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Polychaete annelids from 48 benthic samples containing over 2000 specimens were identified. Samples were taken with either an anchor dredge or an anchor-box dredge from a 15 station transect (44°39.1'N) that ranges from 800 to 2900 meters in depth. Sediment subsamples were collected and analyzed for organic carbon and sediment particle size using standard techniques. Temperature and oxygen of the water near the bottom were taken with a modified Smith-McIntyre grab; however, these measurements were not taken simultaneously with the dredged biological samples.

The results indicated that at least 115 species in 53 families of the class Polychaeta were represented in this transect line. This study found an absence of the families Serpulidae and Syllidae and a reduction of the number of species in the families Nereidae, Cirratulidae and Capitellidae. Only five genera had not previously been reported from the deep sea. The depth distribution of the

polychaetous annelids recovered in this study, coupled with limited physical data, suggest that five faunal regions can be distinguished. Nine new forms of polychaeteous annelids are tentatively described, and others are anticipated in future collections. Suggestions for future studies are also indicated.

Bathyal and Abyssal Polychaetes (Annelids) from the Central Coast of Oregon

by

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BATHYAL AND ABYSSAL POLYCHAETES (ANNELIDS) FROM THE CENTRAL COAST OF OREGON

INTRODUCTION

The region of the world ocean normally referred to as the "Deep Sea" includes three ecological zones according to the classification of marine environments presented by Hedgpeth (1957) and commonly in use by American authors. These are the Bathyal, the Abyssal and the Hadal.

The Bathyal Zone is the transitional area between the continental shelf and the sea floor that includes the continental slope. This region has an average declivity of four percent but usually exceeds six percent off mountainous coasts and averages three and one-half percent off broad low land coasts (Kuenen, 1960). It generally begins at a depth of 200 meters below sea level, extends to 2000 meters, and covers approximately 39 million square kilometers of the earth's surface. Due to the steep and often rugged terrain, the Bathyal zone is a very difficult area to sample, and our knowledge of the conditions and fauna inhabiting it is scant.

The Abyssal region is a huge area where the water temperatures are always below four degrees centigrade. It covers 287 million square kilometers or the greater part of the surface of the earth. The abyssal region generally lies below 2000 meters and includes flat to gently sloping abyssal plains often of considerable

expanse. From these smooth abyssal plains rise seamounts and hills that may be very numerous in some areas. The Hadal area refers to the deep trenches where the maximum depths of the oceans are encountered.

Geomorphology of the Study Area

The Oregon continental shelf is 23.2 to 57.6 km wide. It is narrower, steeper and deeper than the world average shelf (Byrne, 1962). It is approximately 35.2 km wide off Newport. On the outer edge of the shelf off central Oregon there are two rocky shoals, Stonewall and Heceta banks. The continental slope west of Newport is 41.2 km wide and of irregular terrain containing many rocky outcroppings, hills and valleys. It has an average inclination of about 3°. Beyond the slope the Cascadia Abyssal Plain begins about 86.4 km offshore. It maintains a depth of 2700-2800m for approximately 264.0 km to the west where a ridge and seamount province begins (McManus, 1964). The Cascadia Abyssal Plain is continuous from northern Vancouver Island to the Blanco fracture zone (43°00'N.). The area investigated in this study includes the region of the continental slope and abyssal depths.

Biology of the Study Area

A small amount of information is available on the kinds of benthic invertebrates inhabiting bathyal and abyssal bottoms of the north and northeastern Pacific Ocean. Most of this knowledge comes from the Albatross, or similar expeditions, which obtained infrequent and widely scattered trawl and dredge samples.

The present study presents the results of a concentrated study of the benthic polychaeteous annelids collected from fifteen slope and abyssal bottom stations lying along a line at latitude 44°39.1'N. and extending west from Yaquina Bay, Oregon for 320 km. The stations range in depth from 800 to 2900 meters (Figure 1). This transect line has been a region of intensive study by the Department of Oceanography at Oregon State University. Its physical, chemical, geological and biological characteristics are thus becoming better known.

Importance of the Study

Benthic polychaetes play an important role in our understanding of the deep water benthic fauna for several reasons. They occur in large numbers; they are important in the reworking of sediments; and they provide an important food source for other organisms. Their great diversity in the deep sea (Hessler and Sanders, 1966)

makes them an excellent group for the study of faunal diversity.

The significance of the present study can be viewed in the light of recent offshore polychaete research in the United States. Dr. Marian Pettibone (U. S. National Museum) is currently working on the annelids of the Northwest Atlantic Ocean, Dr. Olga Hartman is working on the worms collected by Dr. Howard L. Sanders (Woods Hole Oceanographic Institution) on a transect from New England to Bermuda; she is also finishing detailed studies of collections from the Coast of California and Antarctic seas. Our study, and the forthcoming work of Dr. Karl Banse at the University of Washington, should fill the large gap which exists in knowledge of the abundance and distribution of annelids of the coastlines of the United States.

Descriptive studies must precede any attempt to understand deep sea faunal relationships, and in this regard the deep sea benthic polychaetes of the Oregon region have previously been neglected.

Scope of Study

The major objective of this study is to determine accurately the identity of the benthic polychaetous annelids inhabiting a deep water transect line off Oregon's coast. Such a study is necessary to provide present and future investigators of benthic ecology with background information for quantitative work with the fauna of this region. It will also indicate major trends of abundance and diversity

of the polychaete annelids.

With the exception of the scale bearing families Sigalionidae, Polydontidae, Pareulepidae, Aphroditidae and Polynoidae, this study describes all benthic members for the subclasses Errantia and Sedentaria which were found in the fifty-one samples collected. Samples were collected over a period of five years as part of a detailed ecological study of this little known area. Depth distribution of species and the effects of ecological factors such as sediment type, sediment organic carbon content and water conditions have been investigated.

This study does not include full descriptions of species which are new to science and heretofore undescribed, because a thesis does not constitute an official taxonomic publication. I feel, however, that it would be negligent to omit them completely and brief descriptions of nine new forms are included.

Polychaete Taxonomy and Distribution

The polychaeta are the largest of the three classes of the Phylum Annelida; most members of the class are limited to marine habitats. The other two classes are the terrestrial or aquatic Oligochaeta and Hirudinea.

About seventy-one families including 1600 genera and nearly 10,000 species are generally recognized in the polychaeta (Hartman,

1968). The families are divided into four groups (subclasses). The most common are the Errantia with thirty-three families and the Sedentaria with thirty-two families. The others are a small parasitic group Myzostomaria and the aberrant Archiannelida, each with three families.

Separation into Errantia and Sedentaria is artificial; many of the Errantia construct tubes and some sedentary ones are freely moving (Hartman, 1968). The Errantia is composed of forms in which the body is not divided into distinctive regions; all somites are similar and provided with nephridia and gills except those at the anterior and posterior extremities. The most conspicuous features of the Errantia are antennae and eyes on the prostomium, the adjacent nuchal ciliated organs, and the caruncle of simple to complex structures which aid in the capture and ingestion of foods. The Errantia are usually crawling, swimming or burrowing forms.

The Sedentaria are polychaetes with a body usually divided into distinctive, specialized regions (e. g., head, thorax, abdomen). Nephridia normally occur only in the anterior somites, with a relatively small prostomium and few or no head appendages other than gills. The anterior end may be largely concealed by overhanging structures of the first few segments. The pharynx is a simple nonprotrusible pouch adapted for ingestion of nutrient sediments or for receiving planktonic organisms. The Sedentaria include both

attached and unattached tube dwellers and a few free living forms.

Polychaetes vary greatly in size, shape and form. Lengths of over 1.0 meter are known, yet the typical deep sea worm is less than a centimeter in length. The segmental count varies greatly, from fewer than ten to more than 800.

Separation of the polychaeta into families is based primarily on the kind and degree of cephalization of the prostomium and anteriormost segments. The type and shape of the setae and hooks are also important characteristics. These setae and hooks are remarkably diverse interspecifically; they are usually precise on the specific level and so serve as accurate indicators when minutely examined. Other characters, such as setal lobes and branchial development, can also be used to separate the polychaetes on generic and specific levels. Color patterns have been used to separate species, but modern workers have held that this is generally an unreliable procedure except for a few groups. Color is of little value in working with the deep sea forms as very few specimens are examined before preservation.

The polychaete annelids are widely distributed in the seas. They extend geographically from the Arctic to the Antarctic and are perhaps most diversified in the tropics. They are found throughout different water masses from the littoral areas to depths of 8000 m, however many species are eurybathic and have depth ranges of

several thousand meters. On the basis of deep water studies from various seas, only five of the genera found in this study have not previously been reported from the deep sea.

In European seas the benthic infauna is somewhat similar from Arctic to tropical seas. Communities of greater or lesser extent have been named, and the presence of dominant and minor elements has been noted (Hartman, 1955). She further indicates (p. 39) that the infauna from the ocean bottom of southern California are quite different from those of other parts of the world, in both the presence of species not known elsewhere and also in the absence of some others known to occur in European and other seas.

For most groups of animals the world's oceans appear to have faunal affinities on the generic level but are different on the specific level. As more taxonomic research on the annelids is done, it seems that this general trend will be substantiated.

Previous Studies of the Area

"In 1855 J. G. H. Kinberg described the first polychaete from the Pacific Coast. This worm was Halosydna brevisetosa which had been collected during the Swedish expedition of 1851-1853. Kinberg published material on polychaetes the world over from 1855 to 1910. During this period he erected 103 genera and 292 species, some of these species being reported in this thesis. Herbert P. Johnson

published two papers, one in 1897, the other in 1901. The latter was a survey of the polychaetes of the Puget Sound region and is a necessary reference for any taxonomic study of Pacific Coast polychaetes" (Reish, 1949).

During the period 1888-1901 scientists of the U. S. S. Albatross occupied 85 dredge and trawl stations off the coasts of Oregon and Washington (Townsend, 1901). Of these eighty-five stations, only eleven samples were taken off the Oregon coast in depths greater than 500 meters. Aaron L. Treadwell identified some of the polychaetes from these expeditions, however, most were identified by J. P. Moore. Both Moore and Treadwell's publications on annelids from California, Alaska and other Pacific areas are necessary for taxonomic studies on Oregon polychaetes.

The Albatross expedition and five dredge and trawl samples taken by the Soviet research vessel Vitiaz constitute the only deep water samples taken from off the coast of Oregon.

In 1942 scientists of the Allan Hancock Foundation for Scientific Research occupied forty-two stations off the coast of Oregon with the research vessel Velero III (Fraser, 1943). Thirteen stations were subtidal, the deepest being 140 meters. Records of polychaetes from these samples are scattered throughout the works of Dr. Olga Hartman on California polychaetes.

The only previous study restricted to the polychaetes of the

Oregon Coast was the M. S. Thesis of Dr. Donald Reish (1949). The subsequent publication by Hartman and Reish (1950) reported on only nine samples from offshore waters (50-600m).

Dr. Hartman's extensive work on the California polychaetes as well as those of deep waters in other areas have also been very important in identifying the polychaetes collected in this study.

Other workers who described polychaetes from the coast of North America and whose works have been of help in this study were Ralph Chamberlin, Edith and Cyril Berkeley, and Katharine J. Bush.

MATERIALS AND METHODS

Forty-eight samples containing over 2100 specimens were analyzed. Where possible replicate samples were taken with either an anchor dredge (Sanders, Hessler and Hampson, 1965) or with an anchor-box dredge (Carey and Hancock, 1965) which were operated from the deck of the Oregon State University oceanographic research vessels, Acona or Yaquina. The period of collections extended from July 6, 1962 until March 28, 1966.

Sampling

The fifteen stations sampled were a portion of those established by Dr. Andrew G. Carey, Jr. for large scale benthic studies currently in progress at Oregon State University. Stations were established at 200 m depth intervals down the slope to 2900 m. All stations lie along latitude 44-39.1°N. On the abyssal plain there are six stations spaced every twenty miles (see Figure 1 and Table 1).

Sampling the rugged continental slope region was most difficult: the abrupt bathymetric changes make ship positioning very tedious and cause problems in the actual dredging. For these reasons the middle and lower continental slope stations were not as extensively sampled as the upper slope and abyssal plain stations.

Positioning of the ships was accomplished with Loran-C and a

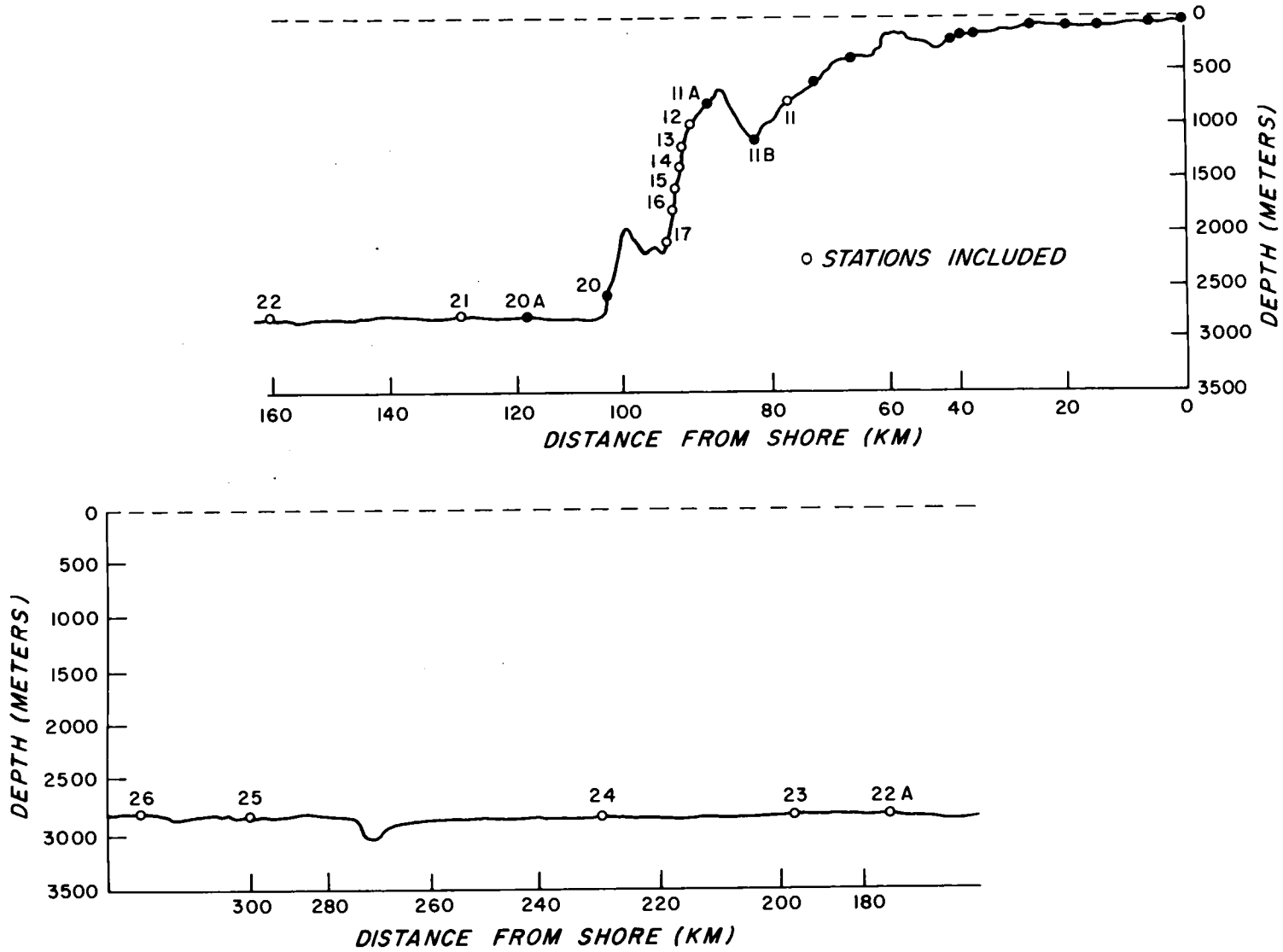

Figure 1. Bottom profile of station line (44° 39.1'N.)

precision depth recorder.

Upon retrieval of the dredge, sub-samples were taken for sediment analysis and the remainder of the sediment was measured volumetrically and washed through a 0.42 mm aperture sieve (U. S. Standard #40). A large volume flotation method was used to wash the samples (Sanders, et al., 1965). The washed samples were killed and fixed by placing them in a neutral 10 percent formalin-sea water solution. In the laboratory, the polychaetes were picked carefully from the sample and transferred to a 70 percent neutralized iso-propyl alcohol solution for final storage. The specimens then were separated into families under the dissecting microscope and subsequently identified to the specific level under the compound microscope after making the appropriate dissections. The polychaete specimens were identified twice in different order to insure internal consistency.

Worms were compared with either the original species description or a subsequent redescription. If major differences were noted, comparisons with other collections or type specimens were made. Specimens which did not fit known descriptions were taken to the laboratory of Dr. Olga Hartman at the Allan Hancock Foundation where an almost complete library of the literature on polychaeteous annelids is to be found. The classification adopted is mainly that used in Hartman (1959 a and b, 1965b), but some minor unpublished revisions

in systematics were included (Hartman, personal communication).

The annelids identified in this study are arranged in the order listed by Hartman (1959 a and b, 1965b). Since these same studies by Hartman list most synonyms for each species, only pertinent synonymies are given here. The collection record of each species indicates the Newport Anchor Dredge (NAD) station(s) where the collection was made, and (AD-) indicates the anchor dredge number. The total number of specimens taken in any particular dredge haul is given in parentheses ( ) following the AD number. Those collections marked with an asterisk ( )* were identified by Dr. Reish. The actual ship position and depth for each anchor dredge sample is presented in Table 1.

The deep water region studied has not been extensively investigated, and the collections contain a considerable number of new and little known fauna. Nine new species are reported.

Keys to the subclasses and families of polychaetes found in this study were constructed to assist subsequent workers in identifying the annelids from this region. These keys precede the Record of Errantia section of this thesis. Keys to the species follow their respective family designation in the Results section.

Sediment Analysis

Particle size of the sediment was analyzed by standard geological techniques with a graded series of sieves and settling tube for the sand fraction and a soils hydrometer for the silt and clay fraction (Krumbein and Pettijohn, 1938). Each sample analyzed contained 90 to 100 g (dry weight) of sediment. The large volume of sediment required for this analysis prevented duplicate runs for each anchor dredge sample. Results of the particle analysis from the anchor dredges at each station have been averaged and the range indicated. NAD 19 did not yield enough sediment for particle analysis or organic carbon. A summary of this data occurs in Table 2 and Graph I (appendix).

Analyses of total carbon content of the sediment were made on 0.4 g of sediment by complete combustion with a LECO electric induction furnace; the evolved CO_2 was measured with a LECO gas analyzer (Curl, 1963). Carbonate carbon was measured by adding 10 ml 6N HCL to 0.5 g of sediment and measuring the evolved gas in the gas analyzer. All analyses were run in duplicate, and the induction furnace and gas analyzer were routinely standardized using reagent grade chitin and $CaCO_3$. The difference between the total carbon and the carbonate carbon was taken to be organic carbon. The two separate determinations were averaged to obtain a result for

each anchor dredge sample. Repeat samples were obtained for every station except NAD numbers 12, 13, 16, 17, 18, 19, 23, 24, and 25. The average and range of all dredges at a single station are presented in Table 3 and Graph 2 (appendix).

Water Sampling

Water temperature and salinity samples were obtained approximately 30 cm from the bottom using a Fjarlie water bottle with deep sea reversing thermometers attached to a Smith-McIntyre grab sampler (Carey and Paul, 1968). The bottle was rigged to trip just before the grab touched bottom. The temperature data were reduced with a standard computer program used by the Department of Oceanography, Oregon State University. The temperature and salinity data come from the stations where the animal samples in this study were collected, but they were not taken at the same time.

RESULTS

Key to the Subclasses of the Polychaeta

1. Body segments nearly similar excepting the peristomial segments. Prostomium usually well developed and well differentiated from the body. Pharynx usually eversible, parapodia with protruding lobes bearing dorsal and ventral cirri. Free moving forms (creeping, burrowing or swimming) although a few are tubicolous . . . . . Errantia

1. Body segments generally variable, some forms with differentiated body regions (head, thorax and abdomen). Prostomium sometimes lacking horny jaws. Parapodia with short median lobes, cirri often reduced. Mostly tubicolous . . . . . Sedentaria

Key to Families in Subclass Errantia

1. Elytra present . . . . . Scale worms
1. Elytra absent 2

2. Dorsal cirri laterally compressed, broad, foliaceous; prostomium differentiated (except Eumida), bearing 4-5 prostomial tentacles and 1-4 pair tentacles . . . . . Phyllodocidae
2. Dorsal cirri not laterally compressed 3

3. Prostomium clearly differentiated from peristomium 4
3. Prostomium not clearly differentiated from peristomium 13

4. Prostomium with caruncle or anterior segments with recurved hooks. . . . . Amphinomidae
4. Prostomium not carunculate or recurved hooks in more than first few segments 5

5. Pharynx unarmed, or provided with only soft papillae 6
5. Pharynx armed with 1-2 pair stout horny jaws 7

6.	Parapodia biramous (sometimes only one aciculum), all setae simple, two pair peristomial tentacles	Pilargiidae
6.	Parapodia biramous, all setae composite, 6-8 pair peristomial tentacles	Hesionidae
7.	Prostomium elongated, conical with ringed or lateral annulations	8
7.	Prostomium long or short, lacks annulations .	9
8.	Anterior parapodia uniramous, posterior ones biramous	Goniadidae
8.	Parapodia of one type	Glyceridae
9.	Prostomium small, pentagonal, tentacular cirri small, recurved cirri between parapodial rami	Nephtyidae
9.	Setae diverse (simple and filiform, unicinate and composite, all composite, or winged bristles)	10
10.	Prostomium with tentacular cirri, hooded hooks present in anterior segments	11
10.	Prostomium lacking tentacular cirri; some setae with winged bristles	12
11.	Prostomium with five tentacles, palps present	Eunicidae
11.	Prostomium with seven tentacles, palps present	Onuphidae
12.	All setae winged bristles, upper jaw with two long filiform supports	Arabellidae
12.	With simple or compound crotchets as well as winged bristles, jaws lack filiform supports	Lumbrineridae
13.	Anterior end bearing several elongated papillae resembling tentacles, pharynx unarmed; body surface densely papillated . .	Sphaerodoridae
13.	Anterior without papillae, many with tentacles	see subclass Sedentaria

Key to Families in Subclass Sedentaria

1.	Body bearing two ventral orange plates (scutes)	Sternaspidae
1.	Body lacking ventral scutes	2
2.	Anterior end lacking appendages	3
2.	Anterior end bearing appendages (tentacles, cirri or gills)	9
3.	Parapodia with uncini	4
3.	Parapodia with setae of different type	6
4.	Parapodia more or less uniform on all but a few anterior segments; no podial gills	5
4.	Parapodia of different types, body divided into two regions (thorax and abdomen); thoracic setae capilliform or uncinate, abdominal setae uncinate	Capitellidae
5.	Prostomium rounded lacking prostomial disc; notosetae capillaries, neurosetae uncinate . .	Oweniidae
5.	Prostomium with cephalic plaque or rounded with small dorsal cone. Pygidium discoidal or funnel shaped	Maldanidae
6.	Parapodia more or less uniform on all but a few anterior segments	7
6.	Parapodia variable; body divided into two regions, thoracic region flattened	Orbiinidae
7.	Segments divided with external annuli; integument thick	8
7.	Segments not divided with annuli; prostomium elongated, gills cirriform or pectinate, setae capillaries, posterior segments with modified setae (spines)	Paraonidae (genus Paraonis)
8.	Prostomium small, "T" shaped, bearing two lateral frontal horns, setae capillaries and furcate	Scalibregmidae
8.	Prostomium conical, body grub-like or longer with a ventral groove running the entire length of body, gills present on many segments . . .	Opheliidae
9.	Body not divided into thorax and abdomen, all parapodia uniform	10

9.	Body divided into two or more regions	14
10.	Prostomium conical, lacking head appendages, first to third setiger with a single large palpi and/or numerous filaments, lacking dorsal and ventral cirri	12
10.	First setiger without palpi or filaments	11
11.	Prostomium with two very long tentacles, some anterior segments with foliaceous cirri; gills present or absent	Spionidae
11.	Prostomium with unpaired tentacles or bearing lateral branched gills	13
12.	Tentacular filaments, podial gills and palpi absent, dorsum with unpaired median tentacle arising between segments II and III or between III and IV	Cossuridae
12.	Tentacular filaments, palpi and podial gills present	Cirratulidae
13.	Prostomium with unpaired tentacle (single or branched), parapodia with dorsal cirri, gills in anterior region	Paraonidae
13.	Prostomium bearing lateral branched gills . .	Oweniidae
14.	Prostomium bearing one or two pair of palpi .	15
14.	Prostomium lacking palpi	16
15.	Palpi long, fimbriate, thorax of eight setigers, gills absent, abdomen with hooded uncini . . .	Magelonidae
15.	Palpi shorter, not fimbriate, large modified setae on setigers III or IV; body divided into two or more sharply defined regions, hooded uncini absent	Chaetopteridae
16.	Prostomium not clearly visible (covered with feather-like appendages)	Sabellidae
16.	Prostomium clearly visible	17
17.	Body divided into three parts, anterior with two rows of stout brassy spines	Pectinariidae
17.	Body divided into two regions	18
18.	Anterior end bearing numerous filamentous, smooth, retractile tentacles and three to four pair of gills, paleae may be present	Ampharetidae
18.	Anterior end bearing non-retractile tentacles; up to three pair of gills (often arborescent) . .	19

19. Thoracic uncini with elongated hilt . . . . . Trichobranchiidae
19. Thoracic and abdominal uncini with elongated hilt . . . . . Terebellidae

Records of Errantia

Scale Worms

Records: NAD 11 (800) meters
AD-10 (5) ant. frag., AD-10a (2) med. frag., AD-20 (2), AD-21 (1), AD-22 (3), AD-24 (2), AD-25 (2), AD-28 (2), AD-29 (5), AD-37 (3)*
Polynoid AD-38 (2), AD-48 (2)
NAD 14 (1400m)
AD-31 (20)*
NAD 17 (2000m)
AD-6 (1), AD-17 (1)
NAD 19 (2400m)
AD-32 (1)
NAD 21 (2800m)
AD-9 (11), AD-33 (1), AD-41 (1), AD-42 (1)
AD-64 (1), AD-110 (3)

Discussion: Scale worms are represented by many genera in at least two families in our collections. These worms are extremely fragile and loose their elytra in collection. The above records are mostly of fragmented specimens which were not identified further.

Family Amphinomidae

The Amphinomidae are represented by two species in two genera.

Key to Species

1. Body short, broad; caruncle present . . . . . Chloeia pinnata
1. Body long; caruncle absent . . . . . Paramphinome "A"

Genus Chloeia Savingy, 1818

Chloeia pinnata Moore, 1911 p. 239

Records: NAD 11 (800m)
AD-24 (1), AD-37 (2)*, AD-38 (1).
NAD 14 (1400m)
AD-31 (1)

Discussion: Specimens measure to 25 mm long, 8 mm wide. They are very common in shallower waters.

Genus Paramphonime Sars, 1968 p. 254

Paramphinome "A" new species

Records: NAD 21 (2800m)
AD-19 (1), AD-42 (3) as Pareurythoe, AD-65 (4), AD-86 (1), AD-89 (1), AD-90 (1), AD-119 (9), AD-139 (7), AD-150 (6).
NAD 23 (2900m)
AD-18 (1)

Description: Length of type 14mm, width 1.1mm. Other individuals from 9 to 16mm long, 1.5mm wide. Setigerous segments variable, 33 on the type. Body grublike, always coiled when preserved having deep intersegmental grooves. Branchiae present from 4th setiger, number 5 pair (some having 6 pair). Each branchia dendritically branched, inserted behind dorsal cirri, tending to lie flat over dorsum. Prostomium rounded in front, bearing pair of ventrolateral antennae, eyes absent. Peristomium flat, subquadrate, with median tentacle, resembling paired prostomial appendages. First segment reduced dorsally; dorsal and ventral cirri of same form as head appendages. Pair of thick recurved acicular hooks inserted on first setiger at base of dorsal cirri.

Neuropodial and notopodial lobes triangular projections much larger than recorded for other members of genus. Base of notopodial lobe almost in mid-dorsal line, neuropodia mid-lateral. Dorsal and ventral cirri situated behind each podial lobe, reduced to small fleshy projection after first setiger. Two kinds of setae

in notopodia; short moderately stout smooth bristles each terminating in blunt point; and very fine long capillary bristles with serrations on one edge distally. Neuropodial setae of 3 types: extremely fine capillaries serrated on one edge, short thick setae with spur about midway on shaft near ventral cirri, and three thick setae with expanded tips projecting from lobe. Anus ventral.

Discussion: This new form of Paramphinome seems to have features in common with P. australis Monro and P. jeffersii Malmgren. The former has 13 pair of gills which quite readily distinguishes it from the other two. I have examined specimens from the Atlantic Ocean (WHOI, station number E 3) identified by Dr. Olga Hartman and on the basis of this examination have concluded that P. "A" is a much more robust form with many small differences. The most striking difference is the size and shape of the paropodial lobes. In P. jeffersii they are very much reduced, leading G. O. Sars (1872, p. 17) to remark that "the pedal nodes are double, or two on each side of the segments, very small and tolerably far from each other; . . ." His figures substantiate this. The intersegmental grooves of P. "A" are much more pronounced and the dorsal cirri more conspicuous. The setae seem to have minor differences one being that the spur of neuropodial setae in P. "A" seem further from the serrated distal end than in P. jeffersii. P. jeffersii is the most abundant slope form in the Atlantic (Hartman, 1965). Paramphinome "A" however, has been taken only from the abyssal plain in the Pacific.

Family Phyllodocidae

Four species in four genera are represented.

Key to Species

1. Prostomium with median antenna 2
1. Prostomium without median antenna 3
2. Segments I, II, III, distinctly separated . . . . . Eulalia "A"
2. Segments I, II, fused and dorsally indistinct . . Eumida sanguinea
3. Anterior segments with two pair tentacular cirri . . . . . Etone longa

3. Anterior segments with four pair tentacular cirri, body depressed, with posterior median nuchal papillae . . . . . Anaitides grőenlandica

Genus Anaitides Czerniavsky, 1882 p. 158

Anaitides grőenlandica (Oersted) 1843
Phyllodoce grőenlandica Oersted, 1843 p. 192

Records: NAD 11
AD-10 (1) specimen 45mm in length 3mm wide
AD-24 (3), AD-37

Discussion This species is very difficult to separate from the closely related species Anaitides grőenlandica orientalis, Zachs 1933. I have been unable to obtain an accurate description of the latter, and therefore, I have referred these specimens to the stem species.

Anaitides sp.

Records: NAD 11 (800m)
AD-21 (1) specimen with many parts missing
AD-37 (1)
NAD 14
AD-39 (1)*

Discussion: Color dark brown without eyes. The specimens are placed in this genus due to the presence of only four tentacular cirri and a proboscis with longitudinal rows of papillae.

Genus Etone Savigny, 1820 in McIntosh, 1908 (p. 98)

Etone longa (Fabricius) 1780
Nereis longa Fabricius, 1780, p. 300

Records: NAD 21 (2800m)
AD-110 (1) type
NAD 22a (2860m)
AD-89 (1)

Discussion: Prostomium small, subcircular depressed lobe, lacks eyes. Four short frontal antennae, first and

second segment with a single pair of tentacular cirri. Both specimens have scattered remnants of dorsal and ventral cirri. The dorsal cirri are long subrectangular, ventral cirri smaller. Both cirri are heavily pigmented. Setae are composite, very long and slender distally. The entire body is flecked with brown spots.

Genus Eulalia Savigny, 1817, in Bergström, 1914 (1, p. 123)

Eulalia "A" new species

Records: NAD 14 (1600m)
AD-11 (1)
NAD 17 (2000m)
AD-6
NAD 22a (2860m)
AD-89 (1)

Description: Length to 32mm, 0.75mm wide; color brown with yellow intersegmental grooves. Prostomium long, oval; eyes lacking. Two pair short subulate tentacles. Median antenna short, thin, centrally inserted. Dorsal cirri thick, oval, mottled with brown specks. Four pair long slender tentacular cirri. Ventral cirri thick, globular and about one-half the size of the dorsal cirri. Tubes hyaline parchment filled posteriorly with fine sand.

Discussion: Eulalia "A" appears closely related to E. bilineata Johnson which occurs in shallower water off Oregon. It differs in having longer thinner tentacular cirri and median tentacles and in lacking eyes.

?Eulalia

Record: NAD 11 (800m)
AD-25 (1) anterior fragment
AD-59 (1) anterior fragment

Genus Eumida, Malmgren, 1865 p. 97

Eumida?sanguinea (Oersted) 1843
Eulalia sanguinea Oersted 1843b, p. 28

Records: NAD 16 (1800m)
AD-7 (1)

NAD 23 (2900m)
AD-18 (1)

Discussion: Specimen from AD-7 lacks most of the dorsal and ventral cirri and lacks eyes.

Phyllodocide (not identified)

Record: NAD 11 (800m)
AD-4 (1) posterior fragment

Family Hesionidae

Genus Gyptis, Marion and Bobretzky, 1875

Gyptis arenicola glabra (Hartman) 1961
Oxydromus arenicolus glabrus Hartman, 1961, p. 68

Records: NAD 11 (800m)
AD-10 (2) ant. fragments, AD-20 (1), AD-23 (1), AD-24 (1), AD-25 (2), AD-29 (2), AD-47 (2)*.

Family Pilargidae

Four species in two genera are represented.

Key to Species

1. Prostomium small, inconspicuous, antennae shorter than palps, surface of body papillated . 2
1. Prostomium larger, antennae longer than palps, integument smooth . . . . . Sigambra tentaculata

2. Notopodial bases prolonged, bearing simple slender distally pointed setae and recurved hooks . . . . . Ancistrosyllis breviceps

2. Notopodial bases not prolonged, bearing setae of two kinds, simple capillaries and thick acicular. Recurved hooks also present. . . . . Ancistrosyllis hamata

Genus Ancistrosyllis McIntosh 1879, p. 502

Ancistrosyllis breviceps Hartman 1963, p. 13

Record: NAD 11 (800m)
AD-23 (1)

Ancistrosyllis (nr) hamata (Hartman) 1960, p. 88
Pilargis harmatus Hartman, 1960, p. 88

Record: NAD 21 (2800m)
AD-9 (1), AD-41 (3), AD-42 (1), AD-110 (1)

Discussion: Specimens differ slightly from the description of A. hamata Hartman in that the thicker acicular neurosetae have a recurved tip but seem to lack an accessory tooth.

Genus Sigambra F. Müller, 1858, p. 214

Sigambra tentaculata (Treadwell) 1941
Ancistrosyllis tentaculata Treadwell, 1941, p. 1.

Record: NAD 16 (1800m)
AD-7 (3)

Sigambra sp.

Record: NAD 16 (1800m)
AD-7 (1)

Discussion: A single specimen lacking posterior end has long tentacles with noto-acicular spines first present from the 3rd setiger. The prostomium has 8 palpi, each with a thin pointed terminal extension. This may be Sigambra tentaculata (above).

Family Nereidae

Three species in three genera are represented.

Key to species

1. Proboscis with soft papillar processes, ventral cirri of anterior segments bifid . . . . Ceratocephale loveni pacifica

1. Proboscis without soft papillar processes, ventral cirri not bifid 2

2. Proboscis without processes on either ring, parapodia biramous . . . . . Nicon "A"

2. Proboscis with pointed or conical paragnaths of both rings, notopodia with homogomph falcigers and spinigers . . . . . Nereis sp.

Genus Ceratocephale Malmgren, 1867, p. 60

Ceratocephale loveni pacifica Hartman 1960, p. 94

Records: NAD 16 (1800m)
AD-7 (1) frag
NAD 21 (2800m)
AD-42 (2)*

Genus Nereis Linnaeus 1758, p. 644

Nereis sp.

Record: NAD 11 (800m)
AD-10 (1)

Discussion: A single specimen, in which most of the paragnaths are destroyed, has homogomph falcigers and spinigers. Falcigers terminate in a stout recurved hook. Dorsal and ventral cirri long, thin, tapering to a point. Eyes lacking, parapodia biramous.

Genus Nicon Kinberg, 1866, p. 179

Nicon "A" new species

Records: NAD 11 (800m)
AD-25 (1), AD-38 (1)? juvenile
NAD 16 (1800m)
AD-6 (1) type
NAD 17 (2000m)
AD-7 (1), AD-17 (1)

Description: Length of type 15mm for 28 segments, width including parapodia is 3.2mm. Prostomium quadrate, wider than long, with four eyes. Pigmentation of eyes deep red-purple; anterior pair crescent shaped, posterior pair

round. Proboscis smooth, lacking paragnaths; distal end terminated with pair of yellowish brown horny jaws. Each jaw having 13 crenulated teeth on each cutting edge. Tentacular cirri four pairs; median (inside) pair long, smooth reaching to sixth segment; outside pair shorter, only slightly longer than the body width. Anterior parapodia bearing well developed dorsal, two median, and single ventral lobe. Dorsal lobe elongated, tapering to blunt point extending slightly beyond median lobes. Superior median lobe anterior to inferior median lobe, more pointed, the latter terminating within truncate tip. Ventral lobe short, thick, terminating with a rounded tip. Dorsal cirri long, smooth; ventral cirri shorter, more pointed. Acicula dark to black, occurring singly in parapodial rami; each completely embedded. Notosetae only homogomph spinigers, having smooth distal ends. Neuropodial setae of two kinds; superiorly homogomph spinigers with hair-like projections from one edge; inferiorly heterogomph falcigers, thicker, more pronounced than other setae, with reduced distal end.

A smaller specimen from AD-7 lacks eyes and has more slender parapodial lobes.

Discussion: Nicon "A" differs from all known species of the genus in the type and shape of eyes, size of palps, cirri, and parapodia. The jaws, and presence of homogomph spinigers in superior neuropodial fasciles are unique. The shape of the falcigers may also be different.

Family Nephtyidae

Two species in a single genera are represented.

Key to species

1. Posterior tentacle bifurcate . . . . . Nephtys cornuta
1. Posterior tentacles simple, branchiae begin on third to sixth setiger . . . . . Nephtys longosetosa

Genus Nephtys Cuvier, 1817 in Audouin and Milne Edwards, 1833, p. 254

Nephtys cornuta Berkeley and Berkeley, 1945, p. 328

Records: NAD 11
AD-10 (6), AD-20 (1), AD-22 (1), AD-24 (16), AD-25 (5), AD-37 (2)*
NAD 13 (1200m)
AD-16 (2)
NAD 14 (1400m)
AD-31 (3)*

Nephtys longosetosa Oersted, 1843, p. 195

Record: NAD 11 (800m)
AD-10 (9) specimens to 9mm, incomplete posteriorly

Nephtys sp.

Record: NAD 21 (2800m)
AD-42 (1)*

Family Sphaerodoridae

Genus Sphaerodorum Oersted, 1843, p. 42

Sphaerodorum brevicapitis Moore, 1919, p. 335

Records: NAD 14 (1400m)
AD-39 (1)*
NAD 21 (2800m)
AD-42 (1)*
NAD 23 (2900m)
AD-18 (1)*

Family Glyceridae

Three species in two genera are represented.

Key to species

1. Parapodia biramous or biacicular except the first few, notosetae simple, neurosetae composite . . . . . Glycera capitata branchipoda

1. Parapodia uniramous having only composite setae 2

2. Ventral cirri with rounded lobe, only heterogomph spiniger . . . . . Hemipodus borealis

2. Ventral cirri with sharp triangular lobes . . . . Hemipodus "A"

Genus Glycera Savigny, 1818, p. 314

Glycera capitata branchiopoda Hartman, 1959, p. 288
Glycera branchiopoda Moore, 1911, p. 302

Record: NAD 21 (2800m)
AD-9 (2)

Genus Hemipodus Quatrefages, 1865, p. 174

Hemipodus borealis (Johnson), 1901
Hemipodia borealis Johnson, 1901, p. 411
reference: Johnson, 1901

Record: NAD 11 (800m)
AD-4 (1), AD-10 (2), AD-10a (1), AD-21 (1), AD-24 (1), AD-25 (1), AD-30 (1), AD-47 (1)*

Discussion: Specimens range in length from 20 to 27mm, of nearly uniform thickness for the greater portion of the length. Body tapers posteriorly; somites three-ringed, 126 in number; two minute anal cirri. Prostomium with conical, ringed process, tipped with four tentacles. Proboscis with minute, ovate papillae. Jaws with notch near base; jaw appendage a simple rod. Parapodia having only lower ramus, a single acicula, and no simple setae. The dorsal cirrus ovate; no gills. Parapodia consisting of anterior, elongated lobe and a posterior, short, rounded one. Setae entirely composite spinigers with heterogomph articulation.

Distribution: Originally described from Puget Sound, Washington, it is recorded on the Pacific Coast intertidally as far

south as western Mexico. This finding is perhaps an extension of its depth range.

Hemipodus "A" new species

Record: NAD 22 (2900m)
AD-19 (2) type

Description: Complete specimen 28mm long, body transparent, prostomium with 7 deep rings, tentacles not visible on either specimen. Parapodia uniramous throughout, having only homogomph falcigers, the distal end slightly sigmoid.

Discussion: Hemipodus "A" differs from H. borealis Johnson and H. californiensis Hartman in having homogomph falcigers and dorsal and ventral cirri with sharp triangular lobes.

Family Goniadidae

Two genera, three species represented.

Key to species

1. Proboscis having paired series of lateral black chevrons 2
1. Proboscis without chevrons . . . . . Glycinde?pacifica
2. Prostomium with five rings and lateral grooves Goniada annulata
2. Prostomium having more than five rings, no lateral grooves . . . . . Goniada brunneata

Genus Glycinde Müller, 1858, p. 214

Glycinde?pacifica Monro, 1928, p. 83

Record: NAD 21 (2800m)
AD-9 (3), AD-33 (2), AD-65 (1)

Genus Goniada Audouin and Milne Edwards, 1833, p. 266

Goniada annulata (Moore), 1905, p. 594

Record: NAD 11
AD-10 (1), AD-10a (1) lacks posterior end, AD-20 (1), AD-23 (1), AD-24 (1), AD-30 (1) juvenile?

Discussion: Color variable from deep brown with light intersegmental grooves to almost colorless. Length ranges from 5mm to 8.5 cm. long.

Goniada brunneata Treadwell, 1906, p. 1174

Records: NAD 16 (1800m)
AD-7 (2)
NAD 17 (2000m)
AD-6 (3), AD-17 (1)
NAD 21 (2800m)
AD-9 (3), AD-33 (2), AD-10 (1)
NAD 22 (2800m)
AD-44 (1)
NAD 22a (2800m)
AD-89 (1)

Discussion: Deep water specimens appear to have some general differences from the shallow water forms. Setae are conspiciously longer, eyes sometimes absent. The degree of coloration seems to vary directly with the size of the specimen, the larger specimens being a much deeper shade of brown.

Family Onuphidae

Eight species in two genera represented.

Key to species

1. First and second parapodia greatly enlarged and bent forward beneath the prostomium . . . Paranorthia sp.
1. First and second parapodia only slightly enlarged 2

2. Some branchiae pectinate 3
2. All branchiae simple, or absent 4

3. Hooded hooks simple, tridentate, composite spinigers absent; subacicular hooks from setiger 50 . . . . . Onuphis vexillaria

3. Hooded hooks pseudocomposite, tridentate, subacicular hooks from setiger 19 . . . . . Onuphis "A"
3. Hooded hooks composite, tridentate, composite spinigers occurs from setiger seven, subacicular hooks from setiger 13 . . . . . Nothria stigmatis

4. Anterior hooded hooks bidentate with long sharply pointed hood projecting well beyond hook . . . . . Nothria lepta
4. Anterior hooded hooks bi or tri dentate, hood projecting only slightly beyond hook 5

5. Branchiae from first setiger . . . . . Nothria iridescens
5. Branchiae begin after first setiger 6

6. Branchiae from setiger four or five; tubes of white parchment covered with sand, distal fang of anterior hooded hook projecting beyond median tooth . . . . . Nothria geophiliformis

6. Branchiae from setiger three, hooded hooks tridentate, distal fang not projecting beyond median tooth; tube of fine mud . . . . . Nothria pallida

Genus Nothria Malmgren, 1867, p. 166

Nothria geophiliformis Moore, 1903, p. 445

Records: NAD 11 (800m)
AD-37 (4)*, AD-47 (4)*
NAD 14 (1400m)
AD-31 (3)*, AD-39 (3)*

Discussion: These specimens are in the collection of Dr. Reish and may possibly be N. pallida (Moore), a very closely related form. N. geophiliformis is however frequently collected at shallower stations.

Nothria iridescens (Johnson), 1901
Nothria iridescens Johnson, 1901, p. 408

Records: NAD 11 (800m)
AD-22 (2)
NAD 12 (1000m)
AD-148 (1)

Nothria lepta (Chamberlin), 1919
Onuphis lepta Chamberlin 1919, p. 290

Records: NAD 12 (1000m)
AD-148 (1)
NAD 21 (2800m)
AD-9 (1)
NAD 22 (2800m)
AD-119 (1)
NAD 22A (2860m)
AD-88 (2)
NAD 23 (2900m)
AD-18 (3)
NAD 26 (2800m)
AD-53 (1)

Discussion: Nothria lepta is known primarily from its original collection off of the coast of Panama from a depth of 2880m (1600 fms). The above specimens compare in all respects with Chamberlin's 1919 description. Another closely related form is Nothria abyssalis Fauchald, 1968. The two forms are easily separated in that Nothria lepta has only bidentate hooded hooks. This collection represents the northernmost record of this species.

Nothria pallida Moore, 1911, p. 256

Records: NAD 11 (800m)
AD-10 (7), AD-21 (5), AD-22 (2), AD-24 (4), AD-25 (2), AD-29 (1), AD-38 (1), AD-48 (3), AD-59 (1)
NAD 12 (1000m)
AD-148
NAD 13 (1200m)
AD-16 (2)
NAD 16 (1800m)
AD-7 (3)
NAD 17 (2000m)
AD-6 (2), AD-17 (4)

Discussion: Length to 160mm, width 3.5mm. Branchiae from the third setiger, ventral cirri through the 6th setiger, pad-like thereafter. The median ceratophore had 5-7 articles, the outer lateral with up to 20 articles. Anterior hooded hooks tridentate, the distal fang does not project beyond

the median tooth. Proximal tooth occasionally reduced. Subacicular hooks begin on setiger 16. Tube of fine mud.

A single specimen from AD-21 has a branchia on the left side of the first setiger, but setigers two and three are abranchiate. The right side is normal. This specimen also has a single quadridentate hook in the third setiger of the left side.

Specimens from AD-148, AD-149 and AD-48 have been compared with the collection at the Allan Hancock Foundation.

Nothria stigmatis (Treadwell), 1922
Onuphis stigmatis Treadwell, 1922, p. 176

Record: NAD 21 (2798m)
AD-110 (2)

Genus Onuphis Audouin and Milne Edwards, 1833, p. 225

Onuphis vexillaria Moore, 1911, p. 266

Records: NAD 17
AD-6 (2)
NAD 21 (2800m)
AD-9 (2), AD-33 (1), AD-65 (5), AD-110 (4)
NAD 22 (2800m)
AD-44 (2)
NAD 22A (2860m)
AD-88 (1) (1)?
NAD 23 (2900m)
AD-18 (1)
NAD 25 (2600m)
AD-55 (4)
NAD 26 (2560m)
AD-53 (1)

Discussion: Length to 60mm, width to 5mm. Ceratophores are sometimes wrinkled on preservation but appear to lack true annulations.

Onuphis "A" new species

Records: NAD 22 (2900m)
AD-19 (1)

NAD 24 (2800m)
AD-139 (1)
NAD 22A (2860m)
AD-89 (1)

Description: 44mm long, 4mm wide, posterior end lacking. Dorsum, ceratophores and occipital tentacles colorless. Prostomium semi-circular, eyes lacking. Ceratophores annulated, median having four, outer lateral with seven, inner laterals with six. First and second parapodia slightly longer directed forward, each bearing long dorsal and ventral cirri. Ventral cirri cirriform through first seven setigers, pad-like thereafter. Branchiae from tenth setiger beginning as four pectinate filaments increasing to seven or eight filaments on thirtieth setiger. Postsetal lobes long, thin, nearly reaching tip of dorsal cirri. Anterior hooks, pseudocomposite, tridentate and hooded. Subacicular hooks from setiger nineteen, each distally bifid and hooded.

Discussion: Onuphis "A" is quite similar to Onuphis vexillaria. It differs in having composite spinigers from setiger nine, subacicular hooks from setiger nineteen, and in lacking eyes.

Genus Paranorthia Moore, 1903, p. 448

Paranorthia sp.

Record: NAD 11 (800m)
AD-30 (1) fragment

Discussion: An anterior fragment of 12 segments, 5mm long, 1.4mm wide, is tentatively referred to this genus. Color pale with very robust parapodia containing very long stout acicular setae. The first and second pair of parapodia are enlarged and bent forward beneath the prostomium, branchia begin on 8th setiger as single filament. Median and posterior branchia unknown. Ceratophores are conspicuous, short stout and weakly triangulate. Hooded hooks composite, bifid with the strong hooks widely separated. The specimen does not appear to fit any known species of this genus and further collections are necessary before a complete description can be written.

Family Eunicidae

Genus Eunice Cuvier 1817 in Audouin & Milne Edwards, 1833, p. 211

Eunice kobiensis McIntosh, 1885, p. 278

Records: NAD 16 (1800m)
AD-7 (1)
NAD 17 (2000m)
AD-6 (2), AD-17 (1)
NAD 18 (2200m)
AD-13

Discussion: One specimen from AD-6 is more than 120mm long, and 30mm wide. Eunice kobiensis was originally reported from Japan in deep water; these specimens fit this description very accurately. Eunice kobiensis McIntosh is commonly reported intertidally in the Friday Harbor region of Washington. I have not examined these shallow water forms, but it seems doubtful that the deep and shallow forms are identical.

E. kobiensis appears in this study to be endemic to rocky slope areas.

Family Lumbrineridae

Five species in two genera are represented.

Key to species

1. Acicula and setae generally black, branchiae present on some anterior parapodia . . . . . Ninoe gemmea
1. Acicula and setae generally yellow or translucent, branchiae absent 2

2. With only simple falcigers 3
2. Some falcigers composite . . . . . Lumbrineris index

3. Limbate setae not greatly prolonged, anterior parapodia w/short rounded presetal lobe, postsetal lobe longer, deeper, semicircular in outline 4

3. Limbate setae greatly prolonged the longest occur in the inferior end of the fascicle . . . . Lumbrineris moorei

4. Prostomium equiangular, larger (to 100mm) . . Lumbrineris bicirrata

4. Prostomium conical, apex rounded, smaller (to 50mm) but usually less . . . . . Lumbrineris semilabris

Genus Lumbrineris Blainville, 1828, p. 486

Lumbrineris bicirrata Treadwell, 1929, p. 1

Record: NAD 11 (800m)
AD-10 (3) small, immature?

Lumbrineris index Moore, 1911
Lumbrinereis japonica index Moore, 1911, p. 288

Records: NAD 11 (800m)
AD-30 (3)
NAD 13 (1200m)
AD-16 (2)
NAD 17 (2000m)
AD-17 (4)
NAD 22A (2860m)
AD-89 (1)

Lumbrineris moorei Hartman, 1942a, p. 116

Records: NAD 21 (2800m)
AD-9 (1), AD-110 (1)

Lumbrineris similabris Treadwell, 1926, p. 5

Records: NAD 11 (800m)
AD-4 (1), AD-10a (1) frag., AD-20 (1) frag., AD-23 (3), AD-24 (4), AD-25 (4), AD-29 (4), AD-37 (3)*
NAD 14 (1400m)
AD-31 (2)*, AD-39 (1)*
NAD 15 (1600m)
AD-11 (1)
NAD 19 (2400m)
AD-32 (2)

NAD 21 (2800m)
AD-33 (2), AD-41 (4), AD-42 (7), AD-65 (5)
NAD 22 (2800m)
AD-44 (1)

Discussion: Length to 15mm. These specimens are slightly smaller but otherwise correspond to the original description which is based on a single incomplete specimen.

Distribution: Alaska, Bering Sea, Canadian Pacific region. This collection extends its southward range as well as its bathymetric range.

Lumbrineris sp.

Record: NAD 11 (800m)
AD-24 (1) Specimen is 25mm long, lacks suitable features for specific identification.

Genus Ninöe Kinberg, 1865, p. 566

Ninöe gemmea Moore, 1911, p. 285

Records: NAD 11 (800m)
AD-4 (10), AD-10 (19), AD-20 (8), AD-22 (16), AD-23 (9), AD-24 (12), AD-25 (9), AD-28 (16), AD-29 (4), AD-37 (15)*, AD-38 (3), AD-48 (1), AD-59 (3)
NAD 13 (1200m)
AD-16 (2)
NAD 14 (1400m)
AD-31 (2)
NAD 16 (1800m)
AD-7 (1), AD-13 (2)
NAD 17 (2000m)
AD-6 (4)

Discussion: A complete specimen measures to 21mm.

Family Arabellidae

Two species in two genera represented.

Key to species

1. Parapodia with conspicuous projecting spines, Maxilla I dentate basally, falcate distally . . . Drilonereis sp.
1. Parapodia without projecting spines, maxillae with numerous teeth . . . . . Arabella semimaculata

Genus Arabella Grube, 1850, p. 293

Arabella semimaculata (Moore), 1911
Aracoda semimaculata Moore 1911, p. 295

Record: NAD 11 (800m)
AD-10 (2), AD-23 (1), AD-29 (1)

Genus Drilonereis Claparede, 1870, p. 399

Drilonereis sp.

Record: NAD 13 (1200m)
AD-16 (1)

Records of Sedentaria

Family Orbiniidae

Four species in four genera are represented.

Key to species

1. With brush tipped setae . . . . . Califia
1. Without brush tipped setae. 2
2. With four fringed post setal lamellae (papillae) . . . . . Phylo nudus
2. Without postsetal lamellae 3
3. Crotchets present in thoracic neuropodia . . . . Scoloplos nr. armiger
3. Crotchets absent in thoracic parapodia; distally pointed setae . . . . . Haploscoloplos elongatus

Sub-Family Orbiniinae

Genus Califia Hartman, 1957, p. 305

Califia sp.

Record: NAD 16 (1800m)
AD-7 (1)

Discussion: A single fragmentary specimen having brush tipped setae is tentatively placed in this genus. It was also noted that the first three anterior neuropodia differ from those further back. Further collections are necessary before it can be positively ascertained if Califia is a member of the deep water fauna of Oregon.

Genus Haploscoloplos Monro, 1933, p. 261

Haploscoloplos elongatus (Johnson), 1901
Scoloplos elongata Johnson, 1901, p. 412

Records: NAD 11 (800m)
AD-20 (1), AD-22 (2), AD-23 (2), AD-24 (6),
AD-25 (1), AD-28 (1), AD-29 (2), AD-38 (1)
NAD 14 (1400m)
AD-74 (1) fragment
NAD 16 (1800m)
AD-7 (1)

Genus Phylo Kinberg, 1866

Phylo nudus (Moore), 1911
Aricia nuda Moore, 1911, p. 311

Records: NAD 11 (800m)
AD-10 (1)
NAD 25 (2600m)
AD-55 (1)

Discussion: Specimens from Oregon waters differ from the original description in the following characteristics: spines four in a row instead of seven; four postsetal lobes each with four fringes begin on the third setiger and not on setiger 9-13. Three dark brown spots begin on segment seven between the gills and continue posteriorly to the end of the body.

Genus Scoloplos Blainville, 1828, p. 493

Scoloplor nr. armiger (Müller, O.), 1776

Records: NAD 12 (1200m)
AD-148 (1)
NAD 16 (1800m)
AD-7 (1)
NAD 17 (2000m)
AD-6 (1)

Discussion: These specimens all lack posterior ends and differ from the original account by having branchiae from the fifth setiger.

Family Paraonidae

Six species in three genera are represented.

Key to species

1. Prostomium with a median antenna	2
1. Prostomium lacks median antenna, neuropodia with modified acicular spines, branchiae present on ten or more segments	Paraonis gracilis oculata
2. Neuropodia having modified acicular setae . .	3
2. Neuropodia and notopodia bearing only slender, distally pointed setae, median antenna ramified	Aedicira ramosa
3. Modified setae with distally pointed hyaline hood	Aricidea lopezi
3. Modified setae lacking hood	4
4. Modified setae in part subuncinate, uncinate .	Aricidea uschakowi
4. Modified setae entirely uncinate	5
5. Modified setae in a series all about equally thick; posterior neuropodial spines with distal arista	Arieidea suecica
5. Modified setae in a series varying from thickest above to slenderest below, lacking arista .	Aricidea neosuecica

Genus Aedicira Hartman, 1957, p. 311

Aedicira ramosa (Annenkova), 1934
Aricidea (Aedicira) ramosa Hartman, 1959, p. 371
Aricidea ramosa Annenkova, 1934, p. 657

Records: NAD 11 (800m)
AD-4 (7), AD-10 (17), AD-10a (3), AD-22 (4), AD-23 (8), AD-24 (2), AD-25 (5), AD-28 (2), AD-29 (10)
NAD 18 (2000m)
AD-13 (1)

Genus Aricidea Webster 1879, p. 255

Aricidea lopezi Berkeley and Berkeley, 1956b, p. 542

Records: NAD 21 (2800m)
AD-65 (2)
NAD 23 (2900m)
AD-18 (1)
NAD 24 (2800m)
AD-139 (13)

Aricidea neosuecica (Hartman), 1965
Aricidea jeffreysii McIntosh, 1879 sensu Berkeley and Berkeley 1952, p. 542 is quesionably this species.
Aricidea jeffreysii Hartman, 1955, not McIntosh, 1879
Aricidea sp. Hartman, 1955, pp. 60, 73, 77, and 170
Aricidea (near) suecica Hartman, 1957, 1963, p. 39

Records: NAD 11 (800m)
AD-4 (10), AD-10 (51), AD-21 (1), AD-25 (15), AD-37 (11)*, AD-38 (2), AD-47 (2)*, AD-60 (36), AD-59 (1)
NAD 14 (1400m)
AD-31 (15)
NAD 15 (1600m)
AD-11 (1)
NAD 17 (2000m)
AD-6 (5)
NAD 18 (2200m)
AD-13 (1)
NAD 21 (2800m)
AD-9 (4), AD-33 (2), AD-41 (1), AD-42 (2)*, AD-65 (1), AD-110 (7)

NAD 24 (2800m)
AD-139 (31)

Discussion: Aricidea neosuecia is separated from A. suecica Eliason, 1920, only with some difficulty. Our collections indicate that this species has a very patchy distribution.

Aricidea uschakovi Zachs, 1925, p. 2
Aricidea uschakovi Zachs, 1925, pp. 1-5 Annenkova, 1937, p. 173
Aricidea antennata Annenkova 1934, p. 658, fig. 2,3
Aricidea longicornuta Berkeley and Berkeley, 1950, pp. 53-55
Aricidea sp. Hartman, 1955, p. 120
Aricidea (Aricidea) Hartman, 1957, p. 314

Records: NAD 11 (800m)
AD-10 (44), AD-10a (13), AD-20 (13), AD-21 (14), AD-22 (18), AD-23 (28), AD-24 (28), AD-25 (40), AD-28 (20), AD-29 (7), AD-37 (33)*, AD-38 (7), AD-59 (28), AD-60 (28)
NAD 14 (1400m)
AD-31 (15)*
NAD 16 (1800m)
AD-7 (3)
NAD 17 (2000m)
AD-6 (2)
NAD 21 (2800m)
AD-9 (2)

Discussion: All specimens seem to lose posterior ends upon collection.

Aricidea spp.

Records: NAD 11 (800m)
AD-28 (5)
NAD 14 (1400m)
AD-74 (2)
NAD 17 (2000m)
AD-17 (11)
NAD 22 (2800m)
AD-44 (1), AD-99 (1)
NAD 23 (2900m)
AD-18 (3)

Discussion: These specimens seem to have a shorter prostomium, and thicker segments than A. neosuecica.

Genus Paraonis Grube, 1872, p. 58

Paraonis gracilis oculata Hartman, 1957, p. 331

Records: NAD 11 (800m)
AD-10 (2) fragments, AD-20 (1)?
NAD 13 (1200m)
AD-16 (2)
NAD 17 (2000m)
AD-6 (1)
NAD 18 (2200m)
AD-13 (1)
NAD 21 (2800m)
AD-9 (8), AD-41 (1), AD-42 (1)*, AD-65 (11), AD-110 (2)
NAD 22 (2800m)
AD-43 (1)
NAD 23 (2900m)
AD-18 (1)

Family Spionidae

Twelve species in five genera are represented.

Key to species

1.	Fifth segment modified with acicular setae . .	Polydora sp.
1.	Fifth segment lacking acicular setae	2
2.	Branchiae present	6
2.	Branchiae absent	3
3.	Prostomium with frontal horns, bidentate hooded hooks beginning on tenth setiger	Spiophanes bombyx
3.	Prostomium lacking frontal horns	4
4.	Neuropodial hooks tridentate	5
4.	Neuropodial hooks bidentate	Spiophanes anoculata
5.	Dorsal transverse membranes ruffled; with interramal pouches	Spiophanes fimbriata

5. Dorsal transverse membranes smooth, pouches lacking . . . . . Spiophanes anoculata

6. Branchiae fused with dorsal cirri . . . . . Pygospio
6. Branchiae free 7

7. Branchiae begin on second setiger, present on most segments; dorsal lamella attached to branchiae in anterior region . . . . . Nerine foliosa occidentalis
7. Branchiae limited to anterior segments 8

8. Branchiae number four pair or fewer. 9
8. Branchiae number six pair, interramal pouches from setiger three . . . . . Prionospio cirrifera

9. Three or four pair branchiae all pinnate . . . . Prionospio pinnata
9. Four pair branchiae not entirely pinnate 10

10. First and fourth pairs of branchiae with basal pinnae . . . . . Prionospio malmgreni
10. Branchiae smooth 11

11. First pair branchiae longer, second through fourth stubby. . . . . Prionospio "B"
11. All branchial pairs equal in size . . . . . Prionospio "A"

Genus Nerine Johnston, 1838, p. 68

Nerine foliosa occidentalis Hartman, 1961, p. 90
Possibly Nerine foliosa sensa Berkeley and Berkeley, 1952, p. 27

Records: NAD 11 (800m)
AD-4 (3), AD-10 (3), AD-24 (1), AD-25 (3) ant. ends, AD-28 (5), AD-29 (3), AD-37 (4)*, AD-38 (1), AD-47 (15)*, AD-48 (6), AD-59 (1)
NAD 14 (1400m)
AD-31 (1)

Genus Polydora Bosc, 1802, p. 150

Polydora sp.

Record: NAD 11 (800m)
AD-38 (1) anterior fragment

Discussion: Several species of Polydora are found in shallower (less than 600m) Oregon waters.

Genus Prionospio Malmgren, 1867, p. 202

Prionospio cirrifera Wiren, 1883, p. 409 sensu Laubier 1962a,

Record: NAD 21 (2800m)
AD-9 (11)

Prionospio malmgreni Claparede, 1870, p. 73

Records: NAD 11 (800m)
AD-24 (1)
NAD 13 (1200m)
AD-16 (1)

Discussion: Both specimens lack posterior ends. Genital spines present from the 10th setiger, hooded hooks from the 16th setiger.

Prionospio pinnata Ehlers, 1901, p. 163

Records: NAD 11 (800m)
AD-24 (7)
NAD 13 (1200m)
AD-16 (1)
NAD 21 (2800m)
AD-42 (6)*

Prionospio "A" new species

Records: NAD 17 (2000m)
AD-6 (2) frags
NAD 18 (2200m)
AD-13 (2)
NAD 21 (2800m)
AD-42 (1)*, AD-65 (5)
NAD 22 (2800m)
AD-43 (1) type
NAD 24 (2800m)
AD-139 (1)

Description: Length to 7mm long, 0.6mm wide. Prostomium broadest in front having truncate margin without horns.

Gills four pair, all slender, smooth, without pinnae, inserted on setigers two through five. Neuropodial hooded hooks present from 19th setiger, accompanied by pointed setae. Each hook having large fang at right angle to main shaft and two or three smaller teeth superior to fang. Lateral pouches absent.

Discussion: Prionospio "A" differs from P. delta Hartman, 1965, p. 151 in having four not six pair of branchia and lacking eyes. P. japonicus Okuda, another member of this genus with smooth gills, has interramal pouches and branchiae which are much thicker and shorter. The latter is found most frequently in brackish lakes and bays.

Prionospio "B" new species

Records: NAD 17 (2000m)
AD-17 (5) type
NAD 21 (2800m)
AD-9 (33)
NAD 22 (2800m)
AD-119 (13)
NAD 24 (2800m)
AD-139 (8)

Description: Length of type 20mm for 48 segments; prostomium triangulate, anterior margin truncate tapering posteriorly, reaching almost to second setiger. Eyes absent, tentacular cirri absent from type, but present on a single specimen from AD-86, long, somewhat wrinkled, extending to 5th segment. Branchiae 4 pair beginning on first setiger; first long; remaining simple, short, somewhat flattened, all more or less equal. The first parapodia reduced, fused with peristomium. Dorsal cirri of second and third setigers each smaller than those of fourth and fifth setigers. Thereafter diminished.

Neuropodial hooks hooded from the 25th or 27th setiger each terminating in very obscure fang lying at right angles to main shaft. Five or more hooks superior to fang barely visible under high magnification. Occurrence of notopodial hooded hooks uncertain.

Genital spines begin on 21th setiger as single spine but number two after setiger 23. Interramal pouches absent.

Discussion: Prionospio "B" n. sp. differs from Prionospio cirrifera Wiren in the number, size of branchia, it lacks interramal pouches and eyes. Prionospio cirrifera Wiren as discussed by Söderström (1920), p. 237 has neuropodial hooks beginning at 15-17 and genital spines from the 10th. It also has interramal pouches from the third to fourth segment.

Genus Pygospio Claparède, 1863, p. 37

Pygospio sp.

Record: NAD 11 (800m)
AD-9 (1) fragment

Genus Spiophanes Grube, 1850, p. 88

Spiophanes anoculata Hartman, 1960, p. 118

Records: NAD 17 (2000m)
AD-6 (1), AD-17 (1)
NAD 24 (2800m)
AD-139 (7)

Spiophanes bombyx (Claparede), 1870
Spio bombyx Claparede, 1870, p. 485

Record: NAD 21 (2800m)
AD-42 (4)*

Spiophanes cirrata Sars 1872, p. 410

Records: NAD 11 (800m)
AD-47 (1)*
NAD 14 (1400m)
AD-39 (1)*
NAD 19 (2400m)
AD-32 (2)
NAD 21 (2800m)
AD-33 (2), AD-41 (1), AD-42 (2)*, AD-65 (2), AD-110 (1)

Spiophanes fimbriata Moore, 1923, p. 179

Records: NAD 11 (800m)
AD-21 (1), AD-24 (1), AD-25 (3)
NAD 12 (1000m)
AD-148 (2)
NAD 15 (1600m)
AD-11 (1)
NAD 17 (2000m)
AD-6 (2), AD-17 (4)
NAD 21 (2800m)
AD-9 (6)
NAD 22 (2800m)
AD-119 (3)

Discussion: Specimens all lack posterior ends. Thirty segments measure 1mm. The hooks are tridentate, ventral geniculate spines start on the fifth setiger.

Spiophanes sp.

Records: NAD 18 (2200m)
AD-13 (2) fragments
NAD 21 (2800m)
AD-33 (1) fragment

Family Magelonidae

Genus Magelona Müller, 1858, p. 215

Magelona sp.

Record: NAD 11 (800m)
AD-10 (1) fragment

Family Chaetopteridae

Two species in two genera represented in dredged samples; Chaetopterus known from otter trawl samples only.

Key to species

1. Anterior end bearing single pair palpi 2

1. Anterior end bearing both a pair of palpi and antennae . . . . . Phyllochaetopterus claparedii

2. Median region with five segments, three paddle shaped appendages, parapodia uniramous in this region. . . . . Chaetopterus variopedatus (not represented in dredged samples)

2. Median region having 30-90 segments with biramous parapodia . . . . . Telepsavus costarum

Genus Phyllochaetopterus Grube, 1863, p. 52

Phyllochaetopterus claparedii McIntosh, 1885, p. 374

Record: NAD 22A (2860m)
AD-89 (1)

Discussion: A single incomplete specimen with a translucent tube measures over 200mm long. The fourth modified segment has 2 thick setae on one side and a single thick setae on the other.

Genus Telepsavus Costa, 1861, p. 53

Telepsavus costarum Claparede, 1870, p. 80
Leptochaetopterus pottsi E. Berkeley, 1927, p. 441

Record: NAD 11 (800m)
AD-4 (2), AD-10 (1), AD-22 (1), AD-24 (1)

Unidentified Chaetopterid sp.

Record: NAD 14 (1400m)
AD-31 (1)*

Family Cirratulidae

Four species in two genera represented.

Key to species

1. Setae all slender, distally pointed capillaries 2
1. Some setae capillary, others acicular; lateral branchiae present on more than six segments; acicular setae in posterior somites forming encircling series . . . . . Chaetozone setosa

2. Posterior segments not inflated . . . . . Tharyx multifilis
2. Posterior segments inflated or at least usually so 3

3. Setae short, tube of fine white sand . . . . . Tharyx "S"
3. Setae much longer, tube unknown . . . . . Tharyx sp.

Genus Chaetozone Malmgren, 1867, p. 206

Chaetozone setosa Malmgren, 1867, p. 206

Records: NAD 11 (800m)
AD-10a (1)
NAD 14 (1400m)
AD-39 (1)*
NAD 21 (2800m)
AD-9 (15)

Genus Tharyx Webster and Benedict, 1887, p. 741

Tharyx multifilis Moore, 1909, p. 267
Possibly Tharyx marioni (Saint-Joseph), see Day, 1961, p. 504.
Heterocirrus Marioni Saint-Joseph, 1894, p. 56

Records: NAD 11 (800m)
AD-4 (7), AD-10 (3), AD-10a (1), AD-20 (1), AD-22 (2), AD-23 (1), AD-24 (2), AD-25 (5), AD-28 (2), AD-29 (1), AD-30 (2)?, AD-37 (6)*, AD-47 (1)*, AD-59 (2)
NAD 14 (1400m)
AD-31 (8)*, AD-74 (1)
NAD 16 (1800m)
AD-7 (2)
NAD 17 (2000m)
AD-17 (5)
NAD 19 (2400m)
AD-32 (1)

NAD 21 (2800m)
AD-9 (40), AD-33 (6), AD-41 (14), AD-42 (7)*, AD-65 (15), AD-110 (10)
NAD 22 (2800m)
AD-44 (4)
NAD 23 (2600m)
AD-18 (7)

Discussion: Many of the above specimens are lacking posterior ends; tubes (where recovered intact) are of fine sand. Day (1961) thinks that T. multifilis Moore may be a synonym of T. marioni Saint Joseph. He states (p. 504) "As far as I can see they agree perfectly with the description given by Fauvel (1927)."

Tharyx "S" n. sp.

Records: NAD 17 (2000m)
AD-17 (2)
NAD 22 (2900m)
AD-119 (25)
NAD 22A (2860m)
AD-89 (5)
NAD 24 (2800m)
AD-139 (12)

Description: Type is 1.6mm long, 0.15 mm wide. Other individuals to 5mm long, with more than 100 segments. Prostomium bluntly conical with long smooth cylindrical region representing first three fused segments of buccal region. This region about as long as the first 4 setigers. Paired palpi inserted dorso-laterally in segmental groove between buccal region and first short setigerous segments. Anterior region partly covered by branchial filaments (often broken off). Anterior segments narrow, regularly spaced to 8th setigerous segment after which they become irregularly monofiliform, some inflated.

First branchial bases on first setigerous segment; branchiae are more slender than palpi and their basal attachments can be observed on most segments.

Setae fascicles inserted approximately in middle of anterior segments but in median and posterior segments are closer to intersegmental groove. In all segments

they project from parapodia only a short distance. Setae short, generally 5 per fascicle, slightly sigmoid, broadest, subdistally tapering to a slender point. Under oil immersion, the broader subdistal portion has fine serrations on one edge. These minute teeth project at right angles to the shaft. Tubes composed of fine white sand.

Discussion: Tharyx "S" appears close to Tharyx annulosus (Hartman, 1965), but differs in being somewhat smaller, and the serrations on the setae do not project backward as in the latter.

Tharyx sp.

Records:
NAD 11 (800m)
AD-37 (2)*, AD-47 (3)*, AD-48 (2), AD-60 (3)
NAD 13 (1200m)
AD-16 (7)
NAD 14 (1400m)
AD-31 (2)*, AD-74 (4)
NAD 16 (1800m)
AD-7 (5)
NAD 17 (2000m)
AD-6 (20)
NAD 18 (2200m)
AD-13 (1)
NAD 22 (2900m)
AD-119 (2)
NAD 24 (2800m)
AD-139 (2)

Family Cossuridae

Genus Cossura Webster and Benedict, 1887, p. 743

Cossura longocirrata Webster and Benedict, 1887, p. 743

Records:
NAD 11 (800m)
AD-10 (2), AD-22 (2), AD-24 (1)
NAD 14 (1400m)
AD-31 (1)*
NAD 16 (1800m)
AD-7 (7)
NAD 17 (2000m)
AD-17 (4)

NAD 19 (2400m)
AD-32 (2)
NAD 21 (2800m)
AD-9 (15), AD-33 (4), AD-41 (3), AD-42 (5)*, AD-44 (1), AD-65 (10), AD-110 (3)

Discussion: Specimens in the above collections fit Wessenberg-Lund's 1950 account of this species; for details see Reish, 1958.

Family Flabelligeridae

Four species in two genera are represented.

Key to species

1. Anterior with cephalic cage . . . . . Pherusa negligens
1. Anterior lacking cephalic cage 2
2. Surface epithelium papillated, fifth segment with ventral nephridial papillae . . . . . Brada villosa
2. Surface smooth 3
3. Large thick sigmoid hooks in first eight segments . . . . . Brada "A"
3. Lacking sigmoid hooks, 26-31 segments . . . . Brada glabra

Genus Brada Stimpson, 1854, p. 32

Brada glabra Hartman 1960, p. 129

Records: NAD 14 (1400m)
AD-74 (1)
NAD 21 (2800m)
AD-110 (1)

Brada villosa (Rathke) 1843
Siphonostoma villosum Rathke, 1843, p. 215

Records: NAD 11 (800m)
AD-10 (1), AD-20 (1), AD-22 (1), AD-23 (1), AD-24 (1), AD-29 (1), AD-47 (1)
NAD 14 (1400m)
AD-31 (2)*

Brada "A" new species

Records: NAD 16 (1800m)
AD-7 (2) Type and co-type
NAD 21 (2800m)
AD-110 (1)

Description: Length 1.5-4mm, width 0.3-0.5mm, body shape subcylindrical consisting of 27 segments with tough cuticle. Large thick sigmoid hooks occurring in first eight setigerous segments. Thick, "L"-shaped acicular hooks occur in last four segments.

Genus Pherusa Oken, 1807, in Støp-Bowitz, 1948, p. 13

Pherusa negligens (Berkeley and Berkeley) 1950
Stylarioïdes negligens Berkeley and Berkeley, 1950, p. 58

Records: NAD 11 (800m)
AD-10 (1), AD-25 (1)?
NAD 21 (2800m)
AD-9 (2), AD-41 (1)

Unidentified Flabelligerid sp.

Record: NAD 22A (2860m)
AD-89 (1)

Discussion: A single specimen 3.0mm long, 0.02mm wide has a long cephalic cage. First three setigerous segments are expanded, the remainder of the body thin. Sigmoid hooks occur only in the last six segments. The pygidium has two palpi. It is felt that this may represent a new genus; however its relationship to other members of this family must await future collections.

Family Scalibregmidae

Genus Scalibregma Rathke, 1843, p. 182

Scalibregma inflatum Rathke, 1843, p. 182

Records: NAD 17 (2000m)
AD-6 (2)

NAD 21 (2800m)
AD-33 (1)

Family Opheliidae

Four species in two genera are represented.

Key to species

1. Ventral groove extends entire length of of body 2
1. Ventral groove absent 3

2. Pygidium spoon-shaped, open ventrally; setigers number about 50 . . . . . Ammotrypane aulogaster
2. Pygidium tubular, setigers number less than 30 . . . . . Ammotrypane brevis

3. Body consists of 29 segments (25 setigers) . . Travisia brevis
3. Body consists of 24 segments (21 setigers) . . Travisia forbesii

Genus Ammotrypane Rathke, 1843, p. 186

Ammotrypane aulogaster Rathke, 1843, p. 188

Record: NAD 11 (2000m)
AD-24 (2)

Ammotrypane breviata Ehlers, 1913, p. 523

Record: NAD 21 (2800m)
AD-33 (2), AD-42 (1)*

Genus Travisia Johnston, 1840, p. 373

Travisia brevis Moore, 1923, p. 220

Records: NAD 11 (800m)
AD-24 (2)
NAD 21 (2800m)
AD-9 (1), AD-33 (2), AD-42 (2)*, AD-43 (1), AD-65 (1)
NAD 22 (2800m)
AD-44 (1)

Discussion: There seems to be a great deal of confusion concerning this species. Hartman (1938) observed that T. brevis has 29 setigerous segments and (1961) stated that there are only 2 achaetous rings. Moore described it originally as having 29 segments, Branchiae from III - XXIV. Imajima (1963) has reported 24 setigers and four achaetous segments for specimens from the Okhotsk Sea, and Imajima (1964) reports 23 setigers in animals collected off Hokkaido, Japan. Most recently Banse and Hobson (1968) reported specimens from Puget Sound, Washington with 25 setigers followed by four achaeteous rings. In this study T. brevis was reserved for those specimens which fit Moore's original description of 29 segments, 25 setigers and 4 achaetous segments. Maximum length of our specimens was 32 mm.

Travisia? forbesii Johnston, 1840, p. 373

Records: NAD 11 (800m)
AD-4 (1), AD-10a (2), AD-20 (1), AD-21 (1), AD-23 (1), AD-25 (1), AD-30 (1), AD-59 (2), AD-60 (2)
NAD 13 (1200m)
AD-16 (1)
NAD 17 (2000m)
AD-17 (2)

Discussion: The above specimens are placed in this species with some reservation. All specimens consist of 24 segments, 19-21 setigers, and range to 15mm in length. Body generally moderately papillated, an occasional one seems smooth (AD-20). The setae begin on the second segment and usually continue through segment 20 leaving 5 achaeteous segments. Branchiae number 17, starting on the third segment and continue through 20. Pygidium with 8 lateral constrictions and two palpi which seem more reduced than recorded in Hartman's (1966) account of this species. Her earlier account (1956b, p. 190) states T. forbesii has 27-30 segments.

Family Sternaspidae

Genus Sternaspis Otto, 1921, p. 619

Sternaspis scutata (Renier) 1807, in Vejdovsky, 1882, p. 34
Echinorhynchus scutatus clypeatus Renier in Vejovsky, 1882, p. 34
Schreiberius Bremsii Otto, 1821, p. 626
Sternaspis fossor Stimpson, 1854, p. 29

Records: NAD 11 (800m)
AD-24 (1), AD-30 (1)
NAD 14 (1400m)
AD-39 (2)*
NAD 19 (2400m)
AD-32 (1)
NAD 21 (2800m)
AD-9 (1), AD-42 (2)*, AD-65 (2) anterior fragments, AD-33 (2)

Family Capitellidae

Genus Notomastus Sars, 1851, p. 199

Notomastus (Clistomastus) lineatus Eisig, 1887, p. 810
Notomastus (C) lineatus Claparede, 1870a, p. 18
Notomastus lineatus Claparede, 1870a, p. 18

Records: NAD 11 (800m)
AD-24 (4), AD-47 (1)*
NAD 13 (1200m)
AD-16 (1) frag
NAD 14 (1400m)
AD-39 (6)
NAD 16 (1800m)
AD-7 (1)
NAD 17 (2000m)
AD-17 (2)
NAD 19 (2400m)
AD-32 (1)
NAD 21 (2800m)
AD-9 (1), AD-41 (1), AD-42 (1)*, AD-65 (2)
NAD 22A (2860m)
AD-89 (2)

Capitellids (not identified)

Records: NAD 21 (2800m)
AD-110 (2)

NAD 22 (2800m)
AD-44 (3)

Family Maldanidae

Nine species in seven genera represented.

Key to species

1.	With cephalic plaque	2
1.	Lacking cephalic plaque	5
2.	Anal pore dorsal	3
2.	Anal pore terminal	7
3.	Cephalic plaque bearing high median crest	4
3.	Cephalic plaque lacking median crest	*Asychis similis*
4.	Anal plaque entire	*Maldane sarsi*
4.	Anal plaque crenulated	*Maldane glebifex*
4.	Anal plaque foliacious bearing three distally forked cirri	?*Asychis ramosa*
5.	Encircling collars on second and third segments	*Rhodine bitorquata*
5.	Encircling collars absent	6
6.	Anal plaque present, anus dorsal	*Notoproctus pacificus*
6.	Anal plaque present anus terminal	*Nicomache lumbricalis*
7.	Anal end without true funnel; anal cirri numerous, prostomium with slender palapode	*Praxillella gracilis*
7.	Anal end with funnel or funnel-like depression	8
8.	First setiger with series of rostrate neuropodial hooks	*Axiothella rubrocincta*
8.	First three setigers with but one or two acicular setae in neuropodia	*Eucylmene reticulata*

Genus Asychis Kinberg, 1867, p. 341

Asychis similis (Moore), 1906
Maldane similis Moore, 1906, p. 233

Record: NAD 17 (2000m)
AD-17 (3)

?Asychis ramosus Levenstein, R. A., 1961, p. 165

Records: NAD 21 (2800m)
AD-9 (1), AD-65 (1), AD-110 (1)
NAD 22 (2800m)
AD-43

Discussion: A very common form in deep water off the Oregon coast which seems to fit the description of A. ramosa Annenkova as described by Levenstein (1961) in Russian. The presence of a pronounced cephalic keel in all of our specimens suggest that Maldane would be the proper genus for our specimens. Close examination of the type of A. ramosa Annenkova, and A. trifilosa Augner, 1926, should be made before proper classification of our specimens can be accomplished.

Asychis sp.

Record: NAD 11 (800m)
AD-28 (1) Anterior end may be A. disparidentata Moore

Genus Axiothella Verrill, 1900, p. 657

Axiothella rubrocincta (Johnson)
Clymenella rubrocincta Johnson 1901, p. 418

Record: NAD 11 (800m)
AD-28 (6)?, AD-37 (1)*

Genus Euclymene Verrill, 1900, p. 654

Euclymene reticulata Moore, 1923, p. 230

Records: NAD 11 (800m)
AD-37 (1)*, AD-47 (2)*

NAD 14 (1400m)
AD-31 (1)

Euclymene sp.

Record: NAD 11 (800m)
AD-20 (2) AD-22 (4), AD-24 (2), AD-29 (2),
AD-30 (3), AD-60 (4)

Discussion: All specimens are missing posterior ends; they are tentatively assigned to Euclymene for the following characteristics: single spines on the first 3 segments, first four segments tending to collarette, rostrate hooks from the 4th segments with barbules. The tubes are of fine white sand.

Genus Maldane Grube, 1860, p. 92

Maldane glebifex Grube, 1860, p. 92

Records: NAD 11 (800m)
AD-47 (1)*
NAD 19 (2400m)
AD-32 (2)

Maldane sarsi Malmgren, 1865, p. 188

Record: NAD 11 (800m)
AD-10 (1), AD-60 (9)

Discussion: The largest (AD-60) is 7.5cm. long, has 19 setigers; Cephalic median keel is strongly arched, first setigerous segment lacks neuropodial setae, Pygidal plaque is entire except for a single lateral notch on each side. Tube of fine mud. The specimens differ from Moore's (1963) description in that they lack eyes and the spine on the anal plaque was not apparent.

Genus Nicomache Malmgren, 1865, p. 189

Nicomache lumbricalis (Fabricius) 1870
Sabella lumbricalis Fabricius, 1870, p. 374

Record: NAD 17 (2000m)
AD-6 (7), AD-17 (1) fragment

Nicomache sp.

Record: NAD 11 (800m)
AD-24 (3) fragments

Genus Notoproctus Arwidsson, 1907, p. 51

Notoproctus pacificus (Moore), 1906
Lumbriclymene pacifica Moore 1906, p. 246

Record: NAD 16 (1800m)
AD-7 (1) in sandy tube lined with thin parchment

Genus ?Petaloproctus Quatrefages, 1865, p. 247

Record: NAD 19 (2400m)
AD-32 (1)

Genus Praxillella Verrill, 1881, p. 298

Praxillella gracilis (Sars), 1862
Clymeme gracilis Sars, 1862, p. 91

Records: NAD 17 (2000m)
AD-6 (1)
NAD 19 (2400m)
AD-32 (2) frags

Genus Rhodine Malmgren, 1865, p. 169

Rhodine sp.

Record: NAD 11 (800m)
AD-24 (1) Lacking anterior plaque but has intersegmental collars.

Unidentified Maldanid spp.

Records: NAD 11 (800m)
AD-10 (3), AD-24 (5), AD-28 (1), AD-59 (2)
NAD 16 (1800m)
AD-7 (2)
NAD 21 (2800m)
AD-110 (1)

Discussion: All are anterior ends. Probably at least 2 genera are represented.

Family Oweniidae

Genus Myriochele Malmgren, 1867, p. 211

Myriochele heeri Malmgren, 1867, p. 211

Records: NAD 11 (800m)
AD-24 (2)
NAD 14 (1400m)
AD-74 (2)
NAD 17 (2000m)
AD-6 (5)
NAD 22 (2800m)
AD-44 (1)

Family Pectinariidae

Genus Cistenides Malmgren, 1866, p. 358 (See Malmgren, 1865)

Cistenides brevicoma (Johnson), 1901
Pectinaria brevicome Johnson, 1901, p. 277

Record: NAD 11 (800m)
AD-10 (1), AD-10a (1), AD-20 (1), AD-22 (1), AD-23 (1), AD-24 (1), AD-25 (1), AD-48 (1), AD-30 (tube only)

Discussion: Length of our specimens is to 30mm, 4mm wide; tube of fine red sand inter-mixed with large calcareous foraminiferans or medium to find sand. I do not at this time follow Pettibone (1954) or Banse and Hobson (1968) in placing P. brevicoma Johnson in P. granulata, with Cistenides as a subgenus. My observation of both the continental shelf forms of this family and these specimens from moderate depth indicate that specimens with uncini having a single row of teeth, and those with uncini having double rows of teeth are quite separate forms.

Cistenides sp.

Record: NAD 17 (2000m)
AD-6 (1)

Discussion: This fragment has 9 brassy palea with tips strongly attenuated. Uncini are in a single row.

Family Ampharetidae

Nine species in six genera represented.

Key to species

1. With palea (brassy spines) 2
1. Palea absent 4

2. 15 thoracic setigers . . . . . Anobothrus gracilis
2. 16 thoracic setigers . . . . . Lysippe annectens
2. 17 thoracic setigers 3

3. Branchiae flattened, foliaceous; palea tips nearly straight . . . . . Amphicteis scaphobranchiata
3. Branchiae subulate; palea slightly curved, distal end contracted into long slender tips . . . Amphicteis mucronata

4. With a pair of post-branchial spines 5
4. Post-branchial spines lacking; abdominal neuropodia well developed . . . . . Amage anops

5. 17 thoracic setigers, seven to eight teeth on transverse membrane . . . . . Melinna denticulata
5. 18 thoracic setigers 6

6. Transverse membrane denticulated with 14-16 unequal teeth . . . . . Melinna heterodonta
6. Transverse membrane with fewer teeth (12-14) setae more robust usually 800m or less . . Melinna cristata

Genus Amage Malmgren, 1866, p. 370

Amage anops Johnson, 1901
Sabellides anops Johnson, 1901, p. 424

Record: NAD 11 (800m)
AD-10 (2), AD-22 (1) anterior end, AD-29 (1)

Genus Amphicteis Grube, 1850, p. 330

Amphicteis mucronata Moore, 1923, p. 203

Records: NAD 11 (800m)
AD-4 (5), AD-10 (8), AD-10a (1)?, AD-22 (3), AD-23 (8), AD-24 (9), AD-25 (1), AD-28 (8), AD-37 (9)*, AD-47 (2), AD-60 (1)
NAD 14 (1400m)
AD-31 (15)*
NAD 17 (2000m)
AD-17 (1)

Amphicteis scaphobranchiata Moore, 1906, p. 255

Record: NAD 21 (2800m)
AD-33 (1)

Amphicteis sp.

Record: NAD 11 (800m)
AD-22 (3), AD-59 (1) all segments

Genus Anobothrus Levinsen, 1883 (3, p. 158)

Anobothrus gracilis (Malmgren) 1866
Ampharete gracilis Malmgren, 1866, p. 365

Record: NAD 11 (800m)
AD-21 (2), AD-28 (10), AD-29 (9), AD-48 (4)

Discussion: Length 5-8mm, body of 15 thoracic and 13 abdominal setigerous segments, oral tentacles smooth, 4 pair branchiae in straight transverse row, Palea well developed.

Anobothrus sp.

Record: NAD 11 (800m)
AD-4 (2), AD-10 (2), AD-24 (7)

Discussion: These specimens may refer to the above species but the following differences were observed: incomplete specimens have 15 thoracic segments, branchiae are missing, tentacular filaments smooth, retractile and the fine palea very much reduced. The presence of 2 crescent shaped eyespots was also noted.

Genus Lysippe Malmgren, 1866, p. 367

Lysippe annectens Moore, 1923, p. 201

Record: NAD 11 (800m)
AD-29 (1), AD-38 (2)

Genus Melinna Malmgren, 1867

Melinna cristata (Sars), 1851
Sabellibes cristata Sars, p. 205
not M. cristata Moore, 1905

Record: NAD 11 (800m)
AD-10 (2), AD-20 (2), AD-21 (1), AD-24 (5), AD-25 (1), AD-29 (2), AD-38 (1), AD-47 (2)*, AD-48 (1)

Discussion: There seems to be a great deal of confusion in the number of thoracic setigers in this species. The original account gives 18, Hartman, 1965b, shows 15, Berkeley and Berkeley, 1952 shows 18. Tube of fine mud.

Melinna denticulata Moore, 1905, p. 859

Record: NAD 21 (2800m)
AD-65 (1)

Melinna heterodonta Moore, 1923
Melinna cristata heterodonta Moore, 1923, p. 212
See Hartman, 1960, p. 157

Records: NAD 21 (2800m)
AD-9 (5), AD-33 (1), AD-41 (1), AD-65 (1)
NAD 22 (2800m)
AD-43 (1), AD-44 (2)

Discussion: Our specimens come very close to Moore's original description. They all have 18 thoracic setigers, 14 tentacles and have similar nucal hooks. The post-branchial membrane is denticulated with 14-16 unequal lobes that are more irregular in some specimens than in others. I have examined specimens from collection number AHF 7285 from Redondo Canyon while at the Hancock Foundation. Our specimens agree exactly with these specimens and both differ from Moore's description in having avicular and not pectinate uncini. I therefore cannot agree with Moore 1923, "The setae uncini (Plate XVII, fig 25) and other characters agree with M. cristata (Sars)." The setae of M. heterodonta are one-half again as long in proportion to the parapodial lobes as is normal for M. cristata (Sars).

Melinna sp.

Record: NAD 13 (1200m)
AD-16 (1) fragment

Unidentified Ampharetid spp.

Records: NAD 17 (2000m)
AD-6 (3) fragments, two with palea, one lacks palea
NAD 21 (2800m)
AD-65 (1) fragment, with palea

Family Terebellidae

Four species in four genera represented.

Key to species

1. Peristomium with large extensible papillated proboscis . . . . . Artacama conifera
1. Peristomium without extensible proboscis . . . 2

2. Uncini in double row in some thoracic segments 3
2. Uncini in single rows throughout, 15 thoracic setigers . . . . . Streblosoma sp.

3. Nephridia basally connected . . . . . Lanicides sp.
3. Nephridia basally free, two pair branchia . . . Pista fratrella

Subfamily Amphitritnae

Genus Lanicides Hessle, 1917, p. 165

Lanicides sp.

Record: NAD 22 (2900m)
AD-19 (1)

Discussion: A single poorly preserved specimen has two pairs of branchiae inserted on segments two and three. Each branchia consists of a single stalk becoming three branched and each of these stalks are distally arborescent. Seventeen thoracic setigers, at least 5 abdominal segments, the rest may be lacking. Uncini in 2 rows from the 4th setiger, consisting of two types, the anterior with a large fang surmounted by many smaller teeth not in a single row. Posterior uncini with long handles. Nephridia appear to be basally connected.

Genus Pista Malmgren, 1866, p. 382

Pista fratrella Chamberlin, 1919, p. 18

Record: NAD 22A (2860m)
AD-88 (1)

Pista sp

Record: NAD 15 (1600m)
AD-11 (1) fragment

Subfamily Artacaminae

Genus Artacama Malmgren, 1866, p. 394

Artacama coniferi Moore, 1905, p. 853

Record: NAD 21 (2865m)
AD-86 (1)

Subfamily Thelepinae

Genus Streblosoma M. Sars, 1872, p. 413

Streblosoma sp

Record: NAD 15 (1600m)
AD-149 (1)

Discussion: The specimen has two pair of branchiae, fifteen thoracic segments, uncini from the 4th setiger and tentacular filaments smooth with only a single groove. This specimen resembles Hartman's (1956, p. 266) description in that it has 2 pairs of branchiae. It differs in the number of thoracic segments and in lacking eyes.

Family Trichobranchidae

Three species in two genera are represented.

Key to species

1. Branchiae thread like, filaments free	Trichobranchus glacialis
1. Branchiae fused basally to form single group .	2
2. Setae long, coarse, geniculate spines thicker, very sharply bent	Terebellides eurystethus
2. Setae short, fine, geniculate spines thinner . .	Terebellides stroemi

Genus Terebellides Sars, 1835, p. 48

Terebellides eurystethus Chamberlin, 1919, p. 438

Records: NAD 15 (1600m)
AD-149 (1)
NAD 17 (2000m)
AD-6 (1)

NAD 22A (2860m)
AD-88 (2), AD-89 (2)

Discussion: This species appears closely related to T. stroemi Sars which is common in our shallower water. T. eurystethus has coarser, longer setae, and the geniculate spines are thicker and more sharply bent than T. stroemi.

Terebellides stroemi Sars, 1835

Records: NAD 11 (800m)
AD-24 (2)
NAD 17 (2000m)
AD-6 (1)

Trichobranchus Malmgren, 1866, p. 395

Trichobranchus glacialis Malmgren, 1866, p. 395

Record: NAD 11 (800m)
AD-24 (1)

Family Sabellidae

Three species in three genera represented.

Key to species

1. Thoracic neuropodia with avicular crotchets and pennoned setae; thoracic notopodia having setae with elongate blades and spatulate blades; collar bilobed with ends in contact . . . . . Potamella acuminata

1. Thoracic neuropodia with long stemmed crochets only 2

2. Branchiae united by membrane; posterior with ventral and depression . . . . . Euchone analis

2. Branchiae united by membrane but posterior lacking anal depression. . . . . Chone gracilis

Genus Chone Kröyer, 1856, p. 33

Chone gracilis Moore, 1906, p. 539

Records: NAD 11 (800m)
AD-4 (1), AD-10 (5), AD-20 (2), AD-21 (4), AD-22 (2), AD-23 (5), AD-24 (4), AD-28 (3), AD-29 (3), AD-47 (1)*, AD-48 (1)
NAD 14 (1400m)
AD-31 (6)*, AD-39 (1)*

Genus Euchone Malmgren, 1866, p. 405

Euchone analis Kröyer, 1856, p. 17
Sabella analis Kröyer, 1856, p. 17

Records: NAD 17 (2000m)
AD-17 (1)
NAD 18 (2200m)
AD-13 (1)

Genus Potamilla Malmgren, 1866, p. 40

Potamilla acuminata Moore and Bush, 1904, p. 159

Record: NAD 17 (2000m)
AD-6 (4), AD-17 (2)

Discussion: Our specimens contain eight thoracic segments, with setae typical of the genus. They differ from the description of Moore and Bush, 1904, in having 11-12 radioles and not 15-19. The membraneous wings on the inner edge of some radioles are inconspicious to absent. Tube of opaque parchment, center portion with remnants of reddish-white sand cemented to outer surface. A small pebble was also attached to a more anterior portion of the tube.

Results of Sediment and Bottom Water Analyses

The results of sediment particle size, organic carbon content of the sediment, temperature and dissolved oxygen of the bottom

water are summarized in Tables 2, 3 and 4, respectively, and graphs 1-4 (appendix). These results are discussed in the Summary of Results section.

Summary of Results

The 115 species of polychaetes named above belong to fifty-three families of which the best represented are: Spionidae, Maldanidae, Ampharetidae, Onuphidae, Paraonidae, and Lumbrineridae, with 13, 12, 10, 8, 6, and 6, species respectively. The other forty-nine families represented have five or fewer species. These results differ from the records of other world-wide areas where the best represented families are the Polynoidae, Syllidae, Nereidae, and Serpulidae (Hartman, 1959, p. 5). The polynoids, syllids and nereids are most commonly found in the better known littoral and sublittoral zones and not in the bathyal and abyssal areas. If the continental shelf fauna had been included in this survey, there might have been less variation from the known polychaete distributions of other regions. Differences in local topography and sampling techniques may effect the observed differences in faunal composition.

The absence of the two families, Serpulidae and Syllidae, and the reduction in number of species in a third, Nereidae, are one of the most interesting differences from similar studies on other

Table 1. Station List

Anchor Dredge #	Date	Depth (m)	Station	Start Latitude	Start Longitude	Finish Latitude	Finish Longitude
4	6-21-62	800	NAD 11	44-40.3	124-59.0	44-39.0	124-58.2
6	6-6-63	2000	NAD 17	44-33.5	125-14.6	-------	--------
7	8-13-62	1800	NAD 16	44-38.8	125-12.1	-------	--------
9	8-13-62	2800	NAD 21	44-36.4	125-24.8	-------	--------
10	9-4-62	800	NAD 11	44-40.3	124-59.0	-------	--------
10a	9-4-62	800	NAD 11	44-40.3	124-55.9	-------	--------
11	9-5-62	1600	NAD 15	44-39.2	125-11.0	-------	--------
13	9-5-62	2200	NAD 18	44-39.0	125-13.2	-------	--------
16	10-4-62	1200	NAD 13	44-39.0	125-10.0	44-38.0	125-10.0
17	10-4-62	2000	NAD 17	44-39.1	125-19.6	44-39.1	125-18.8
18	10-5-62	2900	NAD 23	44-39.1	126-31.0	44-36.5	126-31.8
19	10-6-62	2900	NAD 22	44-39.7	126-0.03	-------	--------
20	12-4-62	800	NAD 11	44-39.0	124-58.0	44-39.4	124-58.0
21	12-4-62	800	NAD 11	44-39.4	124-58.0	44-39.7	124-58.0
22	12-04-62	800	NAD 11	44-39.7	124-58.0	44-39.6	124-58.0
23	12-04-62	800	NAD 11	44-39.6	124-58.0	44-40.1	124-58.3
24	12-04-62	800	NAD 11	44-39.6	124-58.0	44-39.8	124-58.0
25	12-05-62	800	NAD 11	44-39.8	124-58.0	44-40.6	124-58.5
28	01-25-63	800	NAD 11	44-40.3	124-57.0	-------	--------
30	01-25-63	800	NAD 11	44-39.3	124-57.4	-------	--------
31	01-25-63	1400	NAD 14	44-39.2	125-11.0	44-38.7	125-10.9
32	01-25-63	2400	NAD 19	44-38.6	125-20.1	44-37.6	125-21.0
33	01-25-63	2800	NAD 21	44-39.0	125-34.0	44-39.0	125-33.2
37	04-27-63	800	NAD 11	44-40.0	124-58.0	44-35.7	124-56.6
38	04-27-63	800	NAD 11	-------	--------	-------	--------
39	04-27-63	1420	NAD 14	44-39.1	125-11.0	44-39.5	125-11.1
41	06-01-63	2800	NAD 21	44-39.3	125-34.2	44-40.9	125-35.2
42	06-01-63	2800	NAD 21	44-40.6	125-35.5	44-43.3	125-36.0
43	06-01-63	2800	NAD 22	44-40.0	126-03.0	44-38.0	126-03.0
44	06-01-63	2800	NAD 22	44-38.0	126-03.0	44-38.5	126-03.8
47	05-15-63	800	NAD 11	44-39.2	124-57.0	44-37.7	124-57.6

Table 1. (Continued)

Anchor Dredge #	Date	Depth (m)	Station	Start Latitude	Start Longitude	Finish Latitude	Finish Longitude
48	06-16-63	800	NAD 11	44-38.7	124-57.5	44-37.6	124-55.7
53	08-14-63	2850	NAD 26	44-39.5	127-54.3	44-41.3	127-51.8
55	08-15-63	2600	NAD 25	44-37.4	127-28.0	44-39.0	127-28.2
59	10-29-63	800	NAD 11	44-40.0	125-05.0	-------	--------
60	10-30-63	800	NAD 11	44-40.0	124-58.0	-------	--------
64	12-28-63	3000	NAD 21	44-39.5	125-35.9	44-37.9	125-38.9
65	12-29-63	2750	NAD 21	44-42.0	125-37.8	44-40.9	125-36.9
74	02-20-64	1400	NAD 14	-------	--------	-------	--------
86	05-19-64	2865	NAD 21	44-38.5	125-35.0	44-38.4	125-36.3
88	05-20-64	2860	NAD 22A	44-39.1	126-16.8	44-39.0	126-17.8
89	05-20-64	2860	NAD 22A	44-38.5	126-16.1	44-38.1	126-16.4
110	08-11-64	2798	NAD 21	44-40.1	125-34.0	44-40.0	125-35.0
119	01-13-65	2800	NAD 22	44-38.0	126-02.2	44-38.0	126-06.0
139	02-10-65	2800	NAD 24	44-39.4	126-59.1	44-39.8	126-59.2
148	06-05-65	1000	NAD 12	44-40.7	125-10.0	44-41.1	125-10.0
149	06-05-65	1600	NAD 15	44-41.2	125-15.0	44-41.9	125-15.1
150	10-21-65	2560	NAD 26	44-39.1	127-55.5	44-39.0	127-56.6

Table 2. Summary of Percent Particle Size of Sediment (by weight)*

NAD Station	Sand (%)		Silt (%)		Clay (%)		Sediment Type	Number of Samples
	Mean	Range	Mean	Range	Mean	Range		
11	2.2	0.9-10.3	67.5	56.8-80.1	30.4	9.5-40.0	Clayey Silt	16
12	26.1		39.6		34.3		Sand Silt Clay	1
13	30.0		40.1		29.9		Sand Silt Clay	1
14	32.1	21.1-49.7	50.0	43.5-63.5	18.0	0.0-30.7	Sand Silt Clay	3
15	54.6	31.2-78.0	36.5	28.1-44.9	8.8	0.1-17.5	Silty Sand	2
16	54.6		38.8		6.2		Silty Sand	1
17	37.5	24.2-45.5	49.2	43.5-53.0	13.3	3.3-22.8	Sandy Silt	2
18	25.66		47.2		27.09		Sand Silt Clay	1
19	-----		----		----		------	-
21	7.3	1.2-12.8	52.5	45.8-64.7	40.2	23.8-52.1	Clayey Silt	8
22	1.4	0.6- 1.8	39.1	36.7-40.8	62.3	55.9-62.8	Silty Clay	4
22A	2.0	1.62-2.38	40.0	36.6-45.0	57.08	52.4-61.7	Silty Clay	2
23	2.1		38.3		59.6		Silty Clay	1
24	0.80		30.5		68.6		Silty Clay	1
25	2.4		30.2		67.4		Silty Clay	1
26	1.4	1.3- 1.5	30.6	30.2-30.9	68.1	67.6-68.5	Silty Clay	2

* All samples from NAD stations averaged (See Table 1 for dates and sample number).

Table 3. Summary of Sediment Organic Carbon (% by wt)*

NAD Station	Averages			Ranges			Number of Samples
	Total Carbon	$CaCO_3$ Carbon	Organic Carbon	Total Carbon	$CaCO_3$ Carbon	Organic Carbon	
11	2.65	0.13	2.51	0.05-0.07	0.00-0.03	0.04-0.05	16
12	2.18	0.03	2.15	----	----	----	1
13	1.37	0.16	1.21	----	----	----	1
14	1.16	0.23	0.94	0.48-2.04	0.19-0.20	0.19-1.85	3
15	2.27	0.16	2.12	1.66-2.60	0.12-0.21	1.43-2.49	2
16	.74	0.59	0.15	----	----	----	1
17	1.08	0.43	0.65	1.01-1.14	0.41-0.45	0.56-0.74	2
18	----	----	----	----	----	----	0
19	----	----	----	----	----	----	---
21	1.51	0.20	1.31	1.20-1.78	0.03-0.33	0.93-1.96	8
22	1.66	0.19	1.47	1.62-1.77	0.01-0.35	1.27-1.57	4
22A	2.67	0.14	2.53	----	----	----	2
23	1.73	0.03	1.70	----	----	----	1
24	2.21	0.13	2.08	----	----	----	1
25	1.36	0.25	1.12	----	----	----	1
26	2.52	1.35	1.17	1.56-4.40	0.42-0.45	1.14-1.23	2

*All samples from NAD stations averaged (see Table 1 for sample number and date).

Table 4. Temperature (°C) and Oxygen (ml/liter) of Bottom Water

NAD Station	Season (collection date) Fall	Winter	Spring	Summer	Mean	Range	No. of Samples
11 (800m)							
Date	(Oct '68)	(Jan '68)	(Mar '68)	(July '67)			
Temperature	4.23	4.12	4.22	4.45	4.25	0.38	4
Oxygen	0.34	0.35	0.26	----	0.32	0.08	3
15 (1600m)							
Date	(Oct '67)	(Jan '67)	(Mar '68)	(July '67)			
Temperature	2.15	2.20	2.43	2.10	2.22	0.33	4
Oxygen	1.42	----	0.97	----	1.20	0.45	2
17 (2000m)							
Date	----	(Jan '67)	----	----			
Temperature	----	1.85	----	----	1.85	----	1
Oxygen	----	----	----	----	----	----	---
19 (2800m)							
Date	(Oct '66)	(Jan '67)					
Temperature	1.73	1.81	----	----	1.77	0.08	2
Oxygen	----	----	----	----	----	----	---
21 (2800m)							
Date	(Oct '66)	(Jan '68)	(Mar '68)	(July '67)			
Temperature	1.68	1.71	2.09	1.74	1.80	0.41	4
Oxygen	1.57	1.99	2.02	----	1.86	0.45	3

regions. The absence of the family Serpulidae from the rocky continental slope areas of this study is in contrast to their frequent abundance in this habitat in other regions. The anchor-box dredge has been shown to be a suitable device for sampling rugged terrain such as the slope areas (Carey and Hancock, 1965), however it has difficulty sampling hard rocky surfaces, especially if they are steeply inclined. I would hesitate to totally exclude the family Serpulidae from the Oregon deep water polychaete fauna on the results of this study alone. It seems probable that we may not be using the best instrument to sample them. A sampling device which can scrape the steep rocky slope walls might demonstrate that serpulids are indeed a part of our deep water fauna.

These data also indicate that the family Syllidae is absent, and the number of species in the family Nereidae is much reduced when compared with other studies. Nine syllids and fourteen nereids were found in the collections from Oregon by Hartman and Reish (1950), but no syllids and only three nereids were found in the samples from the bathyal and abyssal region of the Newport Transect. Hartman (1965) found twelve species of syllids in nine genera in the Atlantic Ocean. At the present time I can offer no adequate explanation for this result other than the lack of samples from the continental shelf. The cirratulids and capitellids also seem less abundant than would generally have been predicted from these studies.

Members of the family Sabellidae, Euchone analis, Chone gracilis, and Potamilla acuminata, were found in the mid-slope region of the transect, however a single unidentified sabellid was collected with an anchor-box dredge from station NAD 21 (2800m) during a more recent cruise (April 3, 1967; AD-186). It is possible, therefore, that they occur rarely on the abyssal plain.

Paramphonime "A", a new species, occurred only in the abyssal plain samples in this study, whereas a closely related form, Paramphonime jeffersii, occurred very abundantly in slope depths (97-2900m) in the Atlantic Ocean (Hartman, 1965, p. 2).

The family Onuphidae is one of the best represented and most highly diversified polychaete families represented in the deep sea off Oregon. The genus, Nothria, is represented by seven species, and although their specific identification is very tedious, their depth distribution is well defined. Nothria geophiliformis occurs commonly at depths of 200-600m and in my opinion does not occur within the boundaries of this study. A closely related form, N. pallida, is found at 800-2000m. Nothria iridescens (800-1000m) appears to overlap the distribution of Nothria geophiliformis and Nothria pallida. Nothria lepta is an abyssal form, although a single specimen was collected at 1000m. N. stigmatis is an abyssal plain form.

Table 2 summarizes the sediment particle size (% by weight), Table 3 summarizes the organic content of the sediment (% by weight),

and Table 4 presents all of the available seasonal data on temperature (°C) and oxygen (ml/liter) for the Newport transect line (see also graphs 1-4 Appendix). These may be important factors controlling the distribution of benthic polychaetes. Data on bottom temperature and oxygen are scant due to the difficulties in placing water bottles near the sediment water interface, and therefore, physical data is lacking for many stations. These are not the only factors which affect the distribution and abundance of organisms; others such as food supply, topography, feeding types, larval types, pressure and salinity may also control distribution either singly or in combination, but these were not considered in this study.

In Chart I the polychaete species have been arranged according to their depth distributions. Only those species found in two or more samples from a given station were generally included in this list. Exceptions had to be made for stations NAD 12, 13, 16, 19, 23, 24, and 25, because only a single sample was obtained.

The upper slope station (NAD 11, 800m) lies 62.7 km (39.2 mi) from shore at the outer edge of the continental shelf. It is approximately half way down the near-shore side of a large slope valley which is about fifteen miles wide. The sediment at this station is characterized by having the highest percent of silt (67%) of all the stations sampled. This station also has the warmest recorded temperature (4.45°C) (Table 4) and one of the highest values of organic

carbon (2.51%). This region lies within the oxygen minimum zone (Oregon State University unpublished hydrographic data) and has the lowest oxygen values recorded in the study. As this was the shallowest and most near-shore station studied, it is not known how the polychaete fauna here differs from that at shallower depths. The upper continental slope fauna may be abruptly different from that of the shallower regions, or possibly there may be a more gradual change. Of the 51 species found at this station (Chart I) sixteen are found no deeper than 800m.

Progressing seaward from the 800 meter station, we encounter rather abrupt changes in physical characteristics. Between 800m and NAD 12 (1000m) sediment particle size increases from an average of 2.2% (N=16) sand to 26.1% (N=1) respectively, at NAD 13 it increases another 4%, and between NAD 13 and 14 it increases another 2% to 32.1% (N=3) sand. A rapid increase in the percentage of sand occurs between stations NAD 14 (1400m) and NAD 15 (1600m); the sand percentage at the latter station is 54.6% (N=2). NAD 15 lies 78.7 km (49.2 mi) from shore and is well onto the rugged portion of the slope. The same value was found for a single sample from NAD 16. Over this area of the transect the bottom temperature may drop abruptly. The available data (Table 4) indicates more than a 2°C decrease in temperature between 800m and 1600m. Dissolved oxygen also exhibits a marked increase from 0.32 ml/l, the mean of 3

measurements recorded at 800m to 1.20 ml/l at 1600m. Temperature and oxygen for NAD 16 (1800m) is lacking. Organic carbon content of the sediments over this range is somewhat more erratic. A single sample at NAD 12 indicates it drops slightly to 2.15, continues to decrease through NAD 14 to an average of (N=3) 0.94% and then increases abruptly to an average (N=2) of 2.12% at NAD 15. A single sample measurement of organic carbon at NAD 16 again shows a decrease to 0.15%. Between NAD 11 and NAD 16 twenty-nine species, collected deeper than 800m, reached their lower limit of distribution.

Chart I shows first a single species (Nothria iridescens) dropping out at NAD 12 (1200m), two species (Drilonereis sp. and Prionospio malmgreni) cease at NAD 13, seven species are not found after NAD 14 and single species (Nothria pallida, Haploscoloplos elongatus) leave at NAD 15 and 16 respectively. NAD 16 has the same percentage of sand as NAD 15. This suggests that there are gradual changes in the environment which are reflected in the sediment and bottom water, and these changes seem to reach a maximum at NAD 14 and then gradually decrease beyond at stations NAD 15 and 16. Such a suggestion must be qualified by pointing out that these slope stations were not sampled sufficiently to make conclusive judgments; however, the combined changes in physical characteristics of this region coupled with the indicated shift in fauna suggest that this region has a separate faunal assemblage.

Two sediment samples from station NAD 17 show a 17.1% decrease in sand size particles from that recorded at NAD 16. A single sample from NAD 18 was found to be 25.6% sand. The large range of these measurements indicate the sediment has a very patchy distribution. Similar data are not available for NAD 19. The mean of two measurements indicates that the temperature drops slightly to 1.77°C at NAD 19. In this series of stations nineteen species reach their lower limit along this transect line. When the physical data are better known, it may correlate with the lower slope fauna.

The physiography of the slope region levels quite abruptly to a large flat plain, almost uniformly 2800m, upon which stations 21 to 26 are located. These stations are much more easily sampled than the rugged slope, and therefore the data from them are much better. Station NAD 21 lies closest to the bottom of the steep slope and is 104 km (65 miles) from shore.

The abyssal plain stations exhibit a much finer texture of sediment. Station NAD 21 is 52.5% clay and 40.2% silt. The mean of four temperature measurements over an 18 month period was 1.80°C. Dissolved oxygen is at somewhat higher levels than on the slope, about 2.00 ml/liter. The organic carbon value was 1.31%. This station seems to be the lower limit for twenty species. Yet at the same time a total of twenty-six species found here continue farther out onto the plain. This evidence suggests that this near slope

station is possibly supporting a fauna of its own. At the other abyssal plain stations, NAD 22, 23 and 25, a much less marked change occurs. The data from these stations show a gradual shift from clayey silt to silty clay, an organic content ranging from 1.47 to 1.12%, and an apparent increase in oxygen content of the overlying water. More data from these outer abyssal stations are imperative before it can be determined whether continuous or separate polychaete faunas exist.

Station 22A is somewhat unique both in fauna and physical characteristics. Many of the annelids recovered here were apparently endemic to this region, and the organic carbon content was much higher (2.53%) than the other plain stations. No explanation for this is known, although it might reflect patchiness or be a result of physiography.

Only a few of the species collected in this study are ubiquitous, and the majority inhabit only a single or a few stations in the transect. Specific factors controlling the depth distribution of annelids are not known. Distributions, however, seem to follow the changes with sediment, temperature and oxygen (graphs 1-4, Appendix).

In this transect the families with the greatest abundance were the Cirratulidae, Paranoidae and Spionidae. There is a general decrease in the number of species and the number of individuals with depth, however, certain variations from this trend were noted on the abyssal plain stations. The increase in number of species at NAD 21

and other abyssal plain stations might well be attributed to the lack of samples from the slope stations. Alternatively, the rugged topography of the slope might prevent dispersal of larvae or inhibit circulation of water masses. If data from the shelf stations are included as well as the deep water stations, there is a general trend of decreasing numbers and species with depth and distance from shore.

Grouping the polychaete species by the lower limit of their depth distribution (Chart I in Appendix) tends to indicate five deep water faunal regions; the upper slope fauna (800m), for which the shallower limit has not been established by this study, the mid-slope fauna, the lower slope fauna and the two abyssal plain faunas as named below.

Upper Slope Fauna

Amage anops
Ammotrypane aulogaster
Anaitides groenlandica
Anobothrus gracilis
Arabella semimaculata
Axiothella rubrocincta
Cistenides brevicoma
Goniada annulata
Gyptis arenicola
Gyptis arenicola
Hemipodus borealis
Lysippe annectens
Maldane sarsi
Melinna cristata
Nephtys longosetosa
Telepsavus costarum

Mid-Slope Fauna

Nothria iridescens
Drilonereis
Brionospio malmgreni
Brada villosa
Chloeia pinnata
Chone gracilis
Euclymene reticulata
Nerine foliosa
Nephtys cornuta

Lower Slope Fauna

Haploscoloplos elongatus
Sigambria tentaculata
Nothria pallida
Terebellides stroemi
Travisia forbesii
Amphicteis mucronata
Nicon "A"
Ninoe gemmea
Asychis similis
Eunice kobiensis
Nicomache lumbricalis
Nothria pallida
Potamilla acuminata
Scoloplos armiger
Spiophanes anoculata
Aedicira ramosa
Euchone analis
Maldane glebifex
Praxillella gracilis
Petaloproctus
Lanicides sp.

Nearshore Abyssal Plain Fauna

Prionospio pinnata
Aricidea neosuecica
Aricidea uschakowi
Pherusa negligens
Brada "A"
Ceratocephala loveni pacifica
Brada "A"
Scalibregma inflatum
Ancistrosyllis (nr) hamata
Ammotrypane breviata
Amphicteis scaphobranchiata
Glycera capitata
branchiopoda
Glycinde?pacifica
Chaetozone setosa
Spiophanes cirrata
Spiophanes fimbriata
Asychis? ramosa
Prionospio cirrifera
Spiophanes bombyx
Eulalia "A"
Tharyx sp.
Lumbrineris similabris
Myriochele heeri
Cossura longicirrata
Travisia brevis
Prionospio "A"
Lumbrinereis moorei

Oceanic Abyssal Fauna

Goniada brunnea
Melinna heterodonta
Etone longa
Pista fratella
Onuphis "A"
Phyllochaetopterus claparedii
Terebellides eurystethus
Paraonis gracillis oculata
Notomastus (C.) lineatus
Tharyx multifilis
Aricidea sp.
Sternaspis scutata
Sphaeroderum brevicapitis
Eumida sanguinea
Aricidea lopezi
Paramphonime "A"
Tharyx "S"
Northia lepta
Onuphis vexillaria

DISCUSSION

The total number of species recorded in this study is less than that of a similar study made with an anchor dredge in the Atlantic Ocean (Hartman, 1965) where 209 species were reported. The Atlantic study, however, was broader geographically and bathymetrically. It extended from New England to Bermuda, included other North Atlantic areas and also extended from 97 to 5001 meters in depth. The addition of the polychaete fauna of the Oregon shelf area to the slope and abyssal fauna recorded here would give us a greater number of total species.

This study indicates that the ocean bottom off of Oregon contains a mixture of forms with a wide zoogeographic distribution, some of which have affinities with many regions of the world oceans, as well as forms which are apparently endemic to the Pacific ocean and in particular the East Pacific Ocean. The distributions of the new forms are, of course, not known. Deep-water polychaetes from Oregon exhibit differences from those in other parts of the world; many species and genera are not known elsewhere and some forms known to occur in most of the other oceans are absent. Hartman (1955, p. 39) also noted that the Pacific polychaete fauna differs from that of other regions of the world.

Nine new species were found and characterized in the present

study. Some species previously known only from the original account were also found in the samples. Only five genera found in this study have not previously been reported from the deep sea. They are Chloeia, Arabella, Phylo, Telepsavus and Chone.

The presence of such a diverse and little known fauna suggests that this region was badly in need of study, yet the faunal diversity might have been predicted on the basis of recent polychaete work in other deep water areas. The study of the Atlantic polychaete fauna by Hartman (1965) described 60 new species, 7 new subspecies and 14 new genera. Her study of the Antarctic included 58 new species and 20 new genera. Many more new forms of polychaetes can be expected as the geographical and depth ranges of the Oregon studies are extended.

Comparison of the depth distribution of polychaetes collected in this study with the depth distributions of other groups of animals is most difficult due to differences in sampling techniques and topography. Preliminary studies on gammarid amphipods from the same transect line seem to indicate similar faunal regions. Of 46 species of amphipods which occurred at 800m or deeper, 20 species became limited at station NAD 11 (800m). (Dr. Andrew G. Carey Jr. personal communication). The data for the amphipods on the continental slope areat present too incomplete to make any real comparisons,however five species do not extend beyond station NAD 21

(2800m) on the Cascadia Abyssal Plain.

Suggestions for Future Studies

The major goal of this study was to obtain an accurate set of data on the kinds of polychaeteous annelids which inhabit a deep water transect across Oregon's continental margin. Previous studies of this area are few and before sophisticated ecological problems can be attempted, accurate identifications have to be completed. These data can be of value to considerations of abundance, biomass, and energy relationships. However, many more samples from the slope and distal abyssal region are needed before any statistical analysis can be attempted.

This study has indicated the following research would be useful on providing greater understanding of both the ecology and polychaete fauna of Oregon.

1. Additional transect lines of stations should be sampled to add information on north-south distributions and to test the distributional pattern and species groupings suggested here.

2. Knowledge on the relationships between feeding types of annelids and their environment would be most interesting. Such a study may well help us to better understand the distribution and abundance of these organisms. Further insight would be gained by studying the vertical distribution of the organisms within the sediment.

3. Zoogeographic studies comparing the annelids of this region with those from other areas of the world and with those of the continental shelf of Oregon would be important.

4. The role played by polychaeteous annelids in benthic communities would be a most important area of research.

5. Breeding cycles in the deep sea is of current interest. Polychaeteous annelids may provide excellent material for these studies because of their abundance.

6. Accurate identification is a prerequisite to physiological and ecological studies on polychaetes.

CONCLUSIONS

Identification of the polychaetous annelids from 48 samples taken in a transect across the continental margin and onto the abyssal plain off the coast of Oregon allows the following conclusions:

1. At least 115 species in 53 families are represented in these samples; therefore the deep water annelids of this region are very diversified.
2. In comparison to the polychaete fauna of other areas, the families Serpulidae and Syllidae are absent from Oregon and there is a reduction in the number of species in the families Nereidae, Cirratulide and Capitellidae. Only five genera found in this study had not been reported from bathyal and abyssal depths.
3. Depth distributions coupled with limited information on temperature, oxygen and organic carbon on the sediment suggest that five separate faunal regions can be delineated in this region. These are the Upper Slope, Middle Slope, Lower Slope, Nearshore Abyssal Plain, and Oceanic Abyssal Plain.
4. Nine species new to science were tentatively described. Other new species are to be expected in future collections.
5. Species found in this study and previously known only from

their original descriptions were Nothria lepta, Terebellides eurythstus, Asychis? ramosus and Paranorthia sp.

6. Much more study is necessary before our knowledge of the deep water annelids of the Oregon coast is complete. Six suggestions for future studies are discussed.

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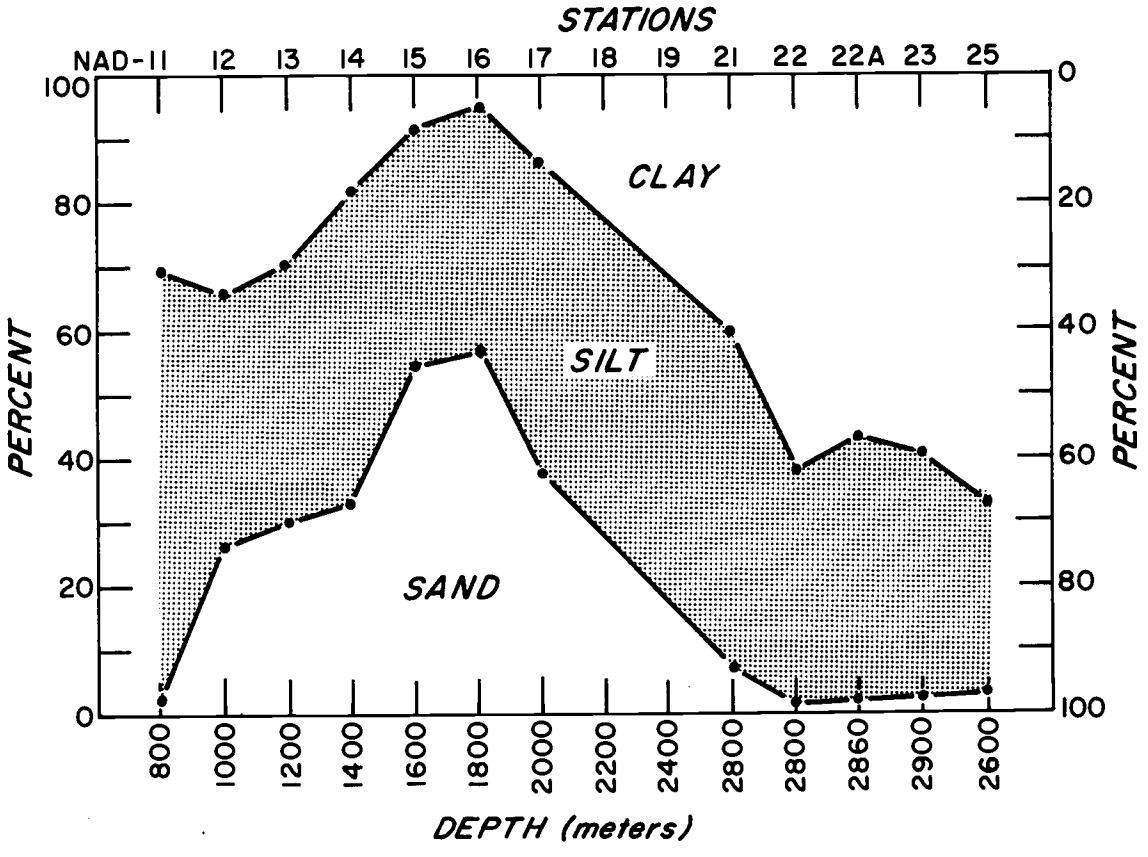
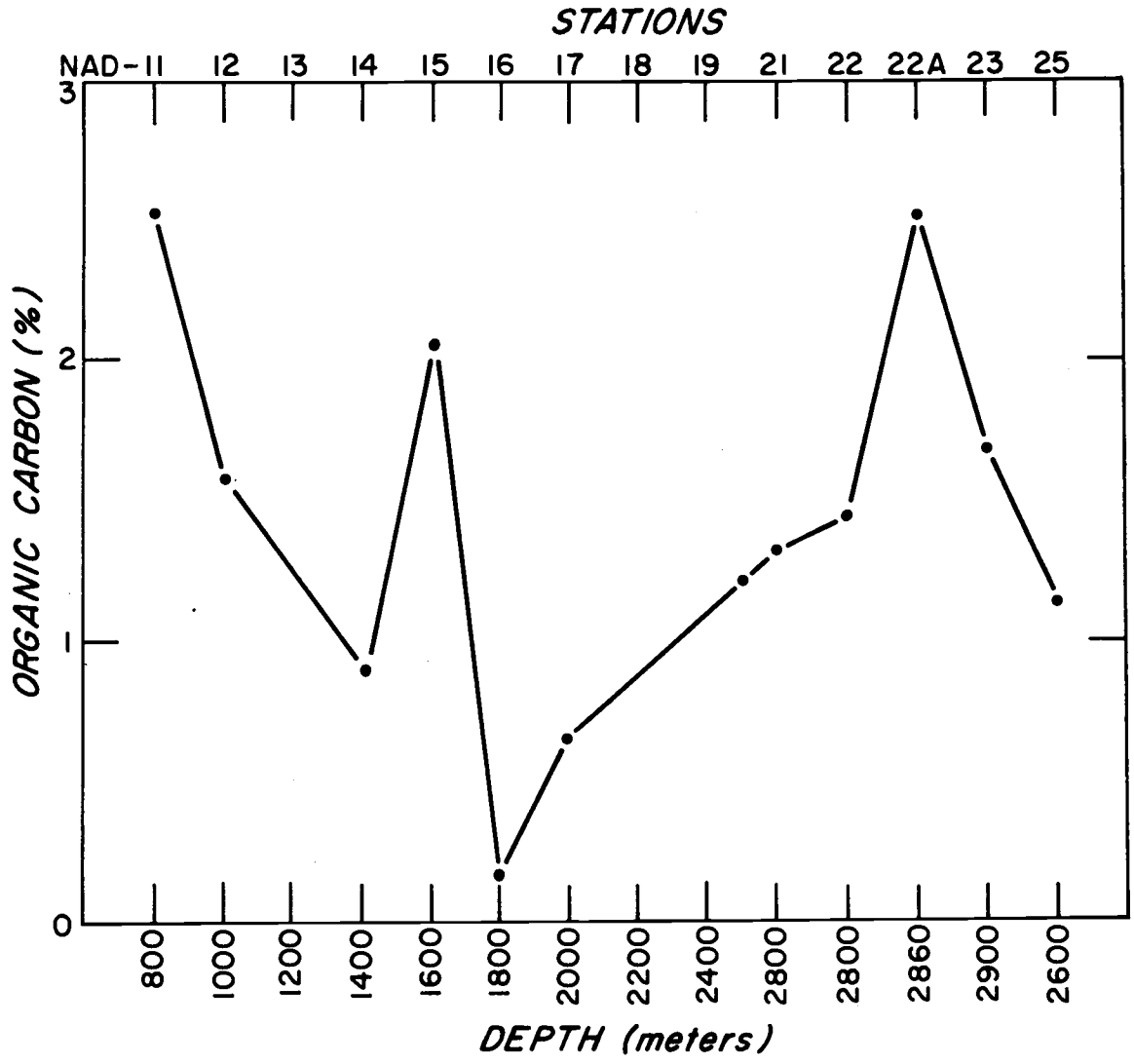
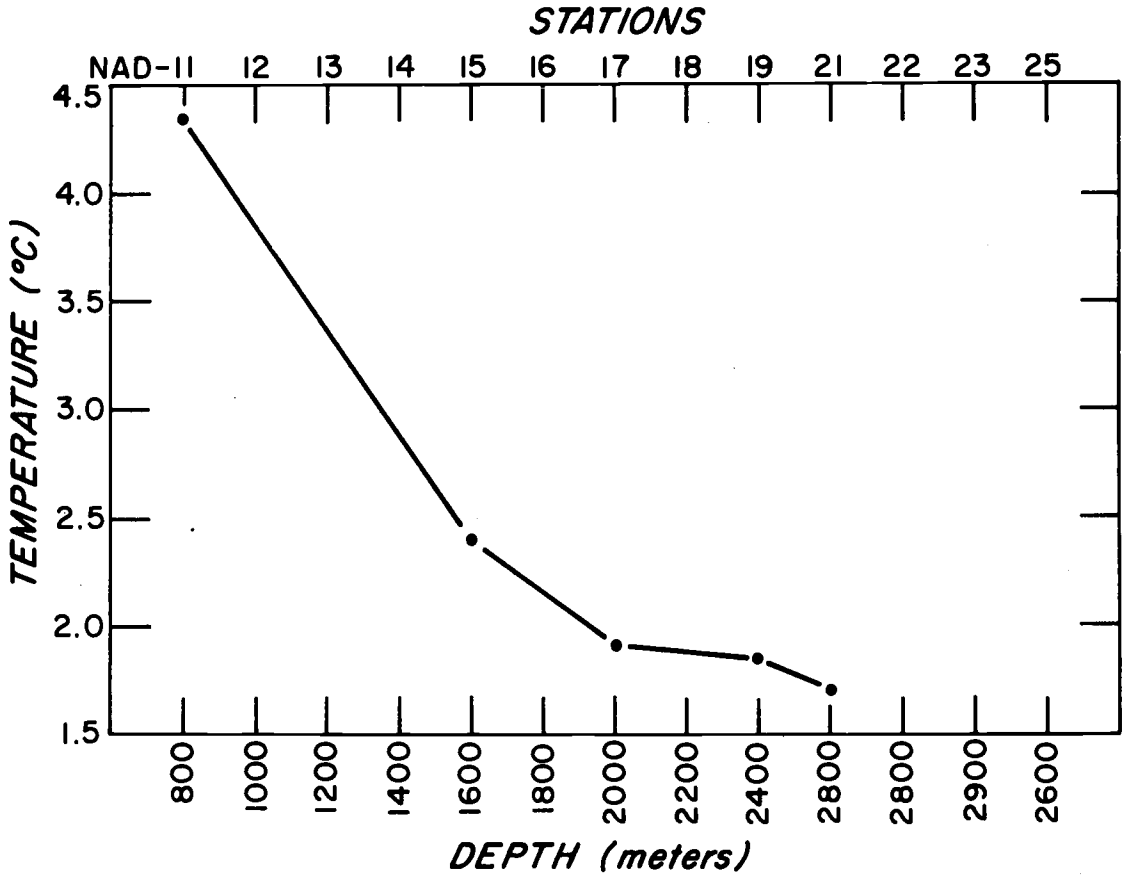
APPENDIX



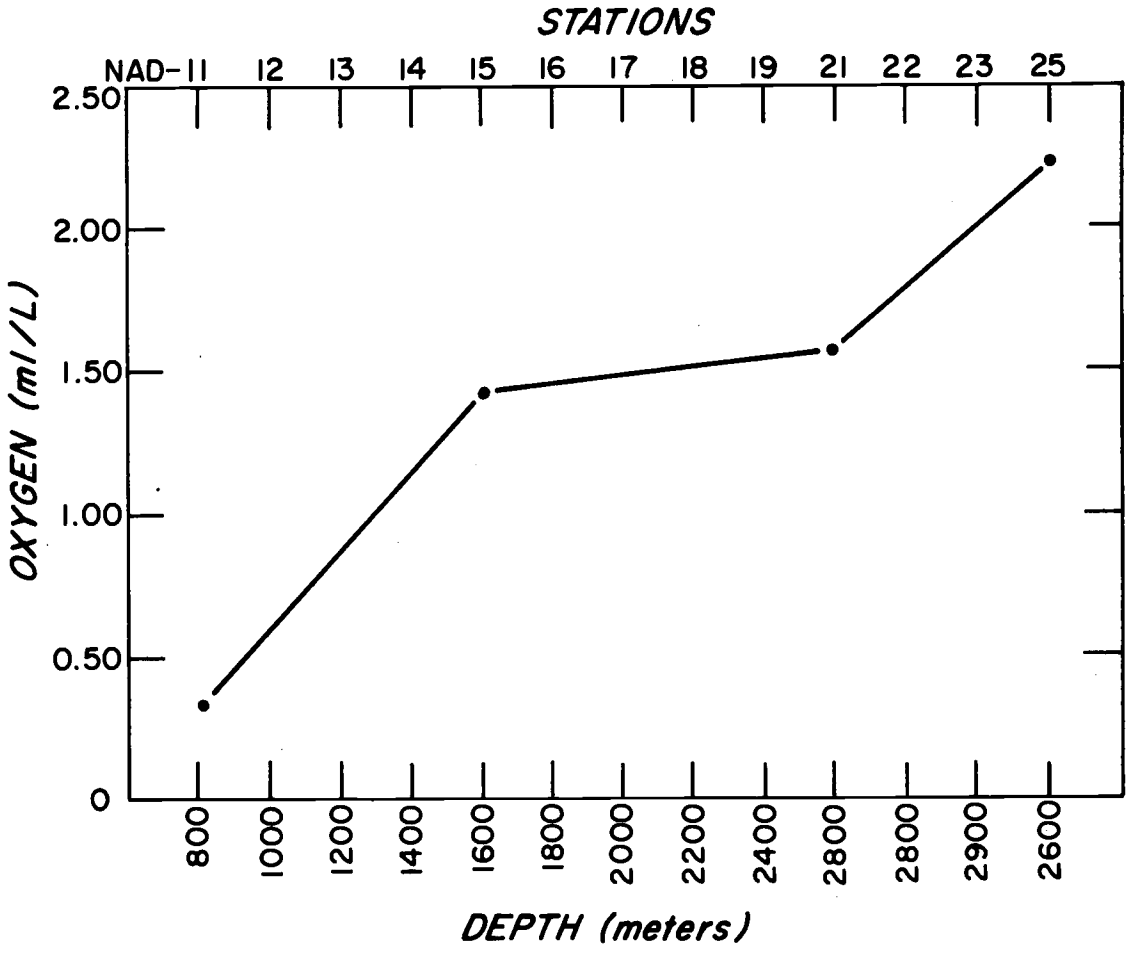
Graph 1. Sediment particle size (average percent by weight)



Graph 2. Sediment organic carbon (percent by weight)



Graph 3. Bottom water temperatures (°C)



Graph 4. Bottom water oxygen (ml/liter)

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