301	MAT HI LC	14 0401	MAT HI LC	14 0501
TAXON	LIFE STAGE	(none captured)									
INVERTEBRATES											

Table D-42. Number of animals taken by AN (nonquantitative) in two small creeks of the sedge area, 6 April 1978.

AREA SAMPLER SITE SAMPLE	TAXON	LIFE STAGE	SEUGE	SEUGE	MEAN(SD)	
			AN	AN		
			01	02		
			0001	0001		
INVERTEBRATES						
	CNIDARIA	ADULTS	100	27	63.5(	36.5)
	CNIDARIA SPP					
	NEMERTEA	ADULTS	1		.5(	.5)
	NEMERTEA SPP					
	NEMATODA	ADULTS	5	6	5.5(	.5)
	NEMATODA SPP					
	POLYCHAETA	ADULTS	1	104	52.5(	51.5)
	CAPITELLIDAE SPP	ADULTS	7		3.5(	3.5)
	PSEUDOPOLYDORA SPP	ADULTS				
	PTYGOSPID SPP	ADULTS		43	21.5(	21.5)
	HUGSONIA FLORIDA	ADULTS	25	63	44.0(	19.0)
	OLIGOCHAETA	ADULTS	291	71	101.0(	110.0*
	OLIGOCHAETA SPP					
	BIVALVIA	LARVAE	1		.5(	.5)
	BIVALVIA SPP	JUVENILES		2	1.0(	1.0)
	BIVALVIA SPP					
	ARANEAE	ADULTS	4	1	2.5(	1.5)
	ARANEAE SPP					
	ACARINA	ADULTS	26	3	14.5(	11.5)
	ACARINA SPP					
	OSTRACODA	ADULTS	3	1	2.0(	1.0)
	OSTRACODA SPP					
	COPEPODA	ADULTS	13	2	7.5(	5.5)
	HARPACTACOIDA SPP					
	GUMACEA	ADULTS	72	21E	144.0(	72.0)
	HEMILEUCON SPP					
	ISOPODA	ADULTS	101	13	57.0(	44.0)
	GHIRINOSPHEROMA LUTEA					
	AMPHIPODA	ADULTS	56	455	257.5(	201.5)
	COROPHIUM SPP	ADULTS	80	55	67.5(	12.5)
	ANISOGAMMARUS CONFERVICOLUS					
	HEMPTERA	NYMPHS	1		.5(	.5)
	SALICIDAE SPP					
	OIPTERA	PUPAE	12		6.0(	6.0)
	OIPTERA SPP	ADULTS	1	2	1.0(	1.0)
	OIPTERA SPP	LARVAE	76	12	44.0(	32.0)
	GERATOPPOGONIDAE SPP	ADULTS			3.5(	3.5)
	CHIRONOMIDAE SPP	ADULTS	3		1.5(	1.5)
	CHIRONOMIDAE SPP	LARVAE	2		.5(	.5)
	PSYCHODIDAE SPP	ADULTS				
	PSYCHODIDAE SPP	ADULTS	6		4.0(	4.0)
	CULICIDAE SPP	LARVAE	1	1	1.0(	1.0)
	TIPULIDAE SPP					
FISH						
	COTTIAE	ADULTS	1		.5(	.5)
	LEPTOCOTTUS ARMATUS					
	TOTAL		891	1000		

Table D-43. Number of animals taken by AN (nonquantitative) at five sampling points in a tidal creek of the sedge area, 21 July 1978.

AREA SAMPLER SITE SAMPLE		SEdge AN	SEdge AN	SEdge AN	SEdge AN	SEdge AN		
		03 0101	03 0201	03 0301	03 0601	03 0801		
TAXON	LIFE STAGE						MEAN (SD)	
INVERTEBRATES								
CNICARIA CNIDARIA SPP	ADULTS	119	6	6		41	34.4 (	44.7)
NEHERTEA NEHERTEA SPP	ADULTS			1			.2 (	.4)
NEMATODA NEMATODA SPP	ADULTS	83	15	19	6	18	28.2 (	27.8)
POLYCHAETA CAPITELLIDAE SPP	ADULTS	1022	5	33	8	247	263.0 (	390.1)
NEPHRIMES LIMNICOLA	ADULTS	5					1.0 (	2.0)
PHYGOSPIO SPP	ADULTS		7	2			.4 (	.8)
HOSONIA FLORIDA	ADULTS	185		6	30	37	53.0 (	67.1)
OLIGOCHEATA OLIGOCHEATA SPP	ADULTS	1111	38	84	29	341	320.6 (	411.3)
GASTROPODA ALVEKIA SPP	ADULTS	26	1	10		25	12.4 (	11.3)
ARANEAE ARANEAE SPP	ADULTS			2	1	3	1.2 (	1.2)
ACARINA ACARINA SPP	ADULTS	4	6	44	11	18	16.6 (	14.5)
OSTRACODA OSTRACODA SPP	ADULTS			1		8	1.8 (	3.1)
COPEPODA CALANOIDA SPP	ADULTS	1					.2 (	.4)
MANFRACTACODA SPP	ADULTS	27	2	7	50	32	23.6 (	17.4)
CIRRIPEDIA BALANOIDAE SPP	ADULTS					1	.2 (	.4)
CUMACEA CUMACEA SPP	ADULTS				2		.4 (	.8)
HEMILEUCON SPP	ADULTS	7	2	44	14	54	24.2 (	28.0)
CUMELLA SPP	ADULTS	3					.6 (	1.2)
ISOPODA GNURINOSPHERONA LUTEA	ADULTS	5	7	52	29	295	77.6 (	110.0)
AMPHIPODA AMPHIPODA SPP	ADULTS			1			.2 (	.4)
COXOPHUM SPP	ADULTS	109	10		34	41	30.8 (	36.2)
GAMMARIDEA SPP	ADULTS				1		.2 (	.4)
ANISOGAMMARUS CONFERVICOLUS	ADULTS	2	1	1	1	8	2.5 (	2.7)
TALLITRIDEA SPP	ADULTS				1		.2 (	.4)
DECAPODA HEMIGRAPUS OREGONENSIS	ADULTS					1	.2 (	.4)
INSECTA INSECTA SPP	LARVAE					1	.2 (	.4)
HEMIPTERA HEMIPTERA SPP	ADULTS		2				.4 (	.8)
HEMIPTERA SPP	ADULTS		1				.2 (	.4)
SALICIDAE SPP	ADULTS	1		13			2.8 (	5.1)
SALICIDAE SPP	ADULTS					10	2.0 (	4.0)
HOMOPTERA APHIDIDAE SPP	ADULTS	51	44	17	9	18	27.8 (	16.5)
COLEOPTERA COLEOPTERA SPP	LARVAE	8		1	2	12	4.6 (	4.6)
STAPHYLINIDAE SPP	ADULTS					1	.2 (	.4)
DIPTERA DIPTERA SPP	PUPAE	1			1		.4 (	.5)
DIPTERA SPP	ADULTS		2	3		23	6.0 (	8.6)
EPHYRIDAE SPP	ADULTS				1		1.2 (	2.4)
MUSCIDAE SPP	LARVAE	2		2		6	2.3 (	2.2)
DOLICHOPODOIDEAE SPP	ADULTS				1		.2 (	.4)
ODONTOPODOIDEAE SPP	ADULTS	2					.2 (	.4)
CEKATOPOGONIDAE SPP	LARVAE	30	1	4	3	5	8.6 (	10.8)
GENICULOGONIDAE SPP	ADULTS					1	.2 (	.4)
CHIRONOMIDAE SPP	LARVAE	1				1	.2 (	.4)
PSYCHODIDAE SPP	LARVAE	8		14	23		9.0 (	8.4)
PSYCHODIDAE SPP	ADULTS		2				.4 (	.8)
TIPULIDAE SPP	ADULTS					3	.6 (	1.2)
FISH								
GASTEROSTEIDAE GASTEROSTEUS ACULEATUS	ADULTS	1		6	2	4	2.6 (	2.2)
TOTAL		2814	152	373	267	1264		

Table D-46. Number of animals taken by drift net (nonquantitative) in tidal creeks of the mature high area. Site 13 (large creek) was sampled by the large drift net on 17 October 1978, 1 November 1978, and 12 April 1979; and site 16 (small creek) was sampled by the small drift net on 12 April 1979. Samples 13-0001 and 13-0002 each sampled about 1 hour and samples 13-0003 and 16-0001 about 2 hours during ebttide. The latter two samples were collected during high winds which stirred bottom materials and likely affected sample composition.

AREA SAMPLER SAMPLE	LIFE STAGE	HAT HI LO	HAT HI LO	HAT HI LO	HAT HI LO	MEAN(SD)
INVERTEBRATES						
CHIGALIA CHIGALIA SPP	ADULTS		7			1.01 3.01
NEREIS NEREIS SPP	ADULTS			48		18.01 17.71
NEREIS NEREIS SPP	ADULTS	6	2	20	1	8.01 7.71
POLYCHAETA CAPITATE SPP	ADULTS		11			2.01 4.01
POLYCHAETA POLYCHAETA SPP	ADULTS		1			.31 .61
POLYCHAETA POLYCHAETA SPP	ADULTS		1			.31 .61
POLYCHAETA POLYCHAETA SPP	ADULTS		1			.31 .61
OLIGOCHAETA OLIGOCHAETA SPP	ADULTS	6	41	48	33	24.51 18.71
ARANEAE ARANEAE SPP	ADULTS		1			.31 .61
ACARINA ACARINA SPP	ADULTS		3		3	1.51 1.51
CURCULIO CURCULIO SPP	ADULTS		1	12000	326	2231.01 5410.61
CURCULIO CURELLA SPP	ADULTS				6	2.01 3.51
TANALUCAE TANALUCAE SPP	ADULTS		2		1	.01 .01
ISOPODA GAMMAROPHAGUS LUTEA	ADULTS			20	2	5.51 0.61
AMPHIRODIA AMPHIRODIA SPP	ADULTS	1	6		10	3.31 1.61
AMPHIRODIA AMPHIRODIA SPP	ADULTS	1	2	400	10	110.71 190.81
AMPHIRODIA AMPHIRODIA SPP	ADULTS	1	1		2	1.01 .71
DECAPODA DECAPODA SPP	ZOEAE				1	.31 .61
COLLEMBOLA COLLEMBOLA SPP	ADULTS		1			.31 .61
MONOPTERA MONOPTERA SPP	ADULTS				1	.31 .61
DIPTERA DIPTERA SPP	PUPAE			20	2	5.01 0.71
DIPTERA DIPTERA SPP	ADULTS					.31 .61
DIPTERA DIPTERA SPP	ADULTS	1				.31 .61
DIPTERA DIPTERA SPP	ADULTS	1				.31 .61
FISH						
UNIDENTIFIED FISH SPP	LARVAE				1	.31 .61
TOTAL		13	70	13288	379	

Table D-47. Density (number per square meter) of small infauna in a sandflat adjacent to the low sand area, 22 July 1978. A single MC sample 10 centimeters deep was taken at each of 10 sampling points within a 30- by 60-meter grid. The samples were screened on a 0.5-millimeter sieve.

AREA SAMPLER SAMPLE	LIFE STAGE	L. 30M MC	L. 30M MC	L. 30M MC	L. 30M MC	L. 30M MC	L. 30M MC	L. 30M MC	L. 30M MC	L. 30M MC	MEAN(SD)
INVERTEBRATES											
NEREIS NEREIS SPP	ADULTS	123				247	247				61.71 99.41
NEREIS NEREIS SPP	ADULTS		617		1237	247	247	863	387		355.11 652.41
POLYCHAETA CAPITATE SPP	ADULTS	6661	1406	2456	2968	1406	748	1787	493		1874.31 1921.41
POLYCHAETA POLYCHAETA SPP	ADULTS	16517	6381	11472	18728	6381	7411	3717	4300	1921	2373.11 2673.71
POLYCHAETA POLYCHAETA SPP	ADULTS	247	493	247	866			123	247		123.71 123.71
OLIGOCHAETA OLIGOCHAETA SPP	ADULTS	2637	1637	2716	2637	2590	3456	2220	6317	2220	2824.71 1286.01
AMPHIRODIA AMPHIRODIA SPP	ADULTS	247				123			247		63.71 99.41
OSTEOGASTER OSTEOGASTER SPP	ADULTS	123									12.31 37.01
CAPITATE CAPITATE SPP	ADULTS		493	247	123			123	867		166.41 216.01
TANALUCAE TANALUCAE SPP	ADULTS	823						247	617		123.71 123.71
AMPHIRODIA AMPHIRODIA SPP	ADULTS	123	123	748	493	863	123	117	1637	1637	748.11 123.71
CELLULOSE CELLULOSE SPP	ADULTS		123								12.31 37.01
AMPHIRODIA AMPHIRODIA SPP	ADULTS		123								12.31 37.01
DIPTERA DIPTERA SPP	LARVAE	823									12.31 37.01
TOTAL		19468	13819	21217	19243	12366	12783	12952	6621	14803	7481

Table D-50. Density (number per square meter) of large infauna in a mudflat adjacent to the sedge area, 24 June 1978. A single LC sample 30 centimeters deep was taken at each of 10 sampling points in a 30- by 60-meter grid (two samples were lost during processing). The samples were screened on a 2-millimeter sieve.

AREA SAMPLER SITE SAMPLE		SEUGE LC	SEUGE LC	SEUGE LC	SEUGE LC	SEUGE LC	SEUGE LC	SEUGE LC	SEUGE LC
		03 0113	03 0303	03 0505	03 0816	03 1508	03 2310	03 2414	03 4423
TAXON	LIFE STAGE								
INVERTEBRATES									
BIVALVIA MALCOMA BALTHICA	ADULTS	439	658		932	439	548	384	1535
DECAPODA HEMIGRAPUS GREGONENSIS	ADULTS		55						
	TOTAL	439	713		932	439	548	384	1535

AREA SAMPLER SITE SAMPLE		SEUGE LC	SEUGE LC	SEUGE LC	MEAN(SD)	
		03 4818	03 5411	03 5922		
TAXON	LIFE STAGE					
INVERTEBRATES						
BIVALVIA MALCOMA BALTHICA	ADULTS	603	1042	877	677.81	387.81
DECAPODA HEMIGRAPUS GREGONENSIS	ADULTS				5.01	15.81
	TOTAL	603	1042	877		

APPENDIX E

FISH SAMPLE DATA

Abbreviations for gear used in this appendix are

LS = large seine
MS = medium seine
OT = otter trawl
SS = small seine

Table E-1.

Area 1 (Low Sand)		
Sampler MS		
Site 13		
Sample 01		
Habitat Low level marsh		
Date 17 November 1978		
Fork Length (mm)	Shiner surperch	Threespine stickleback
30		2
32		1
33		2
34		1
35		5
36		7
37		3
38		6
39		9
40		5
41		5
42		8
43		9
44		6
45		1
46		1
75	1	

Table E-2.

Area 7 (Netarts Seine)					
Sampler MS					
Site 01					
Samples 0101-1401					
(Combined results of 14 samples)					
Habitat Low level marsh					
Date 12 April 1979					
Fork Length (mm)	Staghorn	Sculpin	Threespine stickleback	Surf sculpin	Shiner
27	2				
29	1				
30	3				
32	8				
33	5				
34	1				
35	5				
36	1				
37	5				
38	8				
39	5				
40	5				
41	4				
42	2				
43					
44					
45	4				
46					
48					
49	2				
50					
51					
52					
56	1				
57	1				
59	1				
61	1				
66					
67	1				

Table E-3.

Area 2 (Low Silt)					
Sampler MS					
Site 01					
Sample 01					
Habitat Low level marsh					
Date 6 April 1978					
Fork Length (mm)	Staghorn	Sculpin	Threespine stickleback	Surf sculpin	Shiner
19	1				
25	1				
29	1				
37	1				
39					
40					
47					
49					
50					
51					
52					
53					
54					
55	1				
56					
57					
58					
59					
60					
61					
63					
64					

Table E-4.

Area 3 (Sedge)			
Sampler MS			
Site 01			
Sample 01			
Habitat Low level marsh			
Date 6 February 1978			
Fork Length (mm)	Staghorn	Sculpin	Threespine stickleback
22	1		
32	1		
40			
43	1		

Table E-5.

Area 8 (Silt: Seine) Sampler LS Site 01 Samples 01, 02, 04 (Combined results of 3 samples) Habitat: Low level marsh Date 26 April 1979						
Fork Length (cm)	Staghorn	Sculpin	Threespine Stickleback	Shiner	Starry Flatfish	Salmon
18	1					
21	1					
23	3					
25	3					
27	1					
29	1					
31	1					
36	1					
37	1					
38	2					
39	4					
40	1					
42			1			2
43	1		1			1
44	1					4
45						1
46			2			2
47			2			2
48	2		3			1
49			4			1
50			6			1
51			1			1
52			2			3
53			6			1
54			5			
55			1			2
56			2			1
57			2			
58			3			
59						1
60	1		1			
171			1			
187			1			
191			1			
193			1			
213			1			
246			1			
258			1			
266			1			

Table E-6.

Area 2 (Low Silt) Sampler MS Site 10 Sample 01 Habitat Pan Date 18 September 1978	
Fork Length (mm)	Threespine Stickleback
20	1
21	1
22	1
25	3
26	4
27	5
28	3
29	4
30	1
32	2
33	1

Table E-7.

Area 3 (Sedge) Sampler SS Site 18 Sample 01 Habitat Pan Date 18 September 1978	
Fork Length (mm)	Threespine Stickleback
12	1
13	2
14	4
15	2
16	1
17	3
18	1
19	1
20	1
21	1
24	1

Table E-8.

Area 4 (Immature High) Sampler MS Site 01 Sample 01 Habitat Pan Date 7 April 1978		
Fork Length (mm)	Staghorn Sculpin	Threespine Stickleback
48		1
50		1
52		1
55		1
60		1
62		1
76	1	

Table E-9.

Area 5 (Mature High) Sampler MS Site 15 Sample 01 Habitat Pan Date 1 November 1978	
Fork Length (mm)	Threespine Stickleback
31	1
33	2
34	1
35	11
36	4
37	16
38	25
39	18
40	23
41	10
42	8
43	4
44	1
45	2
46	1
48	1

Table E-10.

Area 5 (Mature High)			
Sampler MS			
Site 15			
Sample 02			
Habitat Pan			
Date 12 April 1979			
Fork Length (mm)	Staghorn	Sculpin	Threespine Stickleback
44	1		
45	1		
48	1		
50	1		
51	1	1	
52	3	1	
53	3	5	
54	1	1	
55	4	3	
56	2		
57	3	1	
58	1		
59	2		
60	1		
62	1		
63	1		
65	1		

Table E-12.

Area 2 (Low Silt)			
Sampler MS			
Site 02			
Sample 02			
Habitat Small tidal creek			
Date 18 September 1978			
Fork Length (mm)	Staghorn	Sculpin	Threespine Stickleback
20			1
21			2
22			2
23			5
24			1
25			14
26			14
27			15
28			17
29			12
30			8
31			5
32			6
33			3
34		1	5
35		1	1
36		1	1
38		1	
39		1	
40			1
41			1
44			1
76			1

Table E-11.

Area 2 (Low Silt)			
Sampler MS			
Site 02			
Sample 01			
Habitat Small Tidal Creek			
Date 6 April 1978			
Fork Length (mm)	Staghorn	Sculpin	Threespine Stickleback
17	1		
21	1		
22	1		
23	2		
24	2		
26	1		
27	3		
28	3		
29	4		
30	1	1	
31	2		
33	1		
34	1		
35	1		
36	1	1	
37	1		
38	1		
39	2	1	
40	1		
41	3		
42	2		
43	2		
44	1	1	
46	1		
47	2		
48	1		
49	2		
50	1		
51	1		
52	3		
53	2		
54	1		
55	1		
56	1		
57	3		
58	2		
66	1		

Table E-13.

Area 3 (Sedge)			
Sampler SS			
Sites 01, 02			
Samples 01, 01			
(Combined results of 2 samples)			
Habitat Small tidal creek			
Date 6 April 1978			
Fork Length (mm)	Staghorn	Sculpin	
23		1	
25		1	
38		1	
46		1	
47		1	
48		3	
50		1	
53		1	
63		1	

Table E-14.

Area 3 (Sedge)								
Samplers MS, SS								
Site 17								
Samples 0201, 0301, 0601, 0801								
(Combined results of 4 samples)								
Habitat Large tidal creek								
Date 18 September 1978								
Fork Length (cm)		Topneelt	Staghorn	Sculpin	Sculpin	Coastal	Sculpin	Threespine
22								2
23								3
24								4
25								4
26								7
27								20
28								20
29								21
30								24
31								21
32	1							16
33								5
34					1			9
35					2			8
36								6
37						1		5
38								1
40								
41		1			1			
44								
46								1
61								
72								
82				1				
84				1				
89				1				
90				1				
93				1				
115				1				
124				1				

Table E-15.

Area 5 (Mature High)				
Sampler MS				
Site 14				
Sample 0101, 0201, 0401				
(Combined results of 3 samples.)				
Habitat Large tidal creek				
Date 1 November 1978				
Fork Length (mm)		Staghorn	Sculpin	Threespine Stickleback
22				1
25				1
27				1
28				3
29				5
30				1
31				4
32				9
33				6
34				15
35				12
36				8
37				20
38				13
39				25
40				15
41				23
42				23
43				15
44				12
45				6
46				4
47				3
48				2
49				2
51				1
54				1
58				1

Table E-16.

Area 5 (Mature High)								
Sampler MS								
Site 14								
Sample 0102, 0301								
(Combined results of 2 samples.)								
Habitat Large tidal creek								
Date 12 April 1979								
Fork Length (cm)		Staghorn	Sculpin	Threespine	Sculpin	Stickleback	Surf	Coastal
35		2						
36		1						
37		1						
39		1						1
40		5						
41		4						
42		5						
43		6						
44		2						
45		4						
46		4						
47		5						
48		3						
49		2						
50		2						
51		5						
52		5						
53		2						
54		2						
55		2						
56		2						
57		2						
59		3						
61		8						
63		1						
64		1						
69		2						
73		1						
82		1						

Table E-17.

Area 3 (Sedge)											
Sampler LS											
Site 11											
Sample 01											
Habitat Slough											
Date 18 September 1978											
Fork Length (mm)	Sturgeon	Sculpin	Prickly Sculpin	Surfperch	White Surfperch	Anchovy	Threespine Stickleback	Snail	Slimy Sculpin	Chinook Salmon	Sockeye Salmon
25							2				
28							1				
27							1				
28							2				
29							8				
30							12				
31							15				
32							9				
33							12		1		
34							14				
35							10				
36							8				
37							9				
38							1				
39							9				
40							9				
41							3				
43							1				
44							2				
45							1				
46							1				
47							1				
50							2				
51							1				
52							1				
55											
56				1							
60				1							
61				6							
62				8							
63				4							
64				6							
65				7							
66				7							
67				5							
68				4							
69				4							
70				5							
71				2							
72				1							
73				1		1					
74				3		1					
75				1		1					
76					1	1					
84				2							
94				1							
97									1	1	
98				1							
99				1							
101										2	
102										1	
104										1	
105				2						1	
108				1							
110						1					
113				3							
114				2							
122				1							
126									1		
130				1							
131				1							
137									1		
138		1									
142			1								
160											
172									1		
196										1	

Table E-18.

Area 3 (Sedge)											
Sampler LS											
Site 10											
Sample 01											
Habitat Slough											
Date 10 September 1978											
Fork Length (mm)	Sturgeon	Shiner	Surfperch	Pacific Herring	Threespine Stickleback	Saltwater Killifish	Valley Trout	Golden Shiner	Chinook Salmon	Sockeye Salmon	
32											
35											
50											
51		1									
52		1									
53											
55		2									
56		4									
57		4									
68		9									
59		1									
60		1									
61		4									
62		7									
63		7									
64		6									
65		13									
66		3									
67		11									
68		14									
69		16									
70		22									
71		12									
72		8									
73		13									
74		11									
75		17									
76		8									
77		7									
78		7									
79		7									
80		5		1							
82		1									
83		3									
84		1									
85		2									
86		1									
87		2									
88		2								1	
92		3									
93		1									
94		2									
95		2									
96		3									
97		4									
98		3									
99		2									
100		7								1	
101		2									
102		4									
103		4									
105		2									
106		3									
107		4									
108		5									
109		9									
110		3									
111		3									
112		2									
113		6						1			
114		6									
115		5									
116	1	1									
117		1									
118		2									
119		1									
120		2									
121		1									
122		2									
124		2									
125		2									
127		1									
128		2									
129		2									
133		1									
137		1									
147		1									
154		1									
164							1				
173	1										

Table E-19.

Area 3 (Sedge)									
Sampler MS									
Site 10									
Sample 02									
Habitat Slough									
Date 26 April 1979									
Fork Length (mm)	Staghorn	Sculpin	Surfperch	Threespine	Stickleback	Sculpin	Starry	Flounder	Shiner
36	1								
41	2								
43									
45	1								
47	1								
48								1	
49						1			
50								1	
54								2	
55						3			
56						2			
58						1			
60									
62						1			
63						2			
64						2			
65						2			
66						2			
67						3			
68						3			
69						1			
70						1			
71						1			
73						1			
74									
83		1							
89		1							
109		1							
112		1							
113		1							
115		1							
116		1							
118		1							
125		1							
128		1							
135		1							
136		1							
138		1							
180									
228									

Table E-20.

Area 3 (Sedge)		
Sampler MS		
Site 23		
Sample 01		
Habitat Slough (shallow region)		
Date 26 April 1979		
Fork Length (mm)	Staghorn	Sculpin
28	1	
35	1	
36	1	
39	1	
40	2	
41	2	
42	2	
43	3	
44	3	
45	3	
46	3	
47	2	
48	1	
49	1	
50	1	
51	2	
52	2	
53	4	
54	1	
56	1	
60	1	

Table E-21.

Area 1 (Low Sand)				
Sampler MS				
Site 01				
Sample 01				
Habitat Tidal flat (sandy)				
Date 7 February 1978				
Fork Length (mm)	Staghorn	Sculpin	Surf	Smelt
36	1			2
41			1	
42			1	1

Table E-22.

Area 1 (Low Sand)			
Sampler MS			
Site 01			
Sample 02			
Habitat Tidal flat (sandy)			
Date 3 June 1978			
Fork Length (mm)	Staghorn	Sculpin	English Sole
33			1
35			1
45		1	
46			1
48			1
50			1
51		1	
53		1	
55		1	1
60		1	
62		1	

Table E-23.

Area 2 (Low Silt)				
Sampler MS				
Site 11				
Sample 01				
Habitat Tidal flat (muddy)				
Date 18 September 1978				
Fork Length (mm)	Shiner	Surfperch	Threespine	Stickleback
11		1		
21		3		
22		1		
23		1		
24		4		
25		6		
26		10		
27		4		
28		8		
29		8		
30		9		
31		4		
32		1		
33		2		
34		3		
35		1		
37		1		
39		1		
41		1		
52		1		
60				1
67				1
68				1
73				1

Table E-24.

Area 9 (Siletz Trawl)		Staghorn							
Sampler OT		Sculpin							
Site 11		Shiner							
Sample 01		Surfperch							
Habitat Tidal flat (muddy)		Saddleback							
Date 18 September 1978		Gunnel							
		Starry							
		Flounder							
		English							
		Sole							
		Sand							
		Sole							
Fork Length (mm)									
65			1						
70		1							
75						1			
77					1				
79					1	1			
80						2			
83					2				
84					1	1			
85						1			
87					1				
88					1				
93			1						
95			1			1			
97						1			
99						2			
100								1	
102		1				1			
103						1			
106			1						
113		1							
115			2		1				
116		1							
117		2							
119			1						
120		1							
124							1		
128					1				
130						1			
133		1							
135						2			
141						1			
144						2			
150						1			
160						1			
165						1			
167						1			
182						1			
185						1			
193		1							
201						1			
218						1			
243						1			

Table E-25.

Area 6 (Nectors Trawl)													
Sample 01													
Sample 01 (each site)													
(Combined results of eight samples.)													
Habitat Bay channel													
Date 2 June 1978													
Fork Length (cm)													
20	1												
21	1												
22	1												
23	1												
24	1												
25	1												
26	1												
27	1												
28	1												
29	1												
30	1												
31	1												
32	1												
33	1												
34	1												
35	1												
36	1												
37	1												
38	1												
39	1												
40	1												
41	1												
42	1												
43	1												
44	1												
45	1												
46	1												
47	1												
48	1												
49	1												
50	1												
51	1												
52	1												
53	1												
54	1												
55	1												
56	1												
57	1												
58	1												
59	1												
60	1												
61	1												
62	1												
63	1												
64	1												
65	1												
66	1												
67	1												
68	1												
69	1												
70	1												
71	1												
72	1												
73	1												
74	1												
75	1												

Table E-26.

Area 9 Siletz Trawl
 Sampler OT
 Sites 12, 15, 16
 Sample 01 (each site)
 (Combined results of 3 samples.
 Habitat Bay channel
 Date 18 September 1978

Fork Length (mm)	Staghorn	Sculpin	Buffalo	Sculpin	Cabezon	Shiner	Surfperch	Threespine	Stickleback	Saddleback	Gummel	Starry	Flounder	English	Sole	Sand	Sole	Cinnook	Salmon
32								1											
51																			
53				1										1					
62										1									
66					1														
68						1													
70														1					
79													1						
82		1												1					
90																		1	
91														1					
95														1					
97																1			
98		1																	
99														1					
103														1					
107		1																	
111		1																	
118										1									
120		1																	
123													1						
124		1											1						
126													2						
134													1						
135													1						
138													1						
144													1						
146													1						
159													1						
171		1																	
181													1						
193													1						
324													1						
384													1						
425													1						

APPENDIX F

FISH FOOD HABITS DATA

Stomach contents of fish captured in marsh and bay channel habitats. Each food habits table is referenced to the appropriate table in Appendix E which provides species and length-frequency data for the sample. Mean prey volumes are shown for all fish examined in a sample (excluding fish with empty stomachs). Means shown as ".0" represent values <.05 percent.

Fish species codes are interpreted in the following table:

<u>Family</u>	<u>Scientific Name</u>	<u>Common Name</u>
0301 Ammodytidae	<i>Ammodytes hexapterus</i>	Pacific Sandlance
0401 Atherinidae	<i>Atherinops affinis</i>	Topsmelt
0901 Bothidae	<i>Citharichthys stigmaeus</i>	Speckled Sanddab
1601 Cottidae	<i>Leptocottus armatus</i>	Staghorn Sculpin
1602 Cottidae	<i>Enophrys bison</i>	Buffalo Sculpin
1603 Cottidae	<i>Scorpaenichthys marmoratus</i>	Cabezon
1604 Cottidae	<i>Cottus asper</i>	Prickly Sculpin
1605 Cottidae	<i>Cottus aleuticus</i>	Coastal Sculpin
2201 Embiotocidae	<i>Cymatogaster aggregata</i>	Shiner Surfperch
2202 Embiotocidae	<i>Phanerodon furcatus</i>	White Surfperch
2301 Engraulidae	<i>Engraulis mordax</i>	Northern Anchovy
2401 Gadidae	<i>Microgadus proximus</i>	Pacific Tomcod
2501 Gasterosteidae	<i>Aulorhynchus flavidus</i>	Tubenout
2502 Gasterosteidae	<i>Gasterosteus aculeatus</i>	Threespine Stickleback
2901 Hexagrammidae	<i>Ophiodon elongatus</i>	Lingcod
2902 Hexagrammidae	<i>Hexagrammos decagrammus</i>	Kelp Greenling
3401 Osmeridae	<i>Hypomesus pretiosus</i>	Surf Smelt
3901 Pholidae	<i>Pholis ornata</i>	Saddleback GUNNEL
4001 Pleuronectidae	<i>Platichthys stellatus</i>	Starry Flounder
4002 Pleuronectidae	<i>Parophrys vetulus</i>	English Sole
4003 Pleuronectidae	<i>Peptichthys melanostictus</i>	Sand Sole
4401 Salmonidae	<i>Oncorhynchus keta</i>	Chum Salmon
4402 Salmonidae	<i>Oncorhynchus tshawytscha</i>	Chinook Salmon
4403 Salmonidae	<i>Salmo gairdnerii</i>	Steelhead Trout
4801 Scorpaenidae	<i>Sebastes spp</i>	Rockfish spp
5301 Stichaeidae	<i>Lumpenus sagitta</i>	Snake Prickleback
5401 Syngnathidae	<i>Syngnathus leptorhynchus</i>	Bay Pipefish

Abbreviations for gear used in this appendix are

LS = large seine
MS = medium seine
OT = otter trawl
SS = small trawl

Table F-1. (Reference Table E-1)

AREA: L SAND						
SAMPLER: NS						
SITE: 13						
SAMPLE: 1						
SPECIES:		2502	2502	2502	2502	2502
SPECIMEN		1	2	3	4	5
PK LHC MN		43	86	42	43	38
STOM FULL %		48	90	75	50	30
ADJUS VOL MPPP%		13.8	5.8	42.9	20.8	6.9
DIG STATE		8	5	8	3	6
PREY		NUMB VOL %	NUMB VOL %	NUMB VOL %	NUMB VOL %	NUMB VOL %
UNSPECIFIED		ND 81.8	ND 53.9	ND 19.6	ND 86.1	ND 88.8
INVERTEBRATES						
NEMATODA						
PARASITIC SPP	ADULTS				1	.4
POLYCHAETA						
POLYCHAETA SPP	ADULTS					
OLIGOCHAETA						
OLIGOCHAETA SPP	ADULTS					
ACARINA						
ACARINA SPP	ADULTS					
CRUSTACEA				1	.6	
CRUSTACEA SPP	ADULTS					
OSTRACODA						
OSTRACODA SPP	ADULTS	9	.7	4	.8	1
COPEPODA						
COPEPODA SPP	ADULTS	176	24.8	79	13.6	267
CIRRIPEDIA						
CIRRIPEDIA SPP	LARVAE			1	.2	1
CUMACEA						
CUMACEA SPP	ADULTS					
ISANOIDEA						
ISANOIDEA SPP	ADULTS	1	1.8	29	28.2	50
AMPHIPODA						
AMPHIPODA SPP	JUVENILES					
AMPHIPODA SPP	ADULTS			1	4.1	
COROPHUM SPP	ADULTS	6	6.8	1	8.7	3
AMPHINO SPP	ADULTS			1	4.6	39
DIPTEA						
DIPTEA SPP	LARVAE					
EPHYRIDAE SPP	LARVAE	1	2.6			
MUSCICAE SPP	LARVAE					
OLIGOMYDIDAE SPP	LARVAE	1	.5	2	2.6	
CERATOPOGONIDAE SPP	LARVAE	16	1.4	3	2.4	1
CHIRONOMIDAE SPP	LARVAE			1	.3	3

Table F-1. (Concluded)

AREA 1 L SAND
SAMPLER 15
SITE 13
SAMPLE 1

		2502	2502	2502	2502	2261	
SPECIES		7	8	9	10	11	
SPECIES		39	42	36	44	75	
FX LK MM		50	88	68	75	15	
SIJN FULL %		13.0	59.3	13.9	64.0	19.6	
BOLUS VOL MM**3		5	7	7	9	5	
DIL - JATC							
PREY		NUMB VOL %	NUMB VOL %	NUMB VOL %	NUMB VOL %	NUMB VOL %	MEAN VOL %
UNSPECIFIED		NO 68.5	NO 28.4	NO 57.8	NO 14.0	NO 64.8	55.2
INVERTEBRATES							
NEMATODA							
PARASITIC SPP	ADULTS						.0
POLYCHAETA							
POLYCHAETA SPP	ADULTS		423 68.9				6.3
OLIGOCHAETA							
OLIGOCHAETA SPP	ADULTS				334 85.8		7.8
ACARINA							
ACARINA SPP	ADULTS			1 .2		1 .4	.1
CRUSTACEA							
CRUSTACEA SPP	ADULTS						.1
OSTRACODA							
OSTRACODA SPP	ADULTS		6 .2	2 .3		27 4.7	.7
COPEPODA							
COPEPODA SPP	ADULTS	97 18.0	38 1.1	88 15.9		29 2.7	9.9
CIRRIPEIDIA							
CIRRIPEIDIA SPP	LARVAE		3 .3	1 .2			.2
CUMACEA							
CUMACEA SPP	ADULTS	10 2.8		2 1.8			.9
TANAIDACEA							
TANAIDACEA SPP	ADULTS	10 7.8	2 .2	8 5.0		51 21.4	8.2
AMPHIPODA							
AMPHIPODA SPP	JUVENILES			2 .6		2 1.4	.2
AMPHIPODA SPP	ADULTS						.4
COROPHUM SPP	ADULTS	5 2.9	4 .7	21 16.0			6.7
ANPIIMOL SPP	ADULTS						.4
DIPTERA							
DIPTERA SPP	LARVAE		3 .2				.0
EPHYRIDAE SPP	LARVAE						.2
MUSCIDAE SPP	LARVAE						.2
ODOLCHOPPOGIDAE SPP	LARVAE						.0
CERATOPHONGIDAE SPP	LARVAE	1 1.8		7 3.0	1 .2	14 4.8	2.1
CHIRONOMIDAE SPP	LARVAE					1 1.3	.2

Table F-2. (Reference Table E-2)

AREA: N SEIN SAMPLE: MS SITE: 1 SAMPLE: 0101-1401							
SPECIES:	4461	1601	1601	1661	1601	1601	1601
SPECIMEN	1	2	3	4	5	6	6
PK LRG MM	40	57	28	48	46	30	30
SICH FULL X	70	100	90	65	80	75	75
BOLUS VOL MM**3	13.0	512.0	5.0	6.9	49.0	5.0	5.0
DIG STATE	7	6	5	4	4	3	3
PREY	NUMB VOL %	NUMB VOL %	NUMB VOL %	NUMB VOL %	NUMB VOL %	NUMB VOL %	NUMB VOL %
UNSPECIFIED	ND 35.0	ND 6.5	ND 69.6	ND 65.6	ND 54.9	ND 92.6	
INVERTEBRATES							
PROTOZOA							
FORAMINIFERA SPP	ADULTS			1 4.1			
NERITODA							
PARASITIC SPP	ADULTS						
POLYCHAETA							
POLICHAETA SPP	ADULTS	ND 14.0					
ETIDONE SPP	ADULTS						
NEANTHES LIMNICOLA	ADULTS	1 56.2					
CRUSTACEA							
CRUSTACEA SPP	JUVENILES						
COPEPODA							
CALANOIDA SPP	ADULTS	1 .5					
CYCLOPOIDA SPP	ADULTS						
HARPACTICOIDA SPP	ADULTS		19 20.0	2 1.6			
CUMACEA							
CUMACEA SPP	ADULTS						
HEMILECUN SPP	ADULTS	10 60.0			1 7.0		
TANAIDACIA							
TANAIDACIA SPP	ADULTS						1 2.0
ISOPODA							
ISOPODA SPP	JUVENILES				1 .2		
AMPHIPODA							
AMPHIPODA SPP	ADULTS		1 10.9	1 16.4			
AMPHIPODA SPP	JUVENILES						
COROPHUM SPP	ADULTS	1 4.8		3 12.3	ND 26.0	1 1.9	
AMPHICAMMARUS CONFERTICOLU	ADULTS		1 6.9		1 15.7		
AMPHIHOE SPP	ADULTS						
DIPTERA							
DIPTERA SPP	PUPAE						
DIPTEROPUCCINIDAE SPP	LARVAE		1 2.7				
DIPTEROPUCCINIDAE SPP	LARVAE	1 .1			2 .6	2 3.1	
FISH							
UNIDENTIFIED	UNSPECIFIED						
COITIDAE	STAGNORN SCULPIN UNSPECIFIED	1 13.5					

Table F-2. (Continued)

AREA: N SEIN													
SAMPLE: MS													
SITE: 1													
SAMPLE: 0801-1401													
SPECIES:	1601	1601	4401	4401	4401	4401							
SPECIMEN	7	8	9	10	11	12							
FK LMG MM	30	32	38	42	37	38							
STOM FULL %	40	60	20	60	40	60							
BOLUS VOL MM**3	2.2	4.1	.8	9.8	4.8	5.9							
DIG STATE	6	6	1	3	4	6							
PREY	NUMB VOL %	NUMB VOL %	NUMB VOL %	NUMB VOL %	NUMB VOL %	NUMB VOL %							
UNSPIC:FILE	ND 76.9	ND 48.6	ND 100.0	ND 36.4	ND 16.9	ND 42.3							
INVERTEBRATES													
PROTOZOA													
FORAMINIFERA SPP	ADULTS												
NEMATODA													
PARASITIC SPP	ADULTS												
POLYCHAETA													
POLYCHAETA SPP	ADULTS												
ETEONE SPP	ADULTS												
NEANTHES LIMNICOLA	ADULTS												
CRUSTACEA													
CRUSTACEA SPP	JUVENILES												
COPEPODA													
CALANOIDA SPP	ADULTS												
CYCLOPOIDA SPP	ADULTS												
HARPACTICOIDA SPP	ADULTS	9 19.2	22 49.8										
CUMACEA													
CUMACEA SPP	ADULTS	1 2.6											
MEILEUJON SPP	ADULTS												
TANAIDACEA													
TANAIDACEA SPP	ADULTS				2 16.9								
ISOPODA													
ISOPODA SPP	JUVENILES												
AMPHIPODA													
AMPHIPODA SPP	ADULTS												
AMPHIPODA SPP	JUVENILES												
COROPHUM SPP	ADULTS												
AMICOGAMMARUS CONFERVICOLU	ADULTS												
AMPHIOL SPP	ADULTS												
DIPTERA													
DIPTERA SPP	PUPAE												
CERATOPOGONIDAE SPP	LARVAE												
CHIRONOMIDAE SPP	LARVAE	1 1.3	2 3.1										
FISH													
UNIDENTIFIED	UNSPECIFIED												
GOSTIOAE													
STAGNORN SCULPIN	UNSPECIFIED												

Table F-2. (Continued)

AREA: M SEIN SAMPLER: RS SITE: 1 SAMPLE: 0101-1401						
SPECIES:	2502	2502	2502	4401	1401	2502
SPECIMEN	13	14	15	16	17	18
FK LNO MM	52	53	49	19	43	43
STON FULL X	40	50	60	40	10	35
HOLUS VOL MM**3	12.2	5.8	9.3	1.0	.1	5.0
DE STATE	2	8	7	3	1	1
PREY	NUMB VOL %	NUMB VOL %	NUMB VOL %	NUMB VOL %	NUMB VOL %	NUMB VOL %
UNSPECIFIED	NO 95.0	NO 12.0	NO 30.2	NO 75.0	NO 100.0	NO 51.0
INVERTEBRATES						
PROTOZOA						
FORAMINIFERA SPP	ADULTS					
MONADIDA						
PARASITIC SPP	ADULTS					1 1.0
POLYCHAETA						
POLYCHAETA SPP	ADULTS					
ETEUNE SPP	ADULTS					
NEANTHES LIMNICOLA	ADULTS					
CRUSTACEA						
CRUSTACEA SPP	JUVENILES					
COPEPODA						
CALANOIDA SPP	ADULTS	2 5.0	0 0.0	1 1.5		
CYCLOPOIDA SPP	ADULTS					
NAUPACICOIDA SPP	ADULTS		2 1.3	1 .5		
CUMACEA						
CUMACEA SPP	ADULTS					
HEMILEUCON SPP	ADULTS		6 40.0	13 36.3	1 25.0	2 7.2
TANAIDACEA						
TANAIDACEA SPP	ADULTS					
ISOFOIDA						
ISOFOIDA SPP	JUVENILES					
AMPHIPODA						
AMPHIPODA SPP	ADULTS		3 30.5			
AMPHIPODA SPP	JUVENILES					
COCCOPIUM SPP	ADULTS			1 27.2		2 40.0
EMISOCAMMARUS CONFERVICOLU	ADULTS			1 4.2		
AMPHIPODA SPP	ADULTS					
DIPTERA						
DIPTERA SPP	PUPAE					
GERATOPGCCIONAE SPP	LARVAE					
CHIRONOMIACE SPP	LARVAE					
FISH						
UNIDENTIFIED	UNSPECIFIED					
COTIIDAE						
STAGNORN SCULPIN	UNSPECIFIED					

Table F-2. (Concluded)

AREA: N SEIN SAMPLE: NS SITE: 1 SAMPLE: 0181-1401												
SPECIES:	4401	1601	1601	4401	3401	4401						
SPECIMEN	19	28	21	22	23	24						
PK LMG MM	42	61	44	40	45	39						
STOM FULL %	65	98	90	45	10	80						
BOLUS VOL MM**3	11.8	196.8	91.1	6.0	4.1	27.0						
DIG STATE	1	2	5	6	5	6						
PREY	NUMB VOL %	NUMB VOL %	NUMB VOL %	NUMB VOL %	NUMB VOL %	NUMB VOL %	MEAN VOL %					
UNSPECIFIED	NO 22.8	NO 61.8	NO 42.8	NO 100.6	NO 51.7	NO 43.7	55.1					
INVERTEBRATES												
PROTOZOA												
FURANINIFERA SPP	ADULTS								.2			
NERATODA												
PARASITIC SPP	ADULTS						.0					
POLYCHAETA												
POLYCHAETA SPP	ADULTS						.6					
ETHEO SPP	ADULTS	2 17.2						.7				
MEANTHES LIMNICOLA	ADULTS						2.2					
CRUSTACEA												
CRUSTACEA SPP	JUVENILES						.8					
COPEPODA												
CALANOIDA SPP	ADULTS						.7					
CYCLOPOIDA SPP	ADULTS						.1					
HARPACTICOIDA SPP	ADULTS	1 .1	1 .2	1 3.5		1 1.8	3.9					
CUMACEA												
CUMACEA SPP	ADULTS						.3					
HEMILEUCON SPP	ADULTS	26 58.6	3 44.8		35 45.8	19.4						
TANAIDACEA												
TANAIDACEA SPP	ADULTS	1 .3	9 8.6									
ISOPODA												
ISOPODA SPP	JUVENILES						.6					
AMPHIPODA												
AMPHIPODA SPP	ADULTS	NO 5.2		2 5.7								
AMPHIPODA SPP	JUVENILES						3.1					
COGROPHIUM SPP	ADULTS	2 11.8	3 5.3									
ANISOGAMMARUS CONFERVICOLU	ADULTS	1 8.4	1 20.1		2 6.6		1.8					
AMPHITHE SPP	ADULTS						.8					
DIPTERA												
DIPTERA SPP	PUPAE					1 1.1	.3					
CERATOPOGONIDAE SPP	LARVAE					1 .9	.6					
CHIRONOMIDAE SPP	LARVAE					.2						
FISH												
UNIDENTIFIED	UNSPECIFIED	1 32.6										
COTTIDAE												
STAGHORN SCULPIN	UNSPECIFIED						.5					
AREA: N SEIN SAMPLE: NS SITE: 1 SAMPLE: 0101-1401												
SPECIES:	4401	4401										
SPECIMEN	1	2										
PK LMG MM	41	40										
STOM FULL %	56	63										
BOLUS VOL MM**3	4.2	3.8										
DIG STATE	6	7										
PREY	NUMB VOL %	NUMB VOL %	MEAN VOL %									
UNSPECIFIED	NO 61.6	NO 26.8	44.7									
INVERTEBRATES												
COPEPODA												
HARPACTICOIDA SPP	ADULTS	1 .1	.1									
CUMACEA												
HEMILEUCON SPP	ADULTS	14 28.8	17 71.8	50.0								
AMPHIPODA												
COGROPHIUM SPP	ADULTS	1 2.8	1.0									
ANISOGAMMARUS CONFERVICOLU	ADULTS	1 5.8	2.5									
DIPTERA												
CERATOPOGONIDAE SPP	LARVAE	2 .5	2 3.8	1.8								

Table F-3. (Reference Table E-5)

SPECIES ¹	AREA: S SEIN	1601	2902	1601	3401	4401	4401
SPECIMEN	SAMPLER: LS	1	2	3	6	5	6
PK LMG MM		48	51	60	43	52	52
STOM FULL %	SITE: 1	95	60	60	5	45	45
BOLUS VOL MM ³	SAMPLE: 1	12.0	21.6	9.6	0	18.0	12.5
DIG STATE		0	7	7	0	2	2
PREY		NUMB VOL %	NUMB VOL %	NUMB VOL %	NUMB VOL %	NUMB VOL %	NUMB VOL %
UNSPECIFIED		NO 16.0	NO 11.0	NO 15.0		NO 23.0	NO 04.7
INVERTEBRATES							
POLYCHAETA							
AMPHARETIIDAE SPP	ADULTS						
OSTRACODA							
OSTRACODA SPP	ADULTS						
COPEPODA							
HARPACTICOIDA SPP	ADULTS						
CUMACEA							
MEILEUCON SPP	ADULTS	4 3.0	6 5.0				
AMPHIPODA							
COROPHIUM SPP	ADULTS	14 88.0					
ANISOGAMMARUS CONFERVICOLU	ADULTS	3 1.0	4 10.0	2 25.0			
ORTHOPTERA							
ORTHOPTERA SPP	ADULTS				2 1.0		
DIPTERA							
DIPTERA SPP	PUPAE				20 7.0	12 5.0	
DIPTERA SPP	ADULTS				11 0.0		
CERATOPOGONIDAE SPP	PUPAE						
CERATOPOGONIDAE SPP	LARVAE					8 .5	
PSYCHODIDAE SPP	ADULTS					13 10.0	
PSYCHODIDAE SPP	PUPAE						
HYMENOPTERA							
FORMICIDAE SPP	ADULTS				1 1.0	1 .0	
FISH							
UNIDENTIFIED FIS LARVAE			7 70.0				
SPECIES ¹		1601	1601	4401	1601		
SPECIMEN		7	8	9	10		
PK LMG MM		27	31	49	21		
STOM FULL %		00	70	45	05		
BOLUS VOL MM ³		1.7	.9	4.4	.8		
DIG STATE		1	5	3	0		
PREY		NUMB VOL %	NUMB VOL %	NUMB VOL %	NUMB VOL %	MEAN VOL %	
UNSPECIFIED		NO 96.4	NO 48.0	NO 76.0	NO 100.0	56.4	
INVERTEBRATES							
POLYCHAETA							
AMPHARETIIDAE SPP	ADULTS	1 .0				.1	
OSTRACODA							
OSTRACODA SPP	ADULTS		8 16.0			2.0	
COPEPODA							
HARPACTICOIDA SPP	ADULTS		1 .2			.0	
CUMACEA							
MEILEUCON SPP	ADULTS		1 1.0	2 .0		1.1	
AMPHIPODA							
COROPHIUM SPP	ADULTS	2 41.0	2 32.0	2 0.0		17.9	
ANISOGAMMARUS CONFERVICOLU	ADULTS					11.1	
ORTHOPTERA							
ORTHOPTERA SPP	ADULTS					.1	
DIPTERA							
DIPTERA SPP	PUPAE			6 0.0		2.2	
DIPTERA SPP	ADULTS					.9	
CERATOPOGONIDAE SPP	PUPAE	1 3.0				.3	
CERATOPOGONIDAE SPP	LARVAE			2 .5		.1	
PSYCHODIDAE SPP	ADULTS			4 7.0		1.9	
PSYCHODIDAE SPP	PUPAE	1 .1				.0	
HYMENOPTERA							
FORMICIDAE SPP	ADULTS					.2	
FISH							
UNIDENTIFIED LARVAE						7.0	

Table F-4. (Reference Table E-5)

AREA: 3 SEIN SAMPLER: LS SITE: 1 SAMPLE: 2						
SPECIES:	4001	4001	4001	4001	4001	
SPECIMEN:	1	2	3	4	5	
FK LNS MM:	189	215	250	169	190	
SDM FULL X:	40	78	55	30	75	
ADLUS VOL MM**3:	42.0	56.0	378.0	19.0	116.5	
DIG STATE:	8	3	8	6	1	
PREY:	NUMB VOL X	NUMB VOL X	NUMB VOL X	NUMB VOL X	NUMB VOL X	MEAN VOL X
UNSPECIFIED:	NO 26.0	NO 3.0	NO 2.0	NO 41.7	NO 99.8	34.5
INVERTEBRATES						
POLYCHAETA						
POLYCHAETA SPP	ADULTS	1 1.0				.2
ETEONE SPP	ADULTS			1 1.0		.2
GLYCERA SPP	ADULTS	1 3.0			1 .2	.6
CUMACEA						
HEMILEUDON SPP	ADULTS			1 .3		.1
AMPHIPODA						
COPPOPHIUM SPP	ADULTS	38 63.0		2 2.0		14.2
ANISUGAMMARUS CCMERYICOLU	ADULTS	1 5.0		2 16.0		4.2
DECAPODA						
DECAPODA SPP	LARVAE		NO 93.0			18.6
GALLIANASSA SPP	ADULTS			1 98.0		19.6
DIPTERA						
TA3AHIDAE SPP	PUPAE			1 39.0		7.8

Table F-5. (Reference Table E-5)

AREA 5 SEIN SAMPLER 15 SITE 1 SAMPLE 4							
SPECIES	4401	4401	4401	4401	4401	4401	4401
SPECIES	1	2	3	4	5	6	6
PK LRG NM	43	42	47	51	52	56	56
STOM FULL X	00	05	00	05	02	07	07
BOLUS VOL MM ³	12.9	4.0	18.2	12.5	12.3	31.3	31.3
DIG STATE	3	4	3	2	5	0	0
PREY	NUMB VOL X	NUMB VOL X	NUMB VOL X	NUMB VOL X	NUMB VOL X	NUMB VOL X	NUMB VOL X
UNSPECIFIED	ND 88.3	ND 61.0	ND 43.0	ND 69.0	ND 44.0	ND 7.1	
INVERTEBRATES							
ARANEAE							
ARANEAE SPP	ADULTS	1 4.0			1 1.0		
COPEPODA							
COPEPODA SPP	ADULTS	1 4.2					
CALANOIDA SPP	ADULTS					1 4.1	
HARPACTICOIDA SPP	ADULTS						
MYSIDACEA							
MYSIDACEA SPP	ADULTS					2 2.5	
AMPHIPODA							
COROPHILUM SPP	ADULTS					1 4.2	
DECAPODA							
DECAPODA SPP	LARVAE					1 4.2	
CARIDEA SPP	ADULTS						
COLLEMBOLA							
COLLEMBOLA SPP	ADULTS		1 1.0			1 1.0	
HEMIPTERA							
HEMIPTERA SPP	ADULTS			ND 2.0		1 4.1	
COLEOPTERA							
COLEOPTERA SPP	LARVAE	1 4.5					
COLEOPTERA SPP	ADULTS						
DIPTERA							
DIPTERA SPP	ADULTS					6 1.0	
DIPTERA SPP	PUPAE	13 1.0	22 31.0	14 6.0	41 26.0	00 51.0	2 4.2
DOLICHOPODIDAE SPP	LARVAE					1 1.0	
CERATOPOGONIDAE SPP	LARVAE	8 1.0	20 6.0				
CHIRONOMIDAE SPP	LARVAE	1 4.5					1 4.1
PSYCHODIDAE SPP	PUPAE			49 47.5			
PSYCHODIDAE SPP	LARVAE	6 1.0	0 1.0	7 2.0	3 2.0	29 2.0	33 6.0
PSYCHODIDAE SPP	ADULTS					1 1.5	
HYMENOPTERA							
HYMENOPTERA SPP	ADULTS			1 1.5			3 1.0
FORMICIDAE SPP	ADULTS	1 1.0			1 1.0		
FISH							
UNIDENTIFIED	LARVAE						34 80.5

Table F-5. (Concluded)

AREA: S SEIN							
SAMPLER: LS							
SITE: 1							
SAMPLE: 6							
SPECIES:		4401	4401	4401	4401		
SPECIMEN		7	8	9	10		
FK LND M4		42	59	55	45		
SDM FULL X		92	97	96	84		
90LUS VOL M4**2		12.0	17.6	18.0	16.4		
DIG STATE		8	8	7	9		
PREY		NUMB VOL %	NUMB VOL %	NUMB VOL %	NUMB VOL %	MEAN VOL %	
UNSPECIFIED		NO 19.7	NO 8.0	NO 9.2	NO 76.9	42.6	
INVERTEBRATES							
ARANEAE	ADULTS						.2
COPEPODA	ADULTS						.0
COPEPODA SPP	ADULTS	1	.1				.0
CALANOIDA SPP	ADULTS	1	.1				.0
HARPACTICOIDA SPP	ADULTS						.0
MYSIDACEA	ADULTS		2	1.0			.4
MYSIDACEA SPP	ADULTS						.4
AMPHIPODA	ADULTS	1	.1				.4
COROPHID SPP	ADULTS			1	.1	2	.4
DECAPODA	LARVAE						.0
DECAPODA SPP	LARVAE						.1
CARIDEA SPP	ADULTS			1	.0		.1
COLLEMBOLA	ADULTS						.2
COLLEMBOLA SPP	ADULTS						.2
HEMIPTERA	ADULTS						.2
HEMIPTERA SPP	ADULTS						.2
COLEOPTERA	LARVAE						.1
COLEOPTERA SPP	LARVAE						.1
COLEOPTERA SPP	ADULTS				1	.0	.1
DIPTERA	ADULTS	9	4.0		18	3.0	.8
DIPTERA SPP	PUPAE			4	1.0	21	13.4
DIPTERA SPP	LARVAE						.1
DOLICHOPODIDAE SPP	LARVAE						.9
CRATOPOGONIDAE SPP	LARVAE						.4
CHIRONOMIDAE SPP	PUPAE	9	2.0		2	.2	12.1
PSYCHODIDAE SPP	LARVAE	89	74.0				.6
PSYCHODIDAE SPP	LARVAE			6	2.0	4	3.0
PSYCHODIDAE SPP	ADULTS						1.5
HYMENOPTERA	ADULTS						.2
HYMENOPTERA SPP	ADULTS						.4
FORNICIDAE SPP	ADULTS				2	2.0	.4
FISH							
UNIDENTIFIED	LARVAE		36	18.0	27	20.0	25.6

Table F-6. (Reference Table E-6)

AREA: L SILT						
SAMPLER: NS						
SITE: 10						
SAMPLE: 1						
SPECIES:	2502	2502	2502	2502	2502	2502
SPECIMEN	1	2	3	4	5	6
PK LMG MM	21	22	25	29	32	24
STOM FULL %	80	8	50	60	80	75
BOLUS VOL MM**3	5.4	8	2.0	22.0	27.0	15.0
DIG STATE	3	8	7	4	4	4
PREY	NUMB VOL %	NUMB VOL %	NUMB VOL %	NUMB VOL %	NUMB VOL %	NUMB VOL %
UNSPECIFIED	ND 64.2		ND 50.6	ND 51.3	ND 30.1	ND 55.4
INVERTEBRATES						
OLIGOCHAETA						
OLIGOCHAETA SPP	ADULTS					1 4.5
GASTROPODA						
ALDERIA SPP	ADULTS			1 11.4	2 7.8	1 3.0
ACARINA						
ACARINA SPP	ADULTS		1 .4			
OSTRACODA						
OSTRACODA SPP	ADULTS		1 .4			6 2.2
COPEPODA						
HARPACTICOIDA SPP	ADULTS	41 28.4	34 8.4	7 1.3	29 3.7	57 13.4
CUNACEA						
HEMILEUDON SPP	ADULTS				1 3.4	
ISOPODA						
GNORINOSPHAEROMA LUTEA	ADULTS		2 17.8			
AMPHIPODA						
COROPHIUM SPP	ADULTS				2 15.6	
DIPTERA						
DIPTERA SPP	PUPAE			1 1.9	1 1.9	1 2.2
MUSCICIDAE SPP	LARVAE					
DOLICHOPODIDAE SPP	LARVAE		2 3.4			
CEATOPUGONIDAE SPP	LARVAE	3 11.4	12 19.4	29 22.4	27 37.6	27 17.8
PSYCHODIDAE SPP	LARVAE			7 11.5		
TIPULIDAE SPP	LARVAE				1 .4	1 .5
SPECIES:	2502	2502	2502	2502		
SPECIMEN	7	8	9	10		
PK LMG MM	27	30	27	24		
STOM FULL %	65	75	75	90		
BOLUS VOL MM**3	5.4	21.9	9.3	24.4		
DIG STATE	5	3	6	5		
PREY	NUMB VOL %	NUMB VOL %	NUMB VOL %	NUMB VOL %	MEAN VOL %	
UNSPECIFIED	ND 64.2	ND 57.3	ND 69.4	ND 60.7	56.8	
INVERTEBRATES						
OLIGOCHAETA						
OLIGOCHAETA SPP	ADULTS	5 7.3	1 .3	1 .3	1.4	
GASTROPODA						
ALDERIA SPP	ADULTS		4 18.5	1 3.5	5.8	
ACARINA						
ACARINA SPP	ADULTS	4 .6		1 .2	.1	
OSTRACODA						
OSTRACODA SPP	ADULTS		1 .4	3 .5	.5	
COPEPODA						
HARPACTICOIDA SPP	ADULTS	31 5.7	4 .3	37 4.9	44 3.5	6.8
CUNACEA						
HEMILEUDON SPP	ADULTS					.4
ISOPODA						
GNORINOSPHAEROMA LUTEA	ADULTS					1.9
AMPHIPODA						
COROPHIUM SPP	ADULTS					1.7
DIPTERA						
DIPTERA SPP	PUPAE					.4
MUSCICIDAE SPP	LARVAE					.2
DOLICHOPODIDAE SPP	LARVAE			2 1.3		.5
CEATOPUGONIDAE SPP	LARVAE	9 4.5	51 22.7	21 24.4	50 31.3	21.3
PSYCHODIDAE SPP	LARVAE	2 2.3	1 .8			1.6
TIPULIDAE SPP	LARVAE	3 11.3				1.4

Table F-7. (Reference Table E-8)

AREA: IM HI						
SAMPLER: MS						
SITE: 1						
SAMPLE: 1						
SPECIES:	2502	2502	2502	2502	2502	2502
SPECIMEN	1	2	3	4	5	6
PK LMG MM	40	62	50	52	55	60
STOM FULL X	20	15	20	15	5	30
BOLUS VOL MM**3	17.6	21.9	17.6	8.8	1.0	32.8
DIG STATE	0	5	9	7	7	7
PREY	NUMB VOL X	NUMB VOL X	NUMB VOL X	NUMB VOL X	NUMB VOL X	NUMB VOL X
UNSPECIFIED	ND 8.8	ND 49.8	ND 6.0	ND 62.1	ND 47.0	ND 5.0
INVERTEBRATES						
OLIGOCHAETA						
OLIGOCHAETA SPP	ADULTS		1 1.5			
COPEPODA						
CALANOIDA SPP	ADULTS	274 98.0	135 39.2	185 44.6	41 34.5	21 43.0
MARFACICOIDA SPP	ADULTS	13 1.0	87 7.5	32 4.8	18 3.4	6 5.0
						43 50.0
AMPHIPODA						
AMPHIPODA SPP	ADULTS					
ANISOGANHARUS CONFERVICOLU	ADULTS	1 1.0	5 2.7	3 3.1		1 5.0
						7 41.7
DIPTERA						
DIPTERA SPP	LARVAE		1 1.6			
SPECIES:	1501					
SPECIMEN	7					
PK LMG MM	76					
STOM FULL X	50					
BOLUS VOL MM**3	12.5					
DIG STATE	2					
PREY	NUMB VOL X	MEAN VOL X				
UNSPECIFIED	ND 31.4	38.2				
INVERTEBRATES						
OLIGOCHAETA						
OLIGOCHAETA SPP	ADULTS		.2			
COPEPODA						
CALANOIDA SPP	ADULTS		40.8			
MARFACICOIDA SPP	ADULTS		3.5			
AMPHIPODA						
AMPHIPODA SPP	ADULTS	ND 33.3	4.8			
ANISOGANHARUS CONFERVICOLU	ADULTS	2 33.3	12.4			
DIPTERA						
DIPTERA SPP	LARVAE		.2			

Table F-8. (Reference Table E-9)

AREA1 NAT HI						
SAMPLER1 M5						
SITE1 15						
SAMPLE1 1						
SPECIES1	2502	2502	2502	2502	2502	2502
SPECIMEN	5	2	3	4	5	6
FK LKG MM	39	30	45	41	46	43
STOM FULL X	30	40	45	25	20	5
BOLUS VOL MM**3	3.4	5.0	22.0	0.0	5.4	.1
DIG STATE	1	1	2	2	2	1
PREY	NUMB VOL X	NUMB VOL X	NUMB VOL X	NUMB VOL X	NUMB VOL X	NUMB VOL X
UNSPECIFIED	NO 99.0	NO 99.0	NO 97.0	NO 90.0	NO 60.0	NO 99.0
INVERTEBRATES						
NEMATODA						
PARASITIC SPP	ADULTS	2 1.0				
COPEPODA						
CA. ANOIDA SPP	ADULTS			1 2.5		
NARPACT COIDA SPP	ADULTS		1 .3	13 3.5		
HEMIPTERA						
HEMIPTERA SPP	NYMPHS			2 4.0		
HEMIPTERA SPP	ADULTS		1 1.0			
DIPTERA						
DIPTERA SPP	ADULTS					
EPHYTORIDAE SPP	LARVAE					
CERATOPUCHIDAE SPP	LARVAE					
CHIRONOMIDAE SPP	LARVAE	1 .0	5 2.0		3 40.0	
SPECIES1	2502	2502	2502	2502		
SPECIMEN	7	8	9	10		
FK LKG MM	37	42	36	40		
STOM FULL X	15	70	50	10		
BOLUS VOL MM**3	1.0	15.6	5.0	.0		
DIG STATE	2	3	2	1		
PREY	NUMB VOL X	NUMB VOL X	NUMB VOL X	NUMB VOL X	MEAN VOL X	
UNSPECIFIED	NO 75.0	NO 43.0	NO 90.0	NO 100.0	86.1	
INVERTEBRATES						
NEMATODA						
PARASITIC SPP	ADULTS		5 .6		.2	
COPEPODA						
CA. ANOIDA SPP	ADULTS		5 .6		.3	
NARPACTICOIDA SPP	ADULTS	25 0.0			1.0	
HEMIPTERA						
HEMIPTERA SPP	NYMPHS				.4	
HEMIPTERA SPP	ADULTS				.1	
DIPTERA						
DIPTERA SPP	ADULTS		1 43.0		4.3	
EPHYTORIDAE SPP	LARVAE				2.5	
CERATOPUCHIDAE SPP	LARVAE	1 .5			.1	
CHIRONOMIDAE SPP	LARVAE	0 7.5	3 .3		5.1	

Table F-9. (Reference Table E-10)

AREA: NAT H1						
SAMPLER: MS						
SITE: 15						
SAMPLE: 2						
SPECIES:	1601	2502	1601	1601	1601	2502
SPECIMEN	1	2	3	4	5	4
PK LNG MM	68	50	65	57	60	54
STOM FULL %	92	70	65	40	45	30
BOLUS VOL MM**3	18.2	4	6.4	4.9	9.0	1.8
DIG STATE	7	0	1	0	9	1
PREY	NUMB VOL %	NUMB VOL %	NUMB VOL %	NUMB VOL %	NUMB VOL %	NUMB VOL %
UNSPECIFIED	NO 21.8	NO 100.0	NO 96.8	NO 99.5	NO 2.8	NO 96.8
INVERTEBRATES						
NEMATODA						
NEMATODA SPP	ADULTS					
OLIGOCHAETA						
OLIGOCHAETA SPP	ADULTS					
COPEPODA						
CALANOIDA SPP	ADULTS		7 1.0	1 .2		34 1.0
MARPACT COGIA SPP	ADULTS			3 .4		174 3.0
ISOPODA						
GNORINOPHAERONA LUTEA	ADULTS				1 98.0	
AMPHIPODA						
TALITRIDAE SPP	ADULTS	1 5.0				
DIPTERA						
CHIRONOMIDAE SPP	LARVAE		1 1.0			
CHIRONOMIDAE SPP	ADULTS					
FISH						
UNIDENTIFIED FIS EGGS	39 74.8					
SPECIES:	1601	2502	2502	2502		
SPECIMEN	7	8	9	10		
PK LNG MM	54	54	53	55		
STOM FULL %	92	85	80	70		
BOLUS VOL MM**3	1.0	.9	4.0	3.6		
DIG STATE	2	8	8	7		
PREY	NUMB VOL %	NUMB VOL %	NUMB VOL %	NUMB VOL %	MEAN VOL %	
UNSPECIFIED	NO 96.6	NO 4.0	NO 7.8	NO 42.7	56.7	
INVERTEBRATES						
NEMATODA						
NEMATODA SPP	ADULTS			1 .1	.0	
OLIGOCHAETA						
OLIGOCHAETA SPP	ADULTS			1 .2	.0	
COPEPODA						
CALANOIDA SPP	ADULTS	48 1.3	1356 96.8	1992 92.0	293 7.0	19.9
MARPACTICOIDA SPP	ADULTS	66 2.0		8 1.8	59 3.0	.9
ISOPODA						
GNORINOPHAERONA LUTEA	ADULTS					9.0
AMPHIPODA						
TALITRIDAE SPP	ADULTS					.5
DIPTERA						
CHIRONOMIDAE SPP	LARVAE	1 .1		14 65.8	4.6	
CHIRONOMIDAE SPP	ADULTS			1 2.0	.2	
FISH						
UNIDENTIFIED EGGS					7.4	

Table F-10. (Reference Table E-11)

AREA: L SILT						
SAMPLER: MS						
SITE: 2						
SAMPLE: 1						
SPECIES:	1601	1601	1601	1601	1601	1601
SPECIMEN	1	2	3	4	5	6
PK LMG HM	42	58	57	52	42	38
STOM FULL X	88	45	85	40	60	40
BOLUS VOL MM**3	88.2	34.5	195.1	27.0	32.8	15.6
DIG STATE	7	8	3	2	6	2
PREY	NUMB VOL X	NUMB VOL X	NUMB VOL X	NUMB VOL X	NUMB VOL X	NUMB VOL X
UNSPECIFIED	NO 17.3	NO 17.8	NO 55.6	NO 79.0	NO 48.4	NO 85.7
INVERTEBRATES						
POLYCHAETA						
AMPHARETIIDAE SPP	ADULTS					
ACARINA						
ACARINA SPP	ADULTS					
OSTRACODA						
OSTRACODA SPP	ADULTS					
COPEPODA						
CELANODIJA SPP	ADULTS					
HAERPACTICOIDA SPP	ADULTS					
CUMACEA						
HEMILEUDON SPP	ADULTS	1 2.8				
ISOPODA						
GNORINGSPHAEROMA LUTEA	ADULTS		1 16.0		1 16.2	
AMPHIPODA						
AMPHIPODA SPP	ADULTS	1 .3	NO 11.4	NO 2.5		NO 14.3
COROPHINIUM SPP	ADULTS	34 78.8				
ANISOGAMMARUS CONFERVICOLU	ADULTS	3 1.4	4 54.3	9 32.2	1 14.8	3 40.4
DIPTERA						
DIPTERA SPP	PUPAE					
CERATOPOLONIDAE SPP	LARVAE		4 8.5			
CHIRONOMIDAE SPP	LARVAE	3 1.0	3 4.2	3 1.0	2 3.7	4 3.0
PSYCHODIDAE SPP	LARVAE					
TIPULIDAE SPP	LARVAE					
SPECIES:	1601	1601	1601	1601	2502	2507
SPECIMEN	7	8	9	10	11	12
PK LMG HM	37	29	26	23	30	44
STOM FULL X	65	40	83	60	75	80
BOLUS VOL MM**3	21.0	4.1	19.7	3.4	6.9	46.0
DIG STATE	5	6	8	8	6	5
PREY	NUMB VOL X	NUMB VOL X	NUMB VOL X	NUMB VOL X	NUMB VOL X	NUMB VOL X
UNSPECIFIED	NO 43.3	NO 44.8	NO 3.8	NO 7.5	NO 20.3	NO 36.2
INVERTEBRATES						
POLYCHAETA						
AMPHARETIIDAE SPP	ADULTS					
ACARINA						
ACARINA SPP	ADULTS					1 .3
OSTRACODA						
OSTRACODA SPP	ADULTS	1 .2				2 .3
COPEPODA						
CELANODIJA SPP	ADULTS					
HAERPACTICOIDA SPP	ADULTS	1 .2	3 2.8	2 .8	91 18.9	16 .4
CUMACEA						
HEMILEUDON SPP	ADULTS					1 .6
ISOPODA						
GNORINGSPHAEROMA LUTEA	ADULTS		1 10.4			
AMPHIPODA						
AMPHIPODA SPP	ADULTS					
COROPHINIUM SPP	ADULTS		12 95.0	4 91.7	1 4.3	3 8.5
ANISOGAMMARUS CONFERVICOLU	ADULTS	2 26.8	1 26.9			1 7.4
DIPTERA						
DIPTERA SPP	PUPAE					
CERATOPOLONIDAE SPP	LARVAE	12 31.3	8 17.9		1 7.4	15 24.1
CHIRONOMIDAE SPP	LARVAE				22 46.0	23 18.3
PSYCHODIDAE SPP	LARVAE					
TIPULIDAE SPP	LARVAE				1 1.1	1 1.3

Table F-10. (Concluded)

AREA# L SILT			
SAMPLE# AS			
SITE# 2			
SAMPLE# 1			
SPECIES		2502	2502
SPECIMEN		13	14
PK LNC MM		36	40
STOM FULL %		50	80
BDLUS VOL MM**3		5.8	125.0
DIC STATE		7	6
PREY		NUMB VOL %	NUMB VOL %
			MEAN VOL %
UNSPECIFIED		NO 49.8	NO 24.8
			37.6
INVERTEBRATES			
POLYCHAETA			
AMPHARETIIDAE SPP	ADULTS	7	83.8
			2.4
ACARINA			
ACARINA SPP	ADULTS		
			.0
OSTRACODA			
OSTRACODA SPP	ADULTS	2	.1
			.0
COPEPODA			
CALANDIUA SPP	ADULTS	1	.2
HARPACTICOIDA SPP	ADULTS	32	9.2
		7	.3
			2.3
CUMACEA			
HEMILEUDON SPP	ADULTS		
			.2
ISOPODA			
GNDRIMOSPHAERONA LUTEA	ADULTS		
			3.0
AMPHIPODA			
AMPHIPODA SPP	ADULTS	NO	6.2
		7	20.8
COROPHIUM SPP	ADULTS		21.3
ANISOGAMMARUS CONFERVICOLU	ADULTS	2	26.5
		5	11.4
			17.4
DIPTERA			
DIPTERA SPP	PUPAE	1	1.0
CERATOPYGGINOAE SPP	LARVAE	4	12.5
			9.7
CNIXONHICIAE SPP	LARVAE		.9
PSYCHOGLIDAE SPP	LARVAE		.1
TRIPULIDAE SPP	LARVAE	1	2.3
			.2

Table F-11. (Reference Table E-12)

LAKE L SILT SAMPLER HS SITE 2 SAMPLES 2						
SPECIES	2502	2502	2502	2502	2502	2502
SPECIMEN	1	2	3	4	5	6
PK LMG MM	25	26	32	27	22	34
STOM FULL %	60	75	80	60	60	75
SOLUS VOL MM**3	4.9	10.7	35.9	6.9	4.9	17.6
DIG STATE	4	5	8	5	5	7
PREY	NUMB VOL %	NUMB VOL %	NUMB VOL %	NUMB VOL %	NUMB VOL %	NUMB VOL %
UNSPECIFIED	NO 73.0	NO 69.5	NO 7.8	NO 51.7	NO 77.2	NO 34.3
INVERTEBRATES						
POLYCHAETA						
POLYCHAETA SPP	ADULTS	2 3.0				
OLIGOCHAETA						
OLIGOCHAETA SPP	ADULTS				2 6.4	
GASTROPODA						
ALDERIA SPP	ADULTS					2 2.5
ARANEAT						
ARANEAE SPP	ADULTS					
ACarina						
ACARINA SPP	ADULTS				1 .4	1 .1
OSTRACODA						
OSTRACODA SPP	ADULTS	4 2.0		5 2.0	2 .6	
GOSPEODA						
MARITACTICULIDA SPP	ADULTS	10 11.2	61 13.4	7 .4	79 11.5	32 10.3
CIRRIPEDIA						
CIRRIPEDIA SPP	LARVAE			3 1.9		
ISUPODA						
GNATHOSPHEROMA LUTEA	ADULTS					
AMPHIPODA						
AMPHIPODA SPP	ADULTS					
COROPHUM SPP	ADULTS	3 6.7				
ANISOGAMMUS CONFERVICOLU	ADULTS	1 2.3		5 5.3		
TALITRIDAE SPP	ADULTS			1 1.4	1 6.3	
INSECTA						
INSECTA SPP	LARVAE			1 1.4		
NOCTOPTERA						
APHIDIDAE SPP	ADULTS					
DIPTERA						
DIPTERA SPP	PUFAE					2 3.7
MUSCICIDAE SPP	LARVAE	1 6.2	1 4.5		1 .8	
DIPTEROPODIDAE SPP	LARVAE					
CERATOPUSIDAE SPP	LARVAE	1 .6	4 3.7		20 11.9	29 53.9
DIPTEROPODIDAE SPP	LARVAE		2 3.0	92 83.7	4 5.1	
TIPULIDAE SPP	LARVAE				2 13.9	1 1.0

Table F-11. (Continued)

AREA: L SILT SAMPLER: MS SITE: 2 SAMPLE: 2							
SPECIES:	2502	2502	2502	2502	1601	1601	
SPECIMEN	7	8	9	10	11	12	
FC LMG MM	41	25	30	29	76	56	
STOM FULL %	75	70	65	75	75	65	
BOLUS VOL MM**3	79.5	13.4	9.3	8.8	195.1	22.0	
DIG STATE	5	4	5	7	7	8	
PRFY	NUMB VOL %	NUMB VOL %	NUMB VOL %	NUMB VOL %	NUMB VOL %	NUMB VOL %	
UNSPECIFIED	NO 69.0	NO 64.3	NO 60.3	NO 32.0	NO 30.0	NO 11.5	
INVERTEBRATES							
POLYCHAETA							
POLYCHAETA SPP	ADULTS						
OLIGOCHAETA							
OLIGOCHAETA SPP	ADULTS	10 9.8	4 2.9	3 2.3			
GASTROPODA							
ALOEHA SPP	ADULTS	0 17.3	2 1.5		4 8.8		
ARAHEAE							
ARAHEAE SPP	ADULTS	1 .7					
ACARINA							
ACARINA SPP	ADULTS			2 .5			
OSTRACODA							
OSTRACODA SPP	ADULTS			3 1.2	1 .5		1 2.3
COPEPODA							
MARPACTICOIDA SPP	ADULTS	7 .3	150 17.2	39 4.2	36 5.0		
CIRRIPEDIA							
CIRRIPEDIA SPP	LARVAE						
ISOPODA							
GNOATHOPHARONIA LUTEA	ADULTS				6 34.2	3 13.0	
AMPHIPODA							
AMPHIPODA SPP	ADULTS				NO 1.7		
COROPHUM SPP	ADULTS					4 34.6	
ANISOGAMMARUS CONFERVICOLUS	ADULTS	3 4.1			1 7.1	19 34.1	1 38.6
TALITRIDAE SPP	ADULTS						
INSECTA							
INSECTA SPP	LARVAE						
MONOPTERA							
APHIDIOIDE SPP	ADULTS			6 9.3			
DIPTERA							
DIPTERA SPP	PUPAE	1 1.0					
MUSCIDAL SPP	LARVAE			1 2.3			
COLICHOPODIDAE SPP	LARVAE		1 .5		1 5.0		
CEKATOPOGONIDAE SPP	LARVAE	15 5.5	15 3.7	7 6.0	21 27.7		
CHIRONOMIDAE SPP	LARVAE	2 .9			1 .5		
TIPULIDAE SPP	LARVAE	1 .3	2 7.9	2 13.9	2 12.4		

Table F-11. (Concluded)

AREA: L SIL					
SAMPLER: MS					
SITE: 2					
SAMPLE: 2					
SPECIES:	1601	1601	1601		
SPECIMEN	13	14	15		
FA. LING. AM	34	30	34		
STOM. FULL 2	80	25	88		
SOLUS VOL. MM**3	18.0	1.0	9.6		
OCG STATE	9	8	0		
PREY	NUMB VOL %	NUMB VOL %	NUMB VOL %	MEAN VOL %	
UNSPECIFIED	ND 10.7	ND 43.8	NO 21.7	43.3	
INVERTEBRATES					
POLYCHAETA					
POLYCHAETA SPP	ADULTS				.3
OLIGOCALTA					
OLIGOCALTA SPP	ADULTS				1.4
GASTROPODA					
ALDERIA SPP	ADULTS				2.0
ARANEAE					
ARANEAE SPP	ADULTS				.0
ACARINA					
ACARINA SPP	ADULTS				.1
OSTRACODA					
OSTRACODA SPP	ADULTS	3 5.8			.9
COPEPODA					
HARPACTICOIDA SPP	ADULTS	3 .7	2 1.2		5.3
CIRRIPEdia					
CIRRIPEdia SPP	LARVAE				.1
ISOPODA					
GNOGIDOPHARIDIA LUTEA	ADULTS	4 12.4	2 25.0	2 3.3	5.9
AMPHIPODA					
AMPHIPODA SPP	ADULTS	ND 21.4		ND 4.3	1.8
COROPHUM SPP	ADULTS		1 5.0		3.1
ANISOGAMMARUS CONFERVICOLU	ADULTS	1 43.8		3 60.7	13.5
TALITRIDAE SPP	ADULTS				.5
INSECTA					
INSECTA SPP	LARVAE				.1
HIMOPTERA					
APHIDIDAE SPP	ADULTS				.6
DIPTERA					
DIPTERA SPP	PUPAE				.3
MUSCIDAE SPP	LARVAE				.9
OLICHOPHAGIDAE SPP	LARVAE				.4
CERATOPHAGIDAE SPP	LARVAE	1 25.0	2 5.7		10.6
CHIRONOMIDAE SPP	LARVAE				5.9
TIPULIDAE SPP	LARVAE		1 4.3		3.6

Table F-12. (Reference Table E-13)

AREA: SEQUE							
SAMPLE# 15							
SITE# 2							
SAMPLE# 1							
SPECIES#	1601	1601	1601	1601	1601	1601	1601
SPECIMEN	1	2	3	4	5	6	7
FK LMS MM	46	47	47	63	25	53	53
STOM FULL X	75	75	68	75	50	50	50
BOLUS VOL MM**3	27.0	42.9	46.7	91.1	45	14.0	14.0
OLC STATE	8	3	3	2	4	2	2
PREY	NUMB VOL X	NUMB VOL X	NUMB VOL X	NUMB VOL X	NUMB VOL X	NUMB VOL X	NUMB VOL X
UNSPECIFIED	NO 28.0	NO 46.4	NO 49.1	NO 60.0	NO 95.0	NO 00.0	
INVERTEBRATES							
ACARINA							
ACARINA SPP	ADULTS	2 1.0					
COPEPODA							
NARPACTICOIDA SPP	ADULTS	1 .5	1 .2		1 5.0		
ISOPODA							
GNATHOSPHAEROMA LUTEA	ADULTS	1 33.0	1 49.1	2 40.0			
AMPHIPODA							
AMPHIPODA SPP	ADULTS						
DOROPHIUM SPP	ADULTS	3 37.0	1 11.6				
FALTIIDAE SPP	ADULTS		1 34.8				
DIPTERA							
DIPTERA SPP	LARVAE					1 10.0	
DIPTERA SPP	ADULTS						
GERATOPUCCHIOIDE SPP	LARVAE	1 .5	1 2.9	4 1.6		9 2.0	
SPECIES#	1601	1601					
SPECIMEN	7	8					
FK LMS MM	54	47					
STOM FULL X	100	30					
BOLUS VOL MM**3	125.0	8.0					
OLC STATE	6	7					
PREY	NUMB VOL X	NUMB VOL X	MEAN VOL X				
UNSPECIFIED	NO 55.0	NO 9.0	53.0				
INVERTEBRATES							
ACARINA							
ACARINA SPP	ADULTS		.1				
COPEPODA							
NARPACTICOIDA SPP	ADULTS		.7				
ISOPODA							
GNATHOSPHAEROMA LUTEA	ADULTS		15.3				
AMPHIPODA							
AMPHIPODA SPP	ADULTS	NO 22.0	NO 89.0	13.9			
DOROPHIUM SPP	ADULTS	4 22.0		8.0			
FALTIIDAE SPP	ADULTS			4.3			
DIPTERA							
DIPTERA SPP	LARVAE			1.3			
DIPTERA SPP	ADULTS			.4			
GERATOPUCCHIOIDE SPP	LARVAE	5 1.0	1 2.0	1.4			

Table F-13. (Reference Table E-14)

AREA: SEDGE SAMPLER: 45 SITE: 17 SAMPLE: 261							
SPECIES:	2502	2502	2502	2502	2502	2502	2502
SPECIMEN	1	2	3	4	5	5	5
FA LNO MM	31	36	31	35	32	34	34
STOM FULL %	50	100	75	60	65	70	70
BDUS VOL MM**3	15.6	32.0	10.6	21.9	35.9	19.7	19.7
DIG STATE	8	6	3	4	7	7	7
PREY	NUMB VOL %	NUMB VOL %	NUMB VOL %	NUMB VOL %	NUMB VOL %	NUMB VOL %	NUMB VOL %
UNSPECIFIED	NO 25.8	NO 82.0	NO 65.4	NO 93.2	NO 71.7	NO 54.6	
INVERTEBRATES							
NEMATODA							
NEMATODA SPP	ADULTS			2	.3		
POLYCHAETA							
AMPHARCTIDAE SPP	ADULTS	1	3.0				
GASTROPODA							
ALOEIA SPP	ADULTS					4	1.8
ARANEAE							
ARANEAE SPP	ADULTS						
ACARINA							
ACARINA SPP	ADULTS						
BRANCHIOPODA							
CLADOCERA SPP	ADULTS	1	.3	2	.3	9	2.0
PODUM SPP	ADULTS	1	.3			2	.5
EVAONE SPP	JUVENILES	2	.5				
OSTRACODA							
OSTRACODA SPP	ADULTS		27	3.0	47	5.0	
COPEPODA							
CALANOIDA SPP	ADULTS				2	.6	
KARPACTICOIDA SPP	ADULTS	24	5.8	09	3.0	58	4.7
					89	4.4	26
						1.7	225
							20.2
CIRRIPEDIA							
CIRRIPEDIA SPP	LARVAE		29	5.0	54	15.1	2
						.5	
CUMACEA							
CUMACEA SPP	ADULTS						
ISOPODA							
GNATHOSPHAEROMA LUTEA	ADULTS						
AMPHIPODA							
COROPHIUM SPP	ADULTS		1	1.4			4
ANISOGAMMARUS CCFERVICOLU	ADULTS						7.1
TALITRIDAE SPP	JUVENILES						
INSECTA							
INSECTA SPP	LARVAE			1	7.6		
DIPTERA							
DIPTERA SPP	LARVAE	5	2.0				
EPHYRIDAE SPP	LARVAE					4	.8
MUSCIDAE SPP	LARVAE						5
DOLICHOPODICIDAE SPP	LARVAE						4.7
GERATOPGONIDAE SPP	LARVAE						
FIPULIDAE SPP	LARVAE	24	69.8	10	2.3	1	.2
						3	.5
							12
							5.1
							4
							20.5

Table F-14. (Reference Table E-14)

AREA: SEDGE					
SAMPLER: MS					
SITE: 17					
SAMPLE: 061					
SPECIES:					
SPECIMEN	1601	2201	2502		
FR LNO MM	1	2	3		
STOM FULL %	90	75	29		
BOLUS VOL MM**3	90	70	65		
DIG STATE	28.0	28.0	2.3		
	7	4	2		
PREY	NUMB VOL %	NUMB VOL %	NUMB VOL %	MEAN VOL %	
UNSPECIFIED	NO 35.0	NO 73.4	NO 63.9	57.4	
INVERTEBRATES					
NEMATODA					
NEMATODA SPP	ADULTS		1 .1	.0	
BRANCHIOPODA					
EWAONE SPP	ADULTS	1 .5		.2	
COPEPODA					
MARPACTICOIDA SPP	ADULTS		13 2.8	.7	
ISOPODA					
GNORHOSPHAERONA LUIEA	ADULTS	1 3.0		1.0	
AMPHIPODA					
CGROPHIUM SPP	ADULTS	4 13.0	5 1.0	9 4.0	6.0
AMISOGAMMARUS CONFERVIGOLU	ADULTS	9 52.0	5 22.0	6 26.0	33.3
DIPTERA					
DIPTERA SPP	LARVAE	1 .1		.0	
CERATOPOGONIDAE SPP	LARVAE		8 4.0	1.3	

Table F-15. (Reference Table E-15)

AREA: NAT MI						
SAMPLER: NS						
SITE: 14						
SAMPLE: 281						
SPECIES:	2502	2502	2502	2502	2502	2502
SPECIMEN	1	2	3	4	5	6
PK LMG MM	38	48	54	48	36	36
STOM FULL X	10	10	60	60	75	65
BOLUS VOL MM**3	18.7	23.2	9.8	18.7	21.9	8.8
DIG STATE	7	3	8	6	5	8
PREY	NUMB VOL X	NUMB VOL X	NUMB VOL X	NUMB VOL X	NUMB VOL X	NUMB VOL X
UNSPECIFIED	ND 35.8	ND 67.9	ND 24.1	ND 36.9	ND 51.0	ND 30.8
INVERTEBRATES						
PROTISTA						
FORAMINIFERA SPP	ADULTS					1 .1
NEMATODA						
PARASITIC SPP	ADULTS	5 .3				
POLYCHAETA						
POLYCHAETA SPP	ADULTS	3 5.2			14 12.8	
AMPHARETIIDAE SPP	ADULTS	2 8.7	4 16.2		9 10.6	
OLIGOCHAETA						
OLIGOCHAETA SPP	ADULTS					
GASTROPODA						
GASTROPODA SPP	ADULTS					
ARTHROPODA						
ARTHROPODA SPP	JUVENILES			3 .1		
ACARINA						
ACARINA SPP	ADULTS					
OSTRACODA						
OSTRACODA SPP	ADULTS			2 .5		
COPEPODA						
CALANOIDA SPP	ADULTS			6 1.1		
NAUPACICOIDA SPP	ADULTS	19 2.6	112 9.3	1 .1	172 27.7	24 2.1
CIRRIPEIDAE						
CIRRIPEIDAE SPP	LARVAE			1 .4		16 10.8
CUMACEA						
CUMACEA SPP	ADULTS					
MEILEUCON SPP	ADULTS	1 1.5	1 .8		1 2.1	
TANAIDACEA						
TANAIDACEA SPP	ADULTS	27 20.0	4 1.8	7 5.7	31 17.0	
AMPHIPODA						
AMPHIPODA SPP	JUVENILES	2 2.8				
COROPHUM SPP	ADULTS	11 21.3	2 3.7	3 15.4	2 20.8	3 3.6
ANISOGAMMARUS CONFERVICOLU	ADULTS					1 1.5
AMPHIPOE SPP	ADULTS			1 19.8	2 12.5	1 4.9
INSECTA						
INSECTA SPP	ADULTS					
MONOPTERA						
CICADELLIDAE SPP	ADULTS					
APHIDIDAE SPP	ADULTS			1 .7		
DIPTERA						
DIPTERA SPP	PUPAE	1 .7				
MUSCIDAE SPP	LARVAE			1 24.1		
OLIGONEPHIDAE SPP	LARVAE	1 3.3		1 7.8		
CERATOPOGONIDAE SPP	LARVAE	2 .8			1 .4	
CHIRONOMIDAE SPP	LARVAE	4 2.9			1 .4	
TIPULIDAE SPP	LARVAE			11 3.1		
HYCETOPHILIDAE SPP	LARVAE					
HYMENOPTERA						
HYMENOPTERA SPP	ADULTS					

Table F-15. (Concluded)

AREA: MAT N1 SAMPLER: HS SITE: 16 SAMPLE: 201						
SPECIES:	2502	2502	2502	2502		
SPECIMEN	7	0	9	10		
PK LAG MM	29	41	43	44		
STDN FULL X	50	50	60	45		
BOLUS VOL MM**3	1.0	15.6	22.0	8.0		
DIG STATE	7	6	6	8		
PREY	NUMB VOL X	NUMB VOL X	NUMB VOL X	NUMB VOL X	MEAN VOL X	
UNSPECIFIED	NO 35.0	NO 44.7	NO 66.2	100 20.7	41.2	
INVERTEBRATES						
PROTOZOA						
FOKAMINIFERA SPP	ADULTS	1 .1	1 .3		.1	
NEMATODA						
PARASITIC SPP	ADULTS	4 4.7			.5	
POLYCHAETA						
POLYCHAETA SPP	ADULTS	6 4.1	2 .4		2.3	
AMPHARETIIDAE SPP	ADULTS	6 40.6			7.3	
OLIGOCOAETA						
OLIGOCOAETA SPP	ADULTS		12 18.1		1.8	
GASTROPODA						
GASTROPODA SPP	ADULTS		3 2.6		.3	
ARTHROPODA						
ARTHROPODA SPP	JUVENILES				.0	
ACARINA						
ACARINA SPP	ADULTS	2 2.0			.2	
OSTRACODA						
OSTRACODA SPP	ADULTS				.1	
COPEPODA						
CALANOIDA SPP	ADULTS		2 .6		.2	
HARPACTICOIDA SPP	ADULTS	62 40.0	28 2.4	5 .4	410 71.7	19.7
CIRRIPEDIA						
CIRRIPEDIA SPP	LARVAE		2 .4	1 .6	1.1	
CUMACEA						
CUMACEA SPP	ADULTS			1 1.6	.2	
HEMILEUDON SPP	ADULTS				.4	
TANAIDACEA						
TANAIDACEA SPP	ADULTS	3 1.6			4.6	
AMPHIPODA						
AMPHIPODA SPP	JUVENILES			1 .6	.3	
CORUPHUM SPP	ADULTS	1 4.1	1 1.0		7.1	
ANISOGAMMUS CONFERVICOLU	ADULTS				.5	
AMFINDO SPP	ADULTS				3.2	
INSECTA						
INSECTA SPP	ADULTS			NO 3.2	.3	
HOMOPTERA						
CICADELLIDAE SPP	ADULTS		1 4.8		.4	
APHIDIDAE SPP	ADULTS	1 2.0			.3	
DIPTERA						
DIPTERA SPP	PUPAE				.1	
MUSCIDAE SPP	LARVAE				2.4	
DIPTEROPHAGIDAE SPP	LARVAE				1.0	
CERATOPOGONIDAE SPP	LARVAE				.1	
CHEIMOMIDAE SPP	LARVAE	3 17.5	1 .4		2.0	
TIPIIDAE SPP	LARVAE				.3	
NYCTOPHILIDAE SPP	LARVAE			3 6.6	.7	
MYHEMPTERA						
MYHEMPTERA SPP	ADULTS			1 1.0	.1	

Table F-16. (Reference Table E-18)

AREA# SEOE						
SAMPLER# LS						
SITE# 10						
SAMPLE# 1						
SPECIES#	2201	2201	2201	2201	2201	2201
SPECIMEN	1	2	3	4	5	6
FK LNC MM	129	108	85	118	70	78
STOR FULL %	5	0	0	0	00	70
SOLUS VOL MM**3	15.6	0	0	0	173.0	148.9
QIC STATE	1	0	0	0	5	3
PREY						
	NUMB VOL %	NUMB VOL %	NUMB VOL %	NUMB VOL %	NUMB VOL %	NUMB VOL %
UNSPECIFIED	NO 100.0				NO 57.7	NO 52.1
INVERTEBRATES						
PROTOZOA						
FORAMINIFERA SPP	ADULTS					
HEMATOZOA						
HEMATODA SPP	ADULTS					
POLYCHAETA						
AMPHARETIIDAE SPP	ADULTS					20 37.2
OLIGOCHAETA						
OLIGOCHAETA SPP	ADULTS					
GASTROPODA						
ALGERIA SPP	ADULTS					
ARANEAE						
ARANEAE SPP	ADULTS					
OSTRACODA						
OSTRACODA SPP	ADULTS					3 .1
COPEPODA						
CYCLOPOIDA SPP	ADULTS					
MARIPACICOIDA SPP	ADULTS					1 .1
CUMACEA						
HEMILEULON SPP	ADULTS			1 1.9	11 1.7	
ISCOPEA						
GHORINOSPHERONA LUTEA	ADULTS					
LOOTIDAE SPP	ADULTS					
AMPHIPODA						
AMPHIPODA SPP	ADULTS			1 1.9		
COROPHIUM SPP	JUVENILES					
CORUPHIUM SPP	ADULTS			21 38.5	5 1.1	
ANISOGAMMARUS CONFERVICOLU	ADULTS				6 6.3	
DECAPODA						
CRANGON NIGRICAUDA	ADULTS					
BRACHYURA SPP	MEGALOPS					1 1.4
INSECTA						
INSECTA SPP	ADULTS					
INSECTA SPP	LARVAE					
HYMENOPTERA						
APHIDIDAE SPP	ADULTS					
DIPTERA						
DIPTERA SPP	LARVAE					
DERATOPUGONIDAE SPP	LARVAE					
FISH						
EMBIOTOCIDAE						
SHINER SURFPERCH UNSPECIFIED						

Table F-16. (Continued)

AREA: SEDGE						
SAMPLER: LS						
SITE: 18						
SAMPLE: 1						
SPECIES:	2201	2201	2201	2201	1601	1501
SPECIES:	7	0	9	18	11	12
FE LMG MM	60	62	70	57	173	147
STON FULL X	90	50	10	60	60	0
BOLUS VOL HMMPS	61.8	94.9	4.3	85.2	6750.0	0
ORG STATE	4	3	3	4	9	0
PREY	NUMB VOL X	NUMB VOL X	NUMB VOL X	NUMB VOL X	NUMB VOL X	NUMB VOL X
UNSPECIFIED	NO 87.0	NO 63.6	NO 66.6	NO 23.5	NO 2.6	
INVERTEBRATES						
PROTOZOA						
FORAMINIFERA SPP	ADULTS	1 .1				
NEMATODA						
NEMATODA SPP	ADULTS					
POLYCHAETA						
AMPHARETICAE SPP	ADULTS		1 15.2			
OLIGOCHAETA						
OLIGOCHAETA SPP	ADULTS					
GASTROPODA						
ALGERIA SPP	ADULTS			15 57.2		
ARANEAE						
ARANEAE SPP	ADULTS					
OSTRACODA						
OSTRACODA SPP	ADULTS	1 .2	1 .1	1 .7		
CORPEPDA						
CYCLOPODIDA SPP	ADULTS					
MARPACTICOIDA SPP	ADULTS	1 .1	1 .1	3 2.3		
CUMACEA						
NEMILEUCOM SPP	ADULTS	2 .9	1 2.7			
ISOPODA						
CHOKIMOSPHAERONA LUTEA	ADULTS					
LODTEIOAE SPP	ADULTS					
AMPHIPODA						
AMPHIPODA SPP	ADULTS			NO 7.0		
COROPHIUM SPP	JUVENILES			5 9.1		
COROPHIUM SPP	ADULTS	10 16.2	NO 56.5	7 12.3		
AMISOGAMMARUS CONFERVICOLU	ADULTS			2 9.2		
DECAPODA						
CRANGON NIGRICAUDA	ADULTS					
BRACHYURA SPP	MEGALOPS					
INSECTA						
INSECTA SPP	ADULTS					
INSECTA SPP	LARVAE					
HOMOPTERA						
APHIDIDAE SPP	ADULTS					
DIPTERA						
DIPTERA SPP	LARVAE					
CERATOPJONIDAE SPP	LARVAE	5 1.5				
FISH						
EMBIOTOCIDAE						
SHINER SURFPERCH UNSPECIFIED					1 88.0	

Table F-16. (Continued)

AREA# SEDGE						
SAMPLER# LS						
SITE# 10						
SAMPLE# 1						
SPECIES#	1601	1601	3491	4402	4402	4432
SPECIMEN	13	14	15	16	17	18
FX LMS MM	115	101	104	105	99	160
STOM FULL %	50	8	10	75	80	75
BOLUS VOL MM ³ 3	621.9	1.0	27.0	792.8	639.0	722.0
OLV STATE	3	1	1	5	5	6
PREY	NUMB VOL %	NUMB VOL %	NUMB VOL %	NUMB VOL %	NUMB VOL %	NUMB VOL %
UNSPECIFIED	NO 95.8	NO 100.0	NO 100.0	NO 95.3	NO 88.2	NO 3.0
INVERTEBRATES						
PROTOZOA						
FORAMINIFERA SPP	ADULTS					
NEMATODA						
NEMATODA SPP	ADULTS					
POLYCHAETA						
AMPHARETIIDAE SPP	ADULTS					
OLIGOCHAETA						
OLIGOCHAETA SPP	ADULTS					
GASTROPODA						
ALDERIA SPP	ADULTS					
ARANEAE						
ARANEAE SPP	ADULTS				3 .6	
OSTRACODA						
OSTRACODA SPP	ADULTS					
COPEPODA						
CYCLIPOIDA SPP	ADULTS					
HARPACTICOIDA SPP	ADULTS					
CUNACEA						
MEILEUCON SPP	ADULTS					
ISOPODA						
GHORINOSPHAERONA LUTEA	ADULTS			1 1.4		
LODITEIDAE SPP	ADULTS			2 .7		
AMPHIPODA						
AMPHIPODA SPP	ADULTS			NO .3	1 .9	NO 10.0
COROPHILUM SPP	JUVENILES					
COROPHILUM SPP	ADULTS	2 3.8			8 5.6	2 2.9
ANISOGAMMARUS CONFERVICOLU	ADULTS	2 2.8		1 1.2	1 .2	57 85.8
DECAPODA						
GRANULUM NIGRICAUDA	ADULTS			1 .5		
BRACHYURA SPP	MEGALOPS					
INSECTA						
INSECTA SPP	ADULTS				NO 10.1	
INSECTA SPP	LARVAE			NO .1		
HOLOPTERA						
APHIDIOIDAE SPP	ADULTS			2 .5	1 .2	
DIPTERA						
DIPTERA SPP	LARVAE				2 2.3	
CERATOPOGONIDAE SPP	LARVAE					
FISH						
ENGIOTOCIDAE						
SHINER SURFPERCH UNSPECIFIED						

Table F-16. (Continued)

AREA: SEDGE SAMPLER: LS SITE: 10 SAMPLE: 1								
SPECIES:	4482	4482	4482	4001	3901	3901		
SPECIMEN	19	20	21	22	23	24		
PK LMG MM	100	96	88	125	107	80		
SDM FULL X	90	50	65	25	60	75		
BDLUS VOL MM**3	342.8	274.6	185.9	64.0	48.0	18.9		
QIG STATE	6	6	8	6	6	7		
PREY	NUMB VOL X	NUMB VOL X	NUMB VOL X	NUMB VOL X	NUMB VOL X	NUMB VOL X	MEAN VOL X	
UNSPECIFIED	NO 48.0	NO 94.0	NO 45.2	NO 39.3	NO 32.9	NO 15.0	58.4	
INVERTEBRATES								
PROTOZOA								
FORAMINIFERA SPP	ADULTS							.0
NEMATODA			2.0					.1
NEMATODA SPP	ADULTS							
POLYCHAETA				6	53.5			5.3
AMPHARETIIDAE SPP	ADULTS							
OLIGOCHAETA				5	1.0			.1
OLIGOCHAETA SPP	ADULTS							
GASTROPODA								
ALDERIA SPP	ADULTS							2.9
ARANEAE								
ARANEAE SPP	ADULTS							.0
OSTRACODA					1	.5		.1
OSTRACODA SPP	ADULTS							
COPEPODA		1	1.0					.1
CYCLOPODA SPP	ADULTS							.1
MARPACTIGOLIA SPP	ADULTS							
CUNACEA								
HEMILEUCON SPP	ADULTS							.4
ISOPODA								
GHORINOSPHAEROMA LUTEA	ADULTS							.1
IDOTEIDAE SPP	ADULTS							.0
AMPHIPODA		NO	18.0					1.9
AMPHIPODA SPP	ADULTS							.5
CORUPHIUM SPP	JUVENILES			3	7.6	3	5.4	7.7
CORUPHIUM SPP	ADULTS	1	1.0	15	45.2	14	67.0	16.0
ANISOGAMMARUS CONFERVICOLU	ADULTS	19	48.0	NO	9.5			
DECAPODA								
GRANCON NIGRICAUDA	ADULTS							.0
BRACHYURA SPP	MEGALOPS							.1
INSECTA								
INSECTA SPP	ADULTS							.5
INSECTA SPP	LARVAE		1	.5				.0
HOMOPTERA								
APHIDIDAE SPP	ADULTS							.0
DIPTERA								
DIPTERA SPP	LARVAE							.1
CERATOPOGONIDAE SPP	LARVAE							.1
FISH								
EMBIOTOCIDAE								
SHINER SURFPERCH UNSPECIFIED								4.9

Table F-16. (Concluded)

AREA: SEDGE						
SAMPLER: LS						
SITE: 10						
SAMPLE: 1						
SPECIES:	2401	2201	2201	2201	2201	2201
SPECIMEN	1	2	3	4	5	6
FX LNG MM	70	127	188	87	129	119
STON FULL %	65	5	10	35	0	10
BOLUS VOL MM**3	13.8	6.8	27.8	42.9	0	35.9
DIG STATE	6	1	1	3	0	3
PREY	NUMB VOL %	NUMB VOL %	NUMB VOL %	NUMB VOL %	NUMB VOL %	NUMB VOL %
UNSPECIFIED	ND 31.0	ND 100.0	ND 100.0	ND 76.3		ND 79.3
INVERTEBRATES						
POLYCHAETA						
POLYCHAETA SPP	ADULTS			ND 14.3		1 4.6
OSTRACODA						
OSTRACODA SPP	ADULTS					1 .3
COPEPODA						
COPEPODA SPP	ADULTS			1 .2		
CIRRIPEDIA						
CIRRIPEDIA SPP	LARVAE			3 .4		
MYSIDACEA						
MYSIDACEA SPP	ADULTS	1 1.8				
CUMACEA						
CUMACEA SPP	ADULTS	2 8.9				1 .9
AMPHIPODA						
AMPHIPODA SPP	ADULTS	11 49.6		9 8.8		9 15.5
ANISOGAMMARUS	ADULTS	2 3.5				
DIPTERA						
PSYCHODIDAE SPP	LARVAE	1 1.8				
SPECIES:	2201	2201				
SPECIMEN	7	4				
FX LNG MM	112	98				
STON FULL %	10	18				
BOLUS VOL MM**3	61.8	64.8				
DIG STATE	3	3				
PREY	NUMB VOL %	NUMB VOL %	MEAN VOL %			
UNSPECIFIED	ND 63.8	ND 73.6	75.0			
INVERTEBRATES						
POLYCHAETA						
POLYCHAETA SPP	ADULTS	1 6.8	2 6.2	4.6		
OSTRACODA						
OSTRACODA SPP	ADULTS			.0		
COPEPODA						
COPEPODA SPP	ADULTS		1 .1	.0		
CIRRIPEDIA						
CIRRIPEDIA SPP	LARVAE			.1		
MYSIDACEA						
MYSIDACEA SPP	ADULTS			.5		
CUMACEA						
CUMACEA SPP	ADULTS		4 1.8	1.7		
AMPHIPODA						
AMPHIPODA SPP	ADULTS	18 38.2	23 16.3	17.2		
ANISOGAMMARUS	ADULTS			.5		
DIPTERA						
PSYCHODIDAE SPP	LARVAE			.3		

Table F-17. (Reference to Table E-22)

SPECIES	4002	4002	4002	4002	4022	1601							
SPECIMEN	1	2	3	4	5	6							
FK LMG MM	35	55	46	48	33	52							
STON FULL X	50	40	53	40	50	68							
BOLUS VOL MM**3	7.2	59.3	15.6	19.7	4.9	148.9							
DIG STATE	0	7	5	5	7	4							
PREY	NUMB VOL X	NUMB VOL X	NUMB VOL X	NUMB VOL X	NUMB VOL X	NUMB VOL X							
UNSPECIFIED	ND 8.6	ND 26.2	ND 8.6	ND 20.0	ND 18.4	ND 35.8							
INVERTEBRATES													
NEMERTEA													
NEMERTEA SPP	ADULTS	5	9.3										
NEMATODA													
PARASITIC SPP	ADULTS												
POLYCHAETA													
POLYCHAETA SPP	ADULTS	23	5.5	ND 51.7	4	6.8							
POLYCHAETA SPP	JUVENILES	4	4.9										
ETELVE SPP	ADULTS	1	32.5										
PSEUDOPOLYDORA SPP	ADULTS	2	10.3		4	8.4							
OLIGCHAETA													
OLIGCHAETA SPP	ADULTS	3	1.6	5	3.5	5	2.5	2	.8				
OSTRACODA													
OSTRACODA SPP	ADULTS												
COPEPODA													
CYCLOPODA SPP	ADULTS	3	.6	2	.1	2	.4	7	2.5	98	36.0	8	.5
HARPACTICODA SPP	ADULTS												
TANAIDACEA													
TANAIDACEA SPP	ADULTS	18	52.8	74	48.6	14	35.8	18	65.0	11	36.0	317	61.8
ISOPODA													
IDOTEIDAE SPP	ADULTS												
AMPHIPODA													
AMPHIPODA SPP	ADULTS												
AMPHIPODA SPP	JUVENILES							2	4.8	1	10.4	7	2.0
COSEPHIDAE SPP	ADULTS									2		.7	
CAMPIDAE SPP	ADULTS												
SPECIES	1601	1601	1601	1601	1601								
SPECIMEN	7	8	9	10	11								
FK LMG MM	53	45	55	60	51								
STON FULL X	75	75	25	50	49								
BOLUS VOL MM**3	148.9	54.9	13.8	29.3	91.1								
DIG STATE	6	7	5	6	7								
PREY	NUMB VOL X	NUMB VOL X	NUMB VOL X	NUMB VOL X	NUMB VOL X	MEAN VOL X							
UNSPECIFIED	ND 17.1	ND 24.3	ND 59.7	ND 34.7	ND 24.4	24.4							
INVERTEBRATES													
NEMERTEA													
NEMERTEA SPP	ADULTS					.8							
NEMATODA													
PARASITIC SPP	ADULTS				1	.4	.0						
POLYCHAETA													
POLYCHAETA SPP	ADULTS						5.7						
POLYCHAETA SPP	JUVENILES						.4						
ETELVE SPP	ADULTS						3.0						
PSEUDOPOLYDORA SPP	ADULTS						1.5						
OLIGCHAETA													
OLIGCHAETA SPP	ADULTS						.8						
OSTRACODA													
OSTRACODA SPP	ADULTS		2	.7			.1						
COPEPODA													
CYCLOPODA SPP	ADULTS						.0						
HARPACTICODA SPP	ADULTS		2	.4	1	.5	3.7						
TANAIDACEA													
TANAIDACEA SPP	ADULTS	118	59.8	91	72.8	8	34.8	90	64.8	141	65.0	53.6	
ISOPODA													
IDOTEIDAE SPP	ADULTS	2	.8							4	3.3	.4	
AMPHIPODA													
AMPHIPODA SPP	ADULTS	1	27.4	1	1.8	1	5.8	1	.9			3.2	
AMPHIPODA SPP	JUVENILES	8	1.7							4	1.2	1.8	
COSEPHIDAE SPP	ADULTS									2	4.9	.5	
CAMPIDAE SPP	ADULTS									1	.4	.1	

Table F-18. (Reference Table E-25)

AREA# N T2WL SAMPLER# D7 SITE# A SAMP.# 1							
SPECIES#	5401	2902	4002	2901	1601	2901	
SPECIMEN	1	2	3	4	5	6	
FK LRG MM	248	73	93	80	100	81	
STOM FULL %	A	95	8	90	0	85	
BOLUS VOL MM**3	2.5	13.1	8	9.0	0	33.6	
DIG STATE	1	6	8	4	0	6	
PREY	NUMB VOL %	NUMB VOL %	NUMB VOL %	NUMB VOL %	NUMB VOL %	NUMB VOL %	
UNSPECIFIED	NO 5.0	NO 16.0		NO 1.0		NO 3.0	
INVERTEBRATES							
POLYCHAETA						1 97.0	
ANPHARETIDAE SPP	ADULTS						
OSTRACODA							
OSTRACODA SPP	ADULTS						
COPEPODA		1 1.0					
CALANOIDA SPP	ADULTS						
HARPACTICOIDA SPP	ADULTS						
CUMACEA							
CUMELLA SPP	ADULTS						
AMPHIPODA		4 4.0					
AMPHIPODA SPP	ADULTS	4 3.0					
COROPHUM SPP	ADULTS						
AMPHIOE SPP	ADULTS	73 53.0					
CAPRELLIDAE SPP	ADULTS						
DECAPODA		1 23.0					
DECAPODA SPP	LARVAE						
CRANGON FRANCISCORUM	ADULTS						
PANDALUS DANAE	ADULTS	1 95.0					
FISH	UNIDENTIFIED	UNSPECIFIED		1 99.0			
SPECIES#	1602	5301	2901	1601	901	3901	
SPECIMEN	7	8	9	15	11	12	
FK LRG MM	82	75	89	86	86	78	
STOM FULL %	0	20	45	34	84	5	
BOLUS VOL MM**3	0	.1	4.2	2.2	9.5	.1	
DIG STATE	0	2	2	1	4	5	
PREY	NUMB VOL %	NUMB VOL %	NUMB VOL %	NUMB VOL %	NUMB VOL %	NUMB VOL %	MEAN VOL %
UNSPECIFIED		NO 23.0	NO 3.0	NO 100.0	NO 29.0	NO 2.0	20.2
INVERTEBRATES							
POLYCHAETA							
ANPHARETIDAE SPP	ADULTS						10.0
OSTRACODA		3 5.0	5 2.0			1 25.0	3.6
OSTRACODA SPP	ADULTS						
COPEPODA		6 2.0					.3
CALANOIDA SPP	ADULTS	126 80.0					7.0
HARPACTICOIDA SPP	ADULTS						
CUMACEA		2 2.0					.2
CUMELLA SPP	ADULTS						
AMPHIPODA							
AMPHIPODA SPP	ADULTS						.4
COROPHUM SPP	ADULTS						.3
AMPHIOE SPP	ADULTS					2 73.0	0.1
CAPRELLIDAE SPP	ADULTS				1 1.0		0.0
DECAPODA							
DECAPODA SPP	LARVAE						2.6
CRANGON FRANCISCORUM	ADULTS				3 70.0		7.0
PANDALUS DANAE	ADULTS						10.0
FISH	UNIDENTIFIED	UNSPECIFIED	1 95.0				21.0

Table F-20. (Reference Table E-26)

AREA# 5 TRWL							
SAMPLE#1 DT							
SITE# 12							
SAMPLE# 1							
SPECIES#	4801	1601	2281	1601	4001	4001	
SPECIMEN	1	2	3	4	5	8	
FK LMG MM	193	107	79	174	135	144	
STOM FULL %	80	80	80	15	83	78	
BOLUS VOL MM**3	11.7	21.6	1.6	28.5	72.9	18.9	
DIG STATE	5	3	1	2	3	3	
PREY	NUMB VOL %	NUMB VOL %	NUMB VOL %	NUMB VOL %	NUMB VOL %	NUMB VOL %	
UNSPECIFIED	ND 11.3	ND 45.5	ND 99.5	ND 99.0	ND 82.0	ND 60.5	
INVERTEBRATES							
NEMATODA							
NEMATODA SPP	ADULTS						
POLYCHAETA							
CAPITELLIGAE SPP	ADULTS				5	2.8	1 .5
ANPHARETIIDAE SPP	ADULTS						1 1.0
POLYDORA SPP	ADULTS					6	8.0
BIVALVIA							
BIVALVIA SPP	ADULTS	2 88.8					
OSTRACODA							
OSTRACODA SPP	ADULTS		1 .5				
MYSTIDACEA							
MYSTIDACEA SPP	ADULTS		1 .5				
AMPHIPODA							
COROPHINIUM SPP	ADULTS	1 1.0	16 38.0		35 16.0	5 2.8	
ANISOGAMMARUS CONFERVICOLU	ADULTS			1 1.0			
DECAPODA							
DECAPODA SPP	LARVAE		2 24.0				
INSECTA							
INSECTA SPP	LARVAE	1 .7					
SPECIES#	1601	1601	4001	4001			
SPECIMEN	7	8	9	10			
FK LMG MM	125	112	322	387			
STOM FULL %	55	93	6	15			
BOLUS VOL MM**3	125.0	24.0	0	56.0			
DIG STATE	1	2	0	1			
PREY	NUMB VOL %	NUMB VOL %	NUMB VOL %	NUMB VOL %	MEAN VOL %		
UNSPECIFIED	ND 100.0	ND 97.5		ND 2.0	69.4		
INVERTEBRATES							
NEMATODA							
NEMATODA SPP	ADULTS	2 .5			.1		
POLYCHAETA							
CAPITELLIGAE SPP	ADULTS				.1		
ANPHARETIIDAE SPP	ADULTS				.3		
POLYDORA SPP	ADULTS				.9		
BIVALVIA							
BIVALVIA SPP	ADULTS			2 98.0	28.7		
OSTRACODA							
OSTRACODA SPP	ADULTS				.1		
MYSTIDACEA							
MYSTIDACEA SPP	ADULTS				.1		
AMPHIPODA							
COROPHINIUM SPP	ADULTS	4 2.0			5.7		
ANISOGAMMARUS CONFERVICOLU	ADULTS				.1		
DECAPODA							
DECAPODA SPP	LARVAE				2.7		
INSECTA							
INSECTA SPP	LARVAE				.1		

Table F-21. (Reference Table E-26)

AREA: S TRML							
SAMPLER: OF							
SITE: 15							
SAMPLE: 1							
SPECIES:	1501	4001	1601	4001	4001	1601	
SPECIMEN	1	2	3	4	5	6	
PK LMG NM	128	119	97	126	124	72	
STOM FULL X	90	60	76	65	58	92	
BOLUS VOL MM**3	55.8	28.5	15.5	7.2	30.0	17.6	
DIG STATE	6	8	5	7	0	6	
PREY	NUMB VOL X	NUMB VOL X	NUMB VOL X	NUMB VOL X	NUMB VOL X	NUMB VOL X	
UNSPECIFIED	ND 31.5	ND 11.5	ND 24.0	ND 7.0	ND 0.0	ND 1.0	
INVERTEBRATES							
POLYCHAETA							
CAPITELLIDAE SPP	ADULTS			1 3.0			
GLYCERA SPP	ADULTS	31 86.0		22 80.0	25 90.0		
BIVALVIA							
BIVALVIA SPP	ADULTS			1 1.0	1 2.0		
CUMACEA							
CUMELLA SPP	ADULTS						
ISOPODA							
ISOPODA SPP	ADULTS	1 3.0					
AMPHIPODA							
COROPHILUM SPP	ADULTS	1 1.0	1 .5	1 1.0			
GAMMARUS SPP	ADULTS	1 .5					
ANISOGAMMARUS CONFERVICOLU	ADULTS			12 76.0		1 4.0	
TALITRIDAE SPP	ADULTS	1 2.0		1 2.0			
DECAPODA							
CRANGON FRANCISCORUM	ADULTS	1 55.0				1 95.0	
SPECIES:	4001	4001	4001	4001			
SPECIMEN	7	8	9	10			
PK LMG NM	122	122	69	65			
STOM FULL X	95	87	77	76			
BOLUS VOL MM**3	45.5	24.5	11.2	9.7			
DIG STATE	7	8	7	7			
PREY	NUMB VOL X	NUMB VOL X	NUMB VOL X	NUMB VOL X	MEAN VOL X		
UNSPECIFIED	ND 1.0	ND 17.0	ND 21.0	ND 1.2	15.4		
INVERTEBRATES							
POLYCHAETA							
CAPITELLIDAE SPP	ADULTS				.3		
GLYCERA SPP	ADULTS	21 77.0	19 80.0	8 75.0	49.8		
BIVALVIA							
BIVALVIA SPP	ADULTS	ND 15.0	3 2.0		2.3		
CUMACEA							
CUMELLA SPP	ADULTS			1 1.0	2 .0	.2	
ISOPODA							
ISOPODA SPP	ADULTS					.3	
AMPHIPODA							
COROPHILUM SPP	ADULTS		1 1.0	4 3.0	135 98.0	18.4	
GAMMARUS SPP	ADULTS					.1	
ANISOGAMMARUS CONFERVICOLU	ADULTS					7.0	
TALITRIDAE SPP	ADULTS					.4	
DECAPODA							
CRANGON FRANCISCORUM	ADULTS					15.0	

Higley, Duane L.

A study of the invertebrates and fishes of salt marshes in two Oregon estuaries / by Duane L. Higley and Robert L. Holton.--Fort Belvoir, Va. : U.S. Army, Corps of Engineers, Coastal Engineering Research Center ; (Springfield, Va. : available from NTIS), 1981. [132] p. : ill., maps ; 27 cm.--(Miscellaneous report / Coastal Engineering Research Center ; no. 81-5) (Contract DACW72-77-C-0013) Prepared by the School of Oceanography, Oregon State University. Report provides base-line and food-chain data on the invertebrate and fish fauna of several marsh habitats located in Siletz and Netarts Bays, Oregon.

1. Aquatic invertebrates--Oregon--Netarts Bay. 2. Aquatic invertebrates--Oregon--Siletz Bay. 3. Fishes--Oregon--Netarts Bay. 4. Fishes--Oregon--Siletz Bay. 5. Tidalmarsh ecology--Oregon--Netarts Bay. 6. Tidalmarsh ecology--Oregon--Siletz Bay. I. Title. II. Holton, Robert L. III. Oregon State University. School of Oceanography. IV. Series: Miscellaneous report (Coastal Engineering Research Center (U.S.)) ; no. 81-5. V. Series. TC203 U581mr no. 81-5 627

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