Environmental Assessment of the Alaskan Continental Shelf

Annual Reports of Principal Investigators for the year ending March 1981

Volume II: Receptors - Benthos

U.S. DEPARTMENT OF COMMERCE
National Oceanic & Atmospheric Administration
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U.S. DEPARTMENT OF INTERIOR
Bureau of Land Management

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ANNUAL REPORT

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ANALYSIS OF VAN VEEN GRAB SAMPLES COLLECTED DURING 1979 AND 1980 IN THE NORTHERN BERING SEA AND SOUTHEASTERN CHUKCHI SEA

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I. SUMMARY OF OBJECTIVES, CONCLUSIONS AND IMPLICATIONS WITH RESPECT TO OCS OIL AND GAS DEVELOPMENT

The most extensive infaunal sampling in the eastern Bering and Chukchi Seas have been completed by Haflinger (1978), Stoker (1978) and Feder *et al.* (1980). However, these studies have yielded little information from prospective OCS oil and gas lease areas. It was the primary intent of this investigation to assess the infaunal invertebrates from potential various lease areas in the eastern Bering and Chukchi Seas. Lease areas targeted for investigation were the Navarin Basin, Zhemchug Basin, St. Matthew Basin, and Hope Basin. Addition stations were also occupied adjacent to these basins. The specific objectives of the study were:

1. A quantitative inventory census of dominant infaunal invertebrates at selected stations in the study areas.

2. A description of spatial distribution patterns of dominant infaunal invertebrates in the study areas.

3. Observations of biological interrelationships, emphasizing trophic interactions, between selected segments of the benthic biota.

The van Veen grab survey for the investigation of infaunal invertebrates was effective, and excellent spatial coverage of most of the study areas was obtained. Sampling in the Hope Basin lease area was hampered by extensive ice cover.

A total of 59 stations was sampled. To date 24 stations from the Navarin Basin lease area, 5 from the vicinity of the Hope Basin lease area, and 1 from the St. Matthew Basin lease area have been sorted and the organisms identified and quantified. Upon preliminary examination, some trends in the distributions of particular species were evident.

Stations 12, 16, 17, 18, 22, 23 and 24, all from the central Navarin Basin, were dominated by polychaetous annelids, especially maldanids, capitellids, cirratulids, and lumbrinerids. Common species from those families were *Maldane glebifex, Barantolla americana, Heteromastus filiformis* and *Lumbrineris* sp., respectively. The ophiuroids *Ophiura* *sarsi* and *Diamphidia craterodmeta* and the sea star *Ctenodiscus crispatus* were also common in this area. Mollusks were present but not abundant.

Stations 3, 7, 8 and 9 were dominated by polychaete worms. Many species and relatively large numbers of individuals were present. *Owenia fusiformis* was particularly abundant. *Heteromastus filiformis, Clymenura* sp. and *Lumbrineris* sp. were also common.

Stations 4 and 5 had relatively large numbers of the polychaetes *Nephys punctata* and *Lumbrineris* sp. The bivalve *Axinopsida serricata* and the brittle star *Ophiura sarsi* were also common at these stations.

The stations from the Chukchi Sea (Hope Basin area) appear to be considerably different from those further south in the Bering Sea (Navarin Basin area). In general, mollusks and amphipods were more prevalent in this area. Stations 48 and 50 were somewhat similar in species composition. These two stations were dominated by large numbers of the polychaete *Myriochele oculata*; bivalves, including *Nucula tenuis* and *Thyasira fluxuosa*; and as yet, unidentified amphipods. Station 52 was similar to Stations 48 and 50, however many juvenile sand dollar *Echinarachnius parma* were also present at Station 52.

Station 51 was also similar, however few *Myriochele oculata* were present. Station 49 was dominated by holothurians of the genus *Cucumaria* as well as a variety of polychaetes and mollusks.

Initial assessment of the data suggests that a few unique and/or abundant infaunal invertebrates are characteristic of the areas investigated and that these species may represent organisms that could be useful for monitoring purposes. Two biological parameters that should be addressed in conjunction with petroleum-related activities are feeding and reproductive biology of important species. It is suggested that an intensive program designed to examine these parameters be initiated well in advance of industrial activity in the oil lease areas.

II. INTRODUCTION

General Nature and Scope of Study

The operations connected with oil exploration, production and transportation in the Bering Sea present a wide spectrum of potential dangers to the marine environment (see Olson and Burgess, 1967, for general discussion of marine pollution problems). Adverse effects on the marine environment of these areas cannot be quantitatively assessed, or even predicted, unless background data are recorded prior to industrial development.

Insufficient long-term information about an environment, and the basic biology and recruitment of species in that environment, can lead to erroneous interpretation of changes in types and density of species that might occur if the area becomes altered (see Nelson-Smith, 1973; Pearson, 1971, 1972, 1975; Rosenberg, 1973; Pearson and Rosenberg, 1978, for general discussions on benthic biological investigations in industrialized marine areas). Populations of marine species fluctuate over a time span of a few to 30 years (Lewis, 1970, and personal communication). Such fluctuations are typically unexplainable because of absence of long-term data on physical and chemical environmental parameters in association with biological information on the species involved (Lewis, 1970, and personal communication).

Benthic organisms (primarily the infauna but also sessile and slow-moving epifauna) are particularly useful as indicator species for a disturbed area because they tend to remain in place, typically react to long-range environmental changes, and by their presence, generally reflect the nature of the substratum. Consequently, the organisms of the infaunal benthos have frequently been chosen to monitor long-term pollution effects, and are believed to reflect the biological health of a marine area (see Pearson, 1971, 1972, 1975; Rosenberg, 1973; Pearson and Rosenberg, 1978, for discussion on long-term usage of benthic organisms for monitoring pollution).

The presence of large numbers of benthic epifaunal species of actual or potential commercial importance (crabs, shrimps, snails, finfishes) in the Bering Sea further dictates the necessity of understanding benthic communities since many commercial species feed on infaunal and small epifaunal residents of the bethos (see Zenkevitch, 1963; Feder *et al.*, 1980; Feder and Jewett, 1978, 1980, for discussions of the interaction of commercial species and the benthos). Any drastic changes in density of the food benthos could affect the health and numbers of these commercially-important species.

Experience in pollution-prone areas of England (Smith, 1968), Scotland (Pearson, 1972, 1975; Pearson and Rosenberg, 1978), and California (Straughan, 1971) suggests that at the completion of an initial exploratory study, selected stations should be examined regularly on a long-term basis to determine any changes in species content, diversity, abundance and biomass. Such long-term data acquisition should make it possible to differentiate between normal ecosystem variation and pollutant-induced biological alteration. Intensive investigations of the benthos of the Bering Sea are also essential to an understanding of the trophic interactions involved in these areas and the potential changes that could take place once oil-related activities are initiated. The benthic macrofauna of the Bering Sea and Chukchi Sea is relatively well known taxonomically, and some data on distribution, abundance, general biology, and feeding mechanisms are reported in the literature (Feder *et al.*, 1980; Feder and Mueller, 1977; Feder and Jewett, 1978, 1980). The relationship of specific infaunal feeding types to certain substrate conditions has limited documentation as well. However, detailed information on the temporal and spatial variability of the benthic fauna is sparse, and the relationship of benthic species to the overlying seasonal ice cover is not known. Some of the macrofaunal benthic species may be impacted by oil-related activities. An understanding of these benthic species and their interactions with each other and various aspects of the abiotic features of their environment are essential to the development of environmental predictive capabilities for the Bering Sea.

The benthic biological program in the northeastern Bering Sea and southeastern Chukchi Sea during its first year emphasized development of a qualitative and quantitative inventory of infaunal species of the shelf slated for oil exploration and drilling activity. In addition, development of computer programs for use with data collected in the northeast Gulf of Alaska and southeastern Bering Sea, designed to quantitatively assess assemblages of benthic species on the shelf there, will be applicable to the northeastern Bering Sea — southeastern Chukchi Sea (Feder and Matheke, 1979; Feder *et al.*, 1980). The resultant computer analysis will expand the understanding of distribution patterns of species in the current study areas.

The study program was designed to survey and define variability of the benthic fauna on the northeastern Bering Sea and southeastern Chukchi Sea shelf in regions of offshore oil and gas concentrations. During the first phases of research, emphasis was placed on the collection of data on the faunal composition and abundance of shelf infauna to form baselines to which potential future changes could be compared. Future development of long-term studies on life histories and trophic interactions should clarify which components of the various species groups are vulnerable to environmental damage, and should help to determine the rates at which damaged environments can recover.

Relevance to Problems of Petroleum Development

The effects of oil pollution on subtidal benthic organisms have been seriously neglected, although a few studies, conducted after serious oil spills, have been published (see Boesch *et al.*, 1974, for review of these papers). Thus, lack of a broad data base elsewhere makes it difficult at present to predict the effects of oil-related activity on the subtidal benthos of the Bering Sea. However, research activities in Alaska OCSEAP areas should ultimately enable us to point with some confidence to certain species or regions that might bear closer scrutiny once industrial activity is initiated. It must be emphasized that a considerable time frame is needed to comprehend long-term fluctuations in density of marine benthic species; thus, it cannot be expected that short-term research programs will result in predictive capabilities. Assessment of the environment must be conducted on a continuing basis.

As indicated previously, infaunal benthic organisms tend to remain in place and consequently have been useful as an indicator species for disturbed areas. Thus, close examination of stations with substantial complements of infaunal species is warranted. Changes in the environment at these and other stations with relatively large number of species might be reflected in a decrease in species diversity with increased dominance of a few (see Nelson-Smith, 1973, for further discussion of oil-related changes in diversity). Likewise, stations with substantial numbers of epifaunal species should be assessed on a continuing basis (see Feder and Jewett, 1978, 1980, for references to relevant stations). The potential effects of loss of specific species to the overall trophic structure in the Bering and Chukchi Seas cannot be fully assessed at this time, but the problem can probably be better addressed utilizing preliminary information on benthic food studies now available in Feder *et al.* (1980); Feder and Jewett (1978, 1980); and Smith *et al.* (1978).

Data indicating the effect of oil on subtidal benthic invertebrates are fragmentary; however, echinoderms are "notoriously sensitive to any reduction in water quality" (Nelson-Smith, 1973). Echinoderms (ophiuroids, asteroids, and holothuroids) are conspicuous members of the benthos of the Bering Sea (Feder and Jewett, 1978, 1980; and Feder Bering Sea and Chukchi Sea NODC submitted data), and could be affected by oil activities there. Asteroids (sea stars) and ophiuroids (brittle stars) are often important components of the diet of large crabs (for example, the king crab feeds on sea stars and brittle stars: unpub. data, Feder and Jewett, 1981) and demersal fishes (Feder, unpub. data; Jewett and Feder, 1980). The Tanner or snow crabs (*Chionoecetes bairdi* and *C. opilio*) are conspicuous members of the shallow shelf of the Bering Sea, and support commercial fisheries of considerable importance. Laboratory experiments with *C. bairdi* have shown that postmolt individuals lose most of their legs after exposure to Prudhoe Bay crude oil; obviously this aspect of the biology of the snow crab must be considered in the continuing assessment of this species (Karinen and Rice, 1974). Little other direct data based on laboratory experiments are available for subtidal benthic species (Nelson-Smith, 1973).

A direct relationship between trophic structure (feeding type) and bottom stability has been demonstrated by Rhoads (see Rhoads, 1974, for review). A diesel-fuel oil spill resulted in oil becoming absorbed on sediment particles with the resultant mortality of many deposit feeders living on sublittoral muds. Bottom stability was altered with the death of these organisms, and a new complex of species became established in the altered substratum. The most common members of the infauna of the Bering Sea infauna are deposit feeders; thus, oil-related mortality of these species could result in a changed near-bottom sedimentary regime with subsequent alteration of species composition.

As suggested above, upon completion of initial baseline studies in pollution prone areas, selected stations should be examined regularly on a long-term basis. Cluster analysis techniques, supplemented by principal coordinate and/or pricipal components analysis, should provide technique for selection of stations to be used for continuous monitoring of infauna. In addition, these techniques should provide an insight into normal ecosystem variation (Clifford and Stephenson, 1975; Williams and Stephenson, 1973; Stephenson *et al.*, 1974). Also, intensive examination of the biology (e.g., age, growth, condition, reproduction, recruitment, and feeding habits) of selected species should afford obvious clues of environmental alteration.

III. CURRENT STATE OF KNOWLEDGE

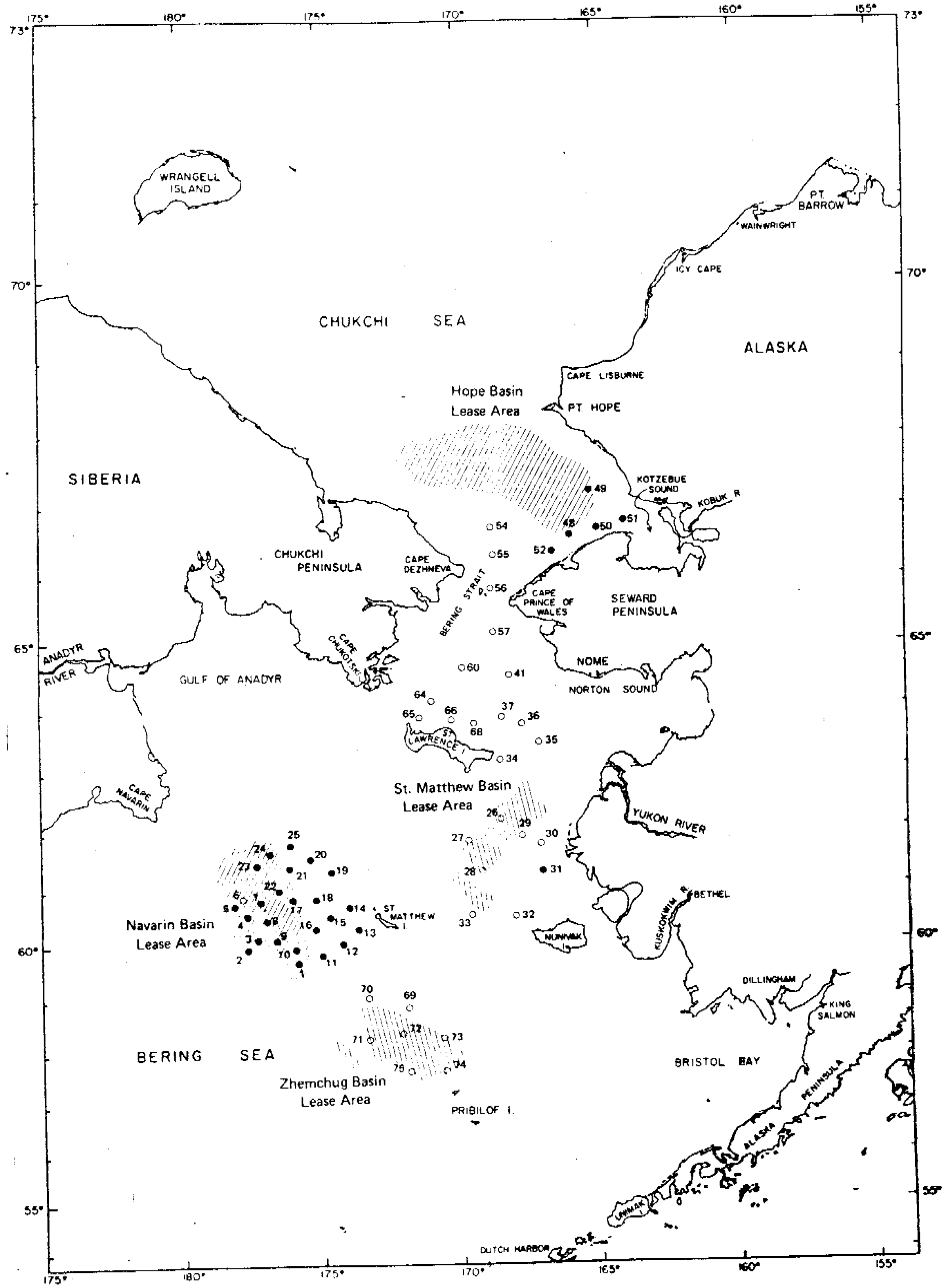
The macrofauna of the Bering Sea is well known taxonomically, and data on distribution, abundance and feeding mechanisms for infaunal species are reported in the literature (Feder and Mueller, 1977; Feder *at al.*, 1980; Filatova and Barsanova, 1964; Kuznetsov, 1964; Neiman, 1960; Rowland, 1973; Stoker, 1973, 1978). The relationship of species infaunal feeding types to certain hydrographic and sediment conditions has been documented (Neiman, 1960, 1963; Stoker, 1973, 1978). However, the direct relationship of these feeding types to the overlying winter ice cover and its contained algal material and to primary productivity in the water column is not known. Preliminary insights as to the mechanisms that might integrate the water column and the benthos of the southeastern Bering Sea discussed in Alexander and Cooney (1979).

The biomass and productivity of microscopic sediment-dwelling bacteria, diatoms, microfauna, and meiofauna have not been determined for the Bering and Chukchi Seas, and their roles should ultimately be clarified. It is probable that these organisms are important agents for recycling nutrients and energy from sediment to the overlying water mass (see Fenchel, 1969, for general review).

Until the initiation of OCSEAP investigations, the epifauna of the eastern Bering Sea had been little studies since the trawling activities of the Harriman Alaska Expedition (Merriam, 1904) and the voyages of the *Albatross*. Limited information can be obtained from the report of the pre-World War II king crab investigations (Fishery Market News, 1942) and from the report of the *Pacific Explorer*, fishing and processing operations in 1948 (Wigutoff and Carlson, 1950). Some information on species found in this area is included in reports of the U.S. Fish and Wildlife Service, Alaska exploratory fishing expedition in 1948 (Ellson *et al.*, 1949) and the exploratory fishing expedition to the northern Bering Sea in 1949 (Ellson *et al.*, 1949). Neiman (1960) has published a quantitative report, in Russian, on the molluscan communities in the eastern Bering Sea. A phase of the research program conducted by the King Crab Investigation of the Bureau of Commercial Fisheries for the International North Pacific Fisheries Commissions included an ecological study of the eastern Bering Sea during the summers of 1958 and 1959 (McLaughlin, 1963). Sparks and Pereyra (1966) have presented a partial checklist and general discussion of the benthic fauna encountered during a marine survey of the southeastern Chukchi Sea during the summer of 1959. Their marine survey was carried out in the southeastern Chukchi Sea from the Bering Strait to just north of Cape Lisburne and west to 169°W. Some species described by them in the Chukchi Sea extend into the Bering Sea and are important there. An intensive survey of the epifauna of the southeastern Bering Sea, northeastern Bering Sea and southeastern Chukchi Sea is reported in Feder and Jewett (1978, 1980). Epifauna collected by them is described in terms of numbers and biomass trawled. They include data on the food of several species of epibenthic invertebrates and species of fishes.

Crabs and bottom-feeding fishes of the Bering-Chukchi Seas exploit a variety of food types, benthic invertebrate species being most important (Feder and Jewett, 1978, 1980). Most of these predators feed on the nutrient-enriched upper slope during the winter, but they move into the shallower and warmer waters of the shelf of the southeastern Bering Sea for intensive feeding and spawning during the summer. Occasionally they exploit the colder northern portions of the Bering Sea shelf. This differential distribution is reflected by catch statistics which demonstrate that the southeastern shelf area is a major fishing area for crabs and bottomfishes. The effect of intensive predatory activity in the southern vs. the northern part of the shelf appears to be partially responsible for the lower standing stock of the food benthos in the southeastern Bering Sea (Neiman, 1960, 1963). Thus, it is apparent that bottom-feeding species of fisheries importance are exploiting the southeastern Bering Sea shelf, and are cropping what appear to be slow-growing species (Feder *et al.*, 1980) such as polychaetous annelids, snails and clams. However, nektobenthic and pelagic crustacea such as amphipods and euphausiids may grow more rapidly in the nutrient-rich water at the shelf edge, and may provide additional important food resources there (also see Alexander and Cooney, 1979 for a discussion of additional food resources available to the benthos by way of an uncoupled pelagic system over the mid-portion of the southeastern Bering Sea shelf).

Some marine mammals of the Bering-Chukchi Seas feed on benthic species (Lowry and Burns, 1976; Lowry *et al.*, 1979, 1980). Walrus feed predominatly on what appear to be slow-growing species of mollusks, but seals prefer the more rapidly growing crustaceans and fishes in their diets (Fay *et al.*, 1977). Marine mammals, although showing food preferences, are opportunistic feeders. As a consequence of the broad spectrum of food utilized and the exploitation of secondary and tertiary consumers, marine mammals are difficult to place in a trophic scheme and to assess in terms of energy cycling. Intensive trawling and oil-related activities on the Bering Sea shelf may have important ecological effects on infaunal and epifaunal organisms used as food by marine mammals. If



- Stations examined to date
○ Stations to be examined

Figure 1. Infaunal stations from the northeastern Bering Sea and southeastern Chukchi Sea, May-June 1980. Shaded areas indicate proposed lease areas.

benthic trophic relationships are altered by these industrial activities, marine mammals may have their food regimes altered.

Bibliographies of northern marine waters, emphasizing the Bering Sea are included in Feder and Mueller (1977) and Feder and Jewett (1978, 1980).

IV. STUDY AREAS

A series of van Veen grab stations was occupied in/or near four prospective OCS petroleum lease areas in the northeastern Bering Sea and southeastern Chukchi Sea: Navarin Basin, Zhemchug Basin, St. Matthew Basin, and Hope Basin (Fig. 1; Table I).

V. SOURCES, METHODS AND RATIONALE OF DATA COLLECTION

Benthic infauna were collected on two legs of a cruise on the USCGC *Polar Star*. The first leg (2-29 May 1980) yielded collections from 33 stations, 25 in the top priority Navarin Basin lease area and 8 in the St. Matthew Basin lease area. Leg II took place between 1-26 June 1980. Benthic data came from 12 stations between St. Lawrence Island and Bering Strait, 7 stations in/or near Hope Basin, and 7 stations in/or near Zhemchug Basin (Fig. 1; Table I). An additional 14 benthic stations were occupied for Mary Nerine, National Marine Fisheries Service, Seattle.

Quantitative samples were taken with a 0.1 m^2 van Veen grab with bottom penetration facilitated by addition of 31.7 kg (70 pounds) of lead weight to each grab. Two 1.0 mm mesh screen doors on top of the grab permitted removal of undisturbed sediment samples. In addition, the screen doors served to decrease shock waves produced by bottom grabs (see Feder and Matheke, 1979, for discussion of grab operation and effectiveness of the van Veen grab). Five replicate grabs were typically taken at all stations on all cruises (see discussion of optimum number of replicates that should be taken in a grab-sampling program in Feder and Matheke, 1979). Material from each grab was washed on a 1.0 mm stainless steel screen and preserved in 10% formalin buffered with hexamine. Samples were stored in plastic bags.

TABLE I

BENTHIC STATIONS OCCUPIED IN THE NORTHEASTERN BERING SEA AND THE SOUTHEASTERN CHUKCHI SEA BY THE USCGC *POLAR STAR*, MAY-JUNE 1980

Station No.	Date	Total grab Vol.[a] (ℓ)	Depth[b] (m)	Coordinates[c] Latitude	Longitude
Navarin Basin					
PST 1	4 May	73	135.6	59°31.6'N	176°08.9'W
PST 2	5 May	36	162.6	59°44.2'N	177°49.2'W
PST 3	5 May	64	136.4	60°00.1'N	177°30.8'W
PST 4	6 May	35	165.6	60°26.6'N	178°17.6'W
PST 5	6 May	32	193.8	60°38.6'N	178°41.1'W
PST 6	7 May	58	171.0	60°47.7'N	178°26.5'W
PST 7	8 May	69	144.2	60°43.5'N	177°38.3'W
PST 8	8 May	71	147.0	60°25.8'N	177°16.5'W
PST 9	9 May	73	141.8	60°01.8'N	176°55.2'W
PST 10	9 May	69	140.8	59°47.2'N	176°11.6'W
PST 11	10 May	66	122.6	59°43.7'N	175°01.2'W
PST 12	10 May	69	103.0	59°58.5'N	174°11.7'W
PST 13	11 May	36	78.2	60°14.6'N	173°44.3'W
PST 14	11 May	95	85.2	60°42.8'N	174°06.0'W
PST 15	12 May	80	102.6	60°30.2'N	174°45.1'W
PST 16	12 May	73	117.8	60°13.3'N	175°28.0'W
PST 17	13 May	74	116.0	60°49.5'N	176°16.3'W
PST 18	13 May	75	101.8	60°59.4'N	175°30.1'W
PST 19	14 May	76	81.4	61°29.8'N	174°44.4'W
PST 20	14 May	85	90.8	61°42.9'N	175°34.3'W
PST 21	15 May	83	103.2	61°31.9'N	176°15.5'W
PST 22	15 May	65	121.4	61°01.9'N	177°03.5'W
PST 23	16 May	62	124.4	61°30.2'N	177°27.7'W
PST 24	16 May	73	115.0	61°48.1'N	177°07.3'W
PST 25	17 May	77	102.4	62°00.2'N	176°22.3'W
St. Matthew Basin					
PST 26	22 May	18	34.6	62°10.4'N	168°59.1'W
PST 27	23 May	49	46.4	61°44.8'N	170°22.3'W
PST 28	23 May	50	44.0	61°17.4'N	169°51.2'W
PST 29	24 May	19	27.8	61°47.3'N	168°08.9'W
PST 30	24 May	18	24.0	61°43.9'N	167°07.8'W
PST 31	25 May	18	22.4	61°14.8'N	167°08.9'W
PST 32	25 May	30	31.0	60°31.6'N	168°14.3'W
PST 33	26 May	37	49.4	60°32.1'N	170°03.2'W

TABLE I

CONTINUED

Station No.	Date	Total grab Vol.[a] (ℓ)	Depth[b] (m)	Coordinates[c] Latitude	Longitude
St. Lawrence Island to Bering Strait					
PST 34	4 June	32.0	40.0	63°11.9'N	168°28.8'W
PST 35	4 June	9.0	24.6	63°34.0'N	166°56.5'W
PST 36	5 June	35.0	32.2	63°52.3'N	167°40.1'W
PST 37	5 June	39.0	34.6	63°57.9'N	168°22.3'W
PST 41	6 June	13.0	32.0	64°29.3'N	167°52.5'W
PST 56	16 June	9.0	51.6	65°46.0'N	168°35.0'W
PST 57	16 June	29.0	47.8	65°06.9'N	168°37.6'W
PST 60	17 June	39.0	42.6	64°40.0'N	169°26.9'W
PST 64	18 June	16.5	28.0	64°00.0'N	171°06.0'W
PST 65	18 June	33.0	23.0	63°50.9'N	171°23.2'W
PST 66	19 June	27.0	41.2	63°51.6'N	170°14.8'W
PST 68	19 June	20.0	33.0	63°50.8'N	169°08.6'W
Hope Basin					
PST 48	8 June	12.0	18.6	66°35.5'N	165°58.9'W
PST 49	9 June	61.0	29.8	67°08.7'N	165°12.8'W
PST 50	11 June	55.0	22.8	66°48.1'N	165°00.0'W
PST 51	12 June	65.0	24.0	66°50.0'N	163°52.0'W
PST 52	13 June	13.0	12.8	66°21.2'N	166°36.0'W
PST 54	15 June	22.0	32.2	66°46.0'N	168°41.0'W
PST 55	15 June	39.0	53.2	66°19.2'N	168°35.0'W
Zhemchug Basin (N.W. of Pribilof Islands)					
PST 69	21 June	61.0	102.0	58°45.3'N	172°19.4'W
PST 70	21 June	40.0	134.4	58°50.8'N	173°55.5'W
PST 71	22 June	19.0	122.4	58°00.0'N	173°45.0'W
PST 72	22 June	56.0	103.4	58°16.4'N	172°21.3'W
PST 73	23 June	50.0	79.6	58°13.9'N	170°41.6'W
PST 74	23 June	20.0	72.2	57°29.6'N	170°28.3'W
PST 75	24 June	49.0	109.4	57°31.0'N	172°18.1'W

[a]Total volume from five grabs

[b]Mean depth of five grabs

[c]Mean coordinate of five grabs

In the laboratory (Institute of Marine Science, University of Alaska, Fairbanks) grab samples were rinsed to remove the last traces of sediment, spread on a gridded tray, covered with water and rough-sorted by hand. The material was then transferred to fresh preservative (buffered 10% formalin), and identifications made. All organisms were counted and wet-weighed after excess moisture was removed with absorbent towel.

Criteria developed by Feder and Matheke, (1979) to recognize Biologically Importnat Taxa (BIT) will be applied to the data collected. By use of these criteria, each species will be considered independently (items 1, 2 and 3 below) as well as in combination with other benthic species (items 4 and 5; adopted from Ellis, 1969). Each taxon classified as BIT in this study should meet at least one of the four conditions below.

1. It is distributed in 50% or more of the total stations sampled.

2. & 3. It comprises over 10% of either the composite population density or biomass collected at any one station.

4. Its population density is significant at any given station. The significance is determined by the following test:

   a. A percentage is calculated for each taxon with the sum of the population density of all taxa equalling 100%.

   b. These percentages are then ranked in descending order.

   c. The percentages of the taxa are summed in descending order until a cut-off point of 50% is reached. The BIT are those taxa whose percentages are used to reach the 50% cut-off point. When the cut-off point of 50% is exceeded by the percentage of the last taxon added, this taxon is also included.

Species diversity will be examined by way of two Indices of Diversity:

1. Shannon-Wiener Index of Diversity:

$$H = -\Sigma\ p_i \log_e p_i \text{ where } p_i = \frac{n_i}{N}$$

n_i = number of individuals of species $i_1, i_2, i_3 \ldots i_x$

N = total number of individuals

s = total number of species

2. Simpson Index of Diversity:

$$s = \Sigma \frac{n_i}{n} \frac{n_j - 1}{N-1}$$

3. Brillouin Index of Diversity:

$$H = \frac{1}{N} (\log_{10} N! - \Sigma \log_{10} N_i!) \text{ where}$$

N = total number individuals in all species

N_i = number of individual in the i^{th} species.

These indices will be calculated for all stations sampled.

The Simpson Index is an indicator of dominance since the maximum value, 1, is obtained when there is a single species (complete dominance), and values approaching zero are obtained when there are numerous species, each a very small fraction of the total (no dominance). The Shannon-Wiener and Brillouin Indices are indicators of diversity in that the higher the value, the greater the diversity and the less the community is dominated by one or a few kinds of species (see Odum, 1975, for further discussion and additional references).

All species taken by grab will be coded according to the 10 digit VIMS system used for fauna collected in a benthic study in Chesapeake Bay (Swartz *et al.*, 1972); coding is suitably modified to conform to species collected in Alaskan waters (Mueller, 1975). Data will be recorded on computer cards, and converted to magnetic tape. Data printout will accomplished by means of a special program written by the Data Processing Services, Institute of Marine Science, University of Alaska. Data output will consist of a listing of stations occupied and replicates (samples) taken, a species-coding number list associated with a printout of BIT for all grab station, and a series of station printout (species collected, number of individuals, percentage of each species [number], biomass of individuals [per m^2 for all replicates per station], percentage of each species [biomass], Simpson Index, Shannon-Wiener Diversity Index). All data will be submitted to NOAA in NODC format.

Station groups and species assemblages will be identified using multivariate classificatory techniques (see Feder *et al.*, 1980 for further details of methology).

VI. RESULTS AND DISCUSSION

To date 24 stations from the Navarin Basin lease area, 5 from the vicinity of the Hope Basin and 1 from the St. Matthew Basin area have been sorted and the organisms identified. The detailed quantitative analysis, as outlined in Section V, is not included in this report, but will be included in the Final Report. Upon preliminary examination, some trends in the distributions of particular species appeared. Some stations tended to form groupings based on similarities in species composition.

Station numbers 12, 16, 17, 18, 22, 23 and 24, all from the central Navarin Basin area (Fig. 1), were dominated by Polychaeta; especially Maldanidae, Capitellidae, Cirratulidae, and Lumbrineridae. From these families, the species *Maldane glebifex, Barantolla americana, Heteromastus filiformis* and *Lumbrineris* sp. were particularly common. The ophiuroids *Ophiura sarsi* and *Diamphiodia craterodmeta* and the sea star *Ctenodiscus crispatus* were also common in this area. Mollusks were present but not abundant.

Stations 20, 21, and 25 had relatively lower numbers of taxa than other stations in the Navarin Basin with mollusks, ophiuroids, and polychaetes predominating. The bivalve *Macoma calcarea* was more prevalent here than at other stations in the area. Ophiuroidea, especially *Ophiura sarsi*, were particularly abundant at Station 25. *Barantolla americana* was the most common polychaete from these three stations.

Stations 1 and 10 were also relatively low both in numbers of taxa and numbers of individuals. Polychaetes, particularly *Heteromastus filiformis*, predominated at these stations. The bivalve *Axinopsida serricata* and the brittle star *Ophiura sarsi* were common.

Stations 3, 7, 8 and 9 were dominated by polychaete worms. Many species and relatively large numbers of individuals were present. *Owenia* *fusiformis* was particularly abundant. *Heteromastus filiformis*, *Clymenura* sp. and *Lumbrineris* sp. were also common.

Stations 4 and 5 had relatively large numbers of the polychaetes *Nephtys punctata* and *Lumbrineris* sp. The bivalve *Axinopsida serricata* and the brittle star *Ophiura sarsi* were also common at these stations.

The species composition of other stations in the Navarin Basin lease area did not fit well into groups. Most of these were dominated by polychaetes of various families. Relatively large numbers of Sabellidae were present at Station 11. Cirratulidae and Capitellidae predominated at Station 13. Station 14 was extremely low in numbers of taxa and in abundance of those organisms which were present. The mollusks *Yoldia* sp. and *Nucula tenuis* were present in four of five grabs. *Barantolla americana* and *Nephtys* spp. were present but not abundant. Station 15 was unique in that the sand dollar *Echinarachnius parma* was found in three of five grabs. Station 19 was characterized by polychaetes and bivalve mollusks. The families Capitellidae and Maldanidae predominated; with *Barantolla americana* and *Maldane glebifex* especially common. The bivalves *Yoldia* sp. and *Nucula tenuis* were also common.

The stations from the Chukchi Sea (Hope Basin area) appear to be considerably different from those further south in the Bering Sea (Navarin Basin area). In general, mollusks and amphipods were more prevalent in this area. Stations 48 and 50 were somewhat similar in species composition. These were dominated by large numbers of the polychaete *Myriochele oculata*; bivalves, including *Nucula tenuis* and *Thyasira fluxuosa*; and as yet, unidentified amphipods. Station 52 was similar to Stations 48 and 50, however many juvenile *Echinarachnius parma* were also present st Station 52.

Station 51 was also similar, however few *Myriochele oculata* were present. Station 49 was dominated by holothurians of the genus *Cucumaria* as well as a variety of polychaetes and mollusks.

One grab from Station 31 in St. Matthew Basin was analyzed and found to be rich in fauna. The polychaete *Myriochele oculata* was present in extremely high numbers. *Trabellides sibiria* and *Pholoe minuta* were also well represented. Amphipods were found from a wide range of species, in abundant quantities. The bryozoan *Alcyonidium disciformis* and members from Foraminifera were also numerous.

VII. CONCLUSION

Since only preliminary quanlitative findings are presented in this report, we are not able to draw any conclusions except to say that the northeastern Bering Sea-southeastern Chukchi Seas infauna appears to be more diverse than the infauna of the southeastern Bering Sea and Gulf of Alaska. Furthermore, polychaetous annelids appear to dominate the infauna at these nothern sampling locations. Datailed conclusion will appear in the Final Report.

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ANNUAL REPORT

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The distribution, abundance, composition and variability of the western Beaufort Sea benthos.

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I. Summary

The benthic macrofauna is distributed roughly into a nearshore group (5-15 m depth) and a more widely spread shelf group of species. There are also outer shelf species at the edge of the continental shelf at depths of 70 to 100 meters. A study of the patterns of numerical densities of dominant species demonstrates that most broadly distributed species of bivalve mollusc, gammarid amphipod and polychaete worm have an optimum depth zone within which they are markedly more abundant. A number of species exhibit a bimodal pattern in abundance with the minimum centered at the region of the sea ice shear zone indicating that the ice gouging itself or secondary effects arising from this process causes a detrimental environmental stress.

The inner continental shelf of the Beaufort Sea is subject to strong environmental disturbances in salinity, turbulence, turbidity and ice gouging. These are strongly seasonal, and several are zoned by depth in spite of the narrow range studied. Most of the bivalve distributions, faunal abundances and functional group compositions (feeding type, reproductive pattern, and substrate orientation) tend to be homogenous along the length of the Alaskan Beaufort coast. At the deepest stations, however, there seems to be a selection for the deposit feeding mode of existence in the siltier sediments. These results suggest that the fluctuating environment has selected for a generalized assemblage of animals.

Polychaetous annelids, collected in coastal waters (5-25 m) along the length of the Alaskan Beaufort Sea coastline, represent a relatively uniform and speciose fauna (105 species). Species richness and total numbers vary little with depth and longitide. Generally there are few dominant species; a large species group (39) is widely distributed throughout the environment studied. At the shallowest depths, however, selective surface deposit feeders predominate in the sandy sediments found there. Predators and non-selective deposit feeders are relatively uniform and low in abundance throughout the region. In spite of a physically structured environment, compositional similarity of the fauna is greater than expected by chance from Point Barrow to Barter Island. Several processes disturb the environment, probably selecting for an environmentally tolerant fauna.

Trends in seasonal and yearly changes in species richness and total numerical density are not statistically significant. An analysis of population size structure of three species of bivalve molluscs and four species of polychaete worms does not demonstrate a seasonal and discrete burst of recruitment to these populations. It appears that most benthic infaunal invertebrate species reproduce throughout much of the year by producing small numbers of yolky lecithotrophic eggs.

The existence of an algal bloom on the undersurface of sea ice in the Arctic Ocean has been known for approximately one hundred years, while the invertebrate fauna associated with the ice is not well known. The plants are generally pennate diatoms; many species are benthic forms. The algal population grows rapidly during the spring months April through early June. Chlorophyl concentrations are high and primary production can be significant. Alexander has estimated that the ice algal blooms may account for up to 30-40% of the total annual production, though its areal extent is not really known at the present time. Because the algal community may be a singificant carbon source in the arctic environment and because it supports an extensive food web this system has been studied as part of the OCS in shelf research. A pilot study was undertaken in Stefansson Sound during the spring of 1979, while a detailed time series study on the algae and the associated invertebrates was accomplished during the period April-June, 1980.

The sea ice algal community appears to be an important source of carbon to the Beaufort Sea food web. Studies on the fauna associated with the undersurface of the sea ice during the spring months indicate that both meiofauna (63μm <500μm) and the macrofauna (>500μm) are present. In shallow oceanic waters, the meiofaunal groups increase significantly in numbers during May-June while benthic species of amphipods (Onisimus litoralis) are twice as abundant at the ice-water interface as on the sediments. Many of the ice fauna are juveniles or larval forms indicating that the sea ice substrate and associated algae may play a role in the early life histories of several species. The oceanic ice environment appears to support a more diverse, abundant and biologically active faunal assemblage. Evidence indicates these animals are grazing on the pennate diatoms growing there.

As a number of the amphipods are abundant in coastal waters and are prominant members of the prey consumed by arctic cod and many fishes, this segment of the Beaufort food web is probably an important part of the food chain of key species of fish, birds and mammals. Arctic cod living in offshore waters tend to feed on pelagic zooplanktonic crustaceans. It is also evident that the diet of many of the demersal fish is varied and draws on benthic polychaetes to a large extent as a food source.

The role of the ice algae in the benthic food web, the recolonization rate of benthos, and the ecology and biology of key prey species of benthos are a few of the research areas that require significant and rapid attention.

II. Introduction

A. General nature and scope of the study.

The present benthic ecological studies on the continental shelf include functional process-oriented research that is built upon an accumulated base of descriptive information on the invertebrate organisms and environmental measurements within the Beaufort Sea. Seasonal changes in the numerical abundance and biomass of the three major macro-infaunal groups (pelecypods, amphipods, and polychaetes) have been examined at stations across the shelf. The benthic food web and its relationship to bird, fish and mammalian predators and the relationships between the epontic ice algal community and the benthic community beneath are under investigation. Research on the interrelationships between the underice epontic community and the associated sedimentary biota has been undertaken.

Concentrated study of the Beaufort Sea continental shelf benthic invertebrates was not initiated until the early 1970's. As very little was known about the fauna at the beginning of the exploration and developmental phases of the petroleum fields on the Alaskan North Slope, the early research involved basic survey work on the 1971 and 1972 U.S. Coast Guard oceanographic cruises (WEBSEC-71 and WEBSEC-72). Initial processing and analysis of bottom grab samples, otter trawls, and bottom photographs were sponsored by the Oceanographic Section of the National Science Foundation through a grant to the Principal Investigator.

When NOAA, under sponsorship of BLM, initiated environmental assessment research around the continental shelves of Alaska, Oregon State University participated in the benthic program in the Beaufort Sea. A combination NSF and NOAA/BLM research project supported several approaches and phases of research. Detailed analysis of benthic communities and identification of the total polychaete worm fauna over a wide range of depths was accomplished under the National Science Foundation's auspices. Further continental shelf survey sampling was then continued under the OCSEAP with the cooperation of the Coast Guard and their Beaufort Sea icebreaker program. With NOAA's interest and logistics support, seasonal sampling and study of temporal changes in the continental shelf communities was accomplished for the first time.

During the first year of operation a major objective was the summarization of literature and unpublished data pertinent to the Beaufort Sea. A significant amount of this information came from the work-up of the samples and the analysis of the data already on hand at Oregon State University as a result of the WEBSEC investigations. The objectives under the present research contract emphasize the delineation of the benthic food web and the description of the coastal benthos. Much of the Beaufort Sea fauna has now been characterized at the species level, and detailed studies on temporal changes in the continental shelf benthic communities are underway. An examination of the nearshore epontic community and its role in the ecology of the Beaufort Sea is now being actively pursued.

Research is currently being undertaken in cooperation with other scientists which is oriented toward understanding the processes that maintain the nearshore and lagoonal ecosystems. Of particular interest is the source of carbon that fuels the heterotrophic organisms living within the system. In lower latitude oceanic waters most of the carbon fixed by photosynthesis is ultimately derived from the phytoplankton, but in coastal waters much of the organic material may be land-derived. Water acts as a three dimensional reservoir and transporter of organic carbon through a complex cycle that involves the interactions of numerous marine organisms. The benthos as an ecological group depend to a large extent on detritus that falls down to them. In the ice-covered waters of the Arctic, the epontic diatoms on the undersurface of the sea ice is an added source of carbon to the system (Horner, 1976), and in shoal waters benthic algae add to the primary production (Matheke and Horner, 1974). In the coastal Beaufort Sea and its bordering lagoons, detrital peat from coastal erosion must also add carbon directly to the system.

The underice diatom bloom is now known to exist in coastal waters in the Chukchi Sea off Barrow, AK (Horner and Alexander, 1972), in the Eskimo Lakes region (Grainger, 1975), and in Stefansson Lagoon. Though its areal extent either in coastal waters or offshore over the continental shelf is not known, it has been suggested that these epontic diatoms could be an important energy source within the southern Beaufort Sea ecosystem (Clasby, et al., 1973). It is most pertinent to note that Schell (RU #537) recently measured substantial concentrations of chlorophyl on the undersurface of Beaufort Sea ice to distances of 100 n mi offshore (personal communication). The existence of the algal epontic community in oceanic waters in the Beaufort Sea suggests that primary production in this community is indeed energetically important to the total Beaufort Sea ecosystem. Although no direct measurements have been made, the pennate diatoms may fall to the sea floor upon ice melt in June (Matheke and Horner, 1974) thus providing a supplementary route for organic carbon to reach the benthos.

Numerous organisms have been sampled in association with the ice-sea water interface as the diatom bloom progresses through the months of April, May and June. Nematode worms are the most abundant, but harpacticoid copepods, amphipods and polychaete larvae have also been observed on the underice surface. The coastal amphipod Onisimus affinis, an important member of the demersal fish food chain, has been reported as migrating up to epontic community presumably to feed (Percy, 1975). Although the degree of linkage between the underice epontic community and the benthic community beneath is not known, it has been hypothesized that the sinking of detritus and diatom cells from the epontic community could provide a sizeable downward organic input to the underlying benthic communities. The vertical migration of benthic fauna up to the ice undersurface could provide these invertebrates with a significant source of energy-rich organics.

B. Specific Objectives

1. Conclude synthetic analyses of benthic communities across the Beaufort Sea continental shelf with concentration on nearshore processes.

    a. Document zoogeographic zonation and faunal community clustering of the Beaufort lease region, so as to put into regional context both the current sale area and future proposed Beaufort Sea lease sales. Make correlative studies to determine the major features of the physical, chemical and biological environment that appear to have an effect on faunal distributions and abundances. Examine the distribution of numerically dominant species and the prey species important in the food web.

b. Document the benthic food web as far as possible for the lease zone environments. Attempt to establish the routes by which energy, elements and pollutants are transferred from one trophic level to another, and examine the data to identify any important feeding areas on the nearshore continental shelf.

c. Analyze the temporal variation of benthic communities across the continental shelf on the OCS Pitt Point Station Transect. Define the recruitment, growth, life histories and reproductive activity of numerical dominant species as far as possible, and extrapolate to determine rough estimates of the rate of recovery from disturbance. The total and average data from the year-round benthic samples at five standard stations on the Pitt Point Transect across the Beaufort Sea continental shelf strongly indicate that the communities undergo seasonal reproductive cycles. Data on the reproductive activity and population size structure of individual species throughout the year are essential to determine if the fauna may be more sensitive to oil-related pollution problems at some particular season. As the free or brooded larval phase of benthic invertebrate reproductive cycles is considered a very critical stage, life histories of the dominant species must be considered to estimate risks involved.

2. Define the interrelationships between the epontic ice algal community and the benthic community beneath as far as possible in conjunction with RU's 359 and 537.

a. Compare the fauna associated with the under-ice surface with that of the sediment surface and statistically analyze to determine if the benthos might be actively grazing on the epontic algal cells or preying on other associated fauna.

b. Sort the sea ice epontic invertebrate fauna into major taxonomic categories, identify the dominant macrofauna to the species level, and process the meiofaunal samples from the grazing effects study.

c. Study the mechanism of vertical migration of benthic fauna to the under-ice surface and, if feasible, determine if there is a direct association between vagile benthic species and the under-ice epontic community. As exploratory and production drilling takes place in the lagoons and offshore of the barrier islands out to 20 meters depth, this information will indicate if the winter-spring months are biologically quiescent or whether organisms may be active and vulnerable to the oil-related activities during the ice-covered months of the year.

C. Relevance to Problems Associated with Petroleum Development.

Extensive exploratory and production drilling for petroleum on the Alaskan and Canadian continental shelf has the potential to significantly influence the marine benthic environment and its associated biota. Although it is not possible to accurately predict the specific consequences of oil and gas development on the invertebrate species and the benthic food web, the addition of descriptive baseline data on species distribution, composition and abundance now permits refined estimates of the variability occurring within the benthic community through both space and time. It is these estimates which are necessary in sorting out the naturally-occurring changes in the biota from those induced by the future development of the petroleum industry.

The benthos of the Beaufort Sea continental shelf represents large concentrations of biomass that are potential food for many predatory organisms. As the benthic food web leads to many critical marine vertebrate species and to man a determination of the distributional ecology and of biological rates is necessary for an understanding and modelling of the food webs of the sensitive species. Though environmental assessment decisions based on biological concerns may be made primarily on the species critical to man's food supply or to the environmentally concerned public, the benthos must also be considered in their role as a primary food source for many of these species. The distribution and abundance of benthic invertebrate prey may well affect the distribution, abundance, reproductive rates, growth rate and mortality rate of the critical vertebrate predators.

Biological rates dictate how much biomass is produced and, therefore, how much food will be available to predators. So little is known about the basic biology of marine organisms in the Arctic that static data based only on standing stocks does not reveal the level of available food supply. Large standing stocks of benthos could be comprised of old, slowly growing and slowly reproducing species. The time-series of benthic macrofaunal samples taken across the continental shelf along the standard OCS Pitt Point Transect now provides excellent material with which to explore some of these problems pertinent to the benthic food web. By determining the recruitment pattern of dominant species of a number of taxonomic groups across the shelf, estimates can be made of the reproductive rate of these species populations. Analyses of growth and mortality rates provide data on the biological activity and secondary production rates of dominant species. Such analyses of gammarid amphipods that are known to be primary food sources for arctic cod will yield basic data on the food supply to that fish under Beaufort Sea conditions.

Life history information is relevant to management decisions concerned with environmental disturbance and the repopulation rates of the benthic communities in disturbed areas. If the nearshore fauna is reproductively already adapted to frequent environmental disturbance caused by storm wave turbulence or by ice gouging, an area subjected to an oil spill or other man-caused event might be expected to repopulate rapidly. Major changes in the benthic communities associated with a pollution event may therefore be found to fall within the limits of natural variability for these invertebrate populations.

Research on the underice epontic biotic community in the Beaufort Sea has great relevance to environmental assessment decisions before, during and after exploratory and production phases of petroleum development. This potentially significant source of plant production and possible significant portion of the marine food web is open to large-scale and direct degradation by any under-ice oil spill. Specifically, it is evident from our 1980 spring studies seaward of Narwhal Island at a water depth of 9 meters that vagile benthic crustaceans such as the gammarid amphipod Onisimus litoralis swim up to the ice algal layer for grazing. Epibenthic crustaceans such as the gammarids are an important source of food for the young arctic cod (Sekerak, unpublished manuscript). It has been suggested by many authors (Clasby, Alexander and Horner, 1973; Horner, 1976 and Hameedi, 1978) that there is a downward flux of ice diatoms and detritus that provides food for the benthic fauna below. Indications point to a productive underice diatom community (Clasby, Alexander and Horner, 1973; Horner, 1976; Dunbar and Acreman, 1980) that is widespread (Schell, personal communication) in Beaufort Sea waters and that may be a major link in the food web of many species of marine vertebrates and of man. Assessments of this community provide a foundation upon which to base industrial decisions that impinge on the Beaufort Sea environment.

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III. Current State of Knowledge

Since 1971, when intensive sampling of the benthos of the southwestern Beaufort Sea was initiated, numerous collections have been made in an effort to define the broad ecological patterns exhibited by the bottom invertebrate organisms. These data have been submitted as part of the Final Report of NOAA/BLM-OCSEAP Contract No. 03-5-022-68, Task Order No. 4 submitted to NOAA by the Benthic Ecology Group at Oregon State University under Dr. Andrew G. Carey, Jr., in Quarterly and Annual Reports for Task Order No. 5 of RU #6, and in numerous publications (see below).

Both temporal and spatial variability have been addressed, and the processes involved in maintaining these are being investigated. In some areas the scoring of the sea floor by ice gouging appears to increase the patchiness of the large infauna (Carey et al., 1974 and Carey and Ruff, 1977). It is suggested that the temporal variability of the outer continental shelf communities are seasonal and related to reproductive cycles, and the data available to test this hypothesis is still being examined (Carey, Ruff and Montagna, unpublished M.S.).

Benthic invertebrates that are important as food sources to marine mammals and birds have been designated by other research groups (RU's 230, 232, 172 and 196), and the ecology of these particular prey species is being elucidated. Research is continuing on the benthic food web, and its structure and rates are under active investigation.

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IV. Study Area

As part of the Arctic Ocean, the Beaufort Sea along the Alaskan north slope is subject to extensive ice cover during much of the year. Normally the sea ice melts and is advected seaward in July and August as a response to regional wind stresses, but in some years the polar pack can remain adjacent to the coastline throughout the entire season. The extent of ice cover during the sunlit summer months affects wind mixing of surface waters and the penetration of light into the water column. These factors affect the onset and intensity of phytoplankton production which is highly variable and generally of low magnitude (Horner, 1976; Clasby, Alexander and Horner, 1976). The keels of sea ice pressure ridges cause significant disturbance to the benthic environment by plowing through the bottom sediments as they are transported across the inner shelf by the currents and prevailing winds (Barnes and Reimnitz, 1974; Reimnitz and Barnes, 1974).

Generally the bottom water masses of the southwestern Beaufort Sea are stable, and except for the shallow coastal zone, differ little in thermohaline characteristics throughout the year (Coachman and Aagaard, 1974). However, the outer shelf region from Point Barrow to about $150^{\circ}W$ is influenced by Bering-Chukchi water that is advected as a subsurface layer and moves around Point Barrow throughout the year in pulses controlled in part by atmospheric pressure gradients (Hufford et al., 1977). Coastal upwelling has also been observed in the Barter Island region during the summer when that pack ice had moved relatively far offshore (Mountain, 1974).

The specific study areas reported upon in the following results sections include:

-five transect lines occupied between Point Barrow and Barter Island, with samples taken in water depths from 5-25 meters (Figure 1);

-a transect line off of Pitt Point bearing $025^{\circ}T$ from the DEW-line site at Lonely, with samples taken seasonally and annually in water depths between 25-100 meters (Figure 2); and

-shallow diving stations occupied in the frozen spring months within Stefansson Sound and just offshore of Narwhal Island (Figure 3).

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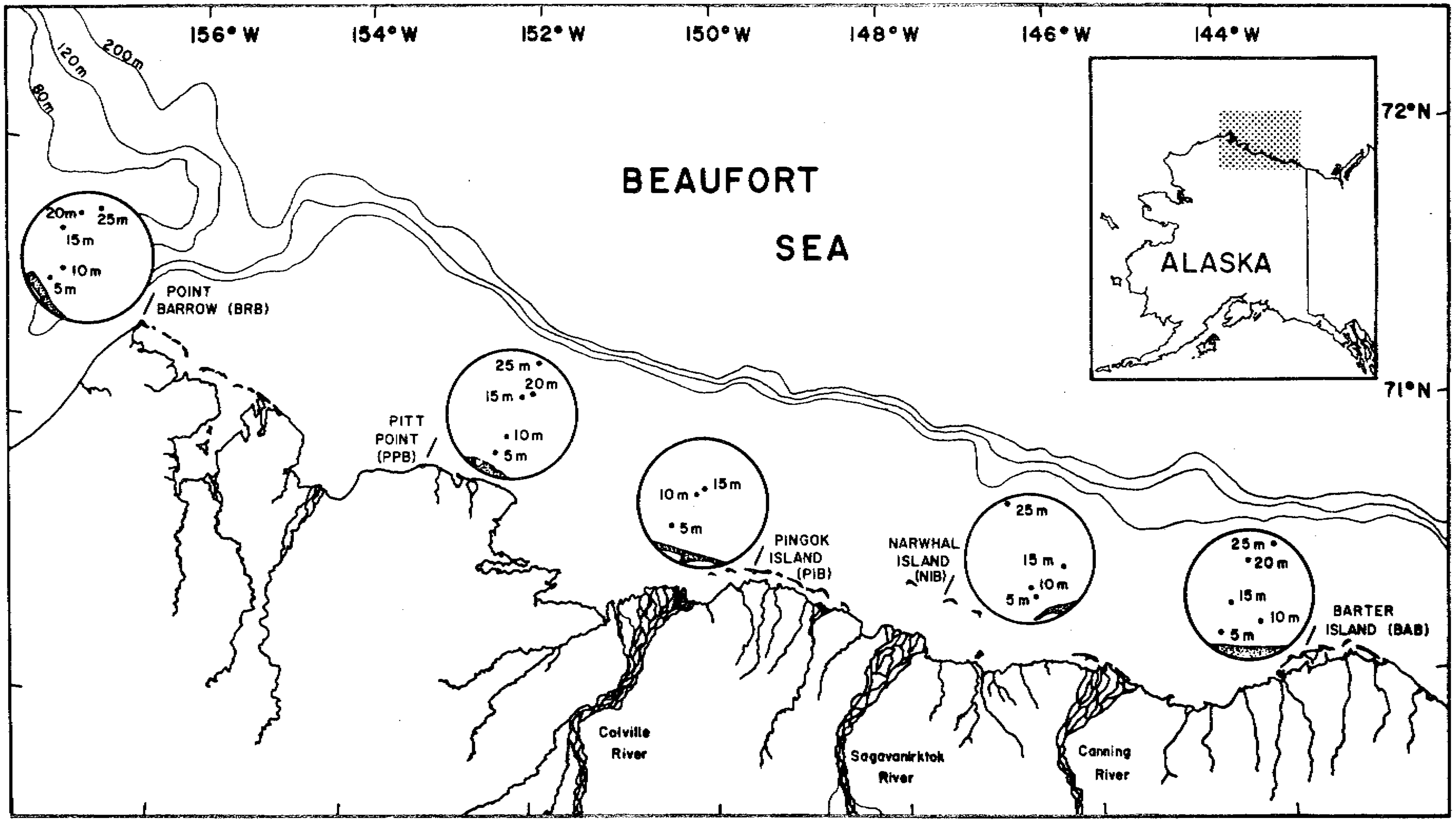

Figure 1. Transect lines occupied across the shallow shell of the Beaufort Sea between Point Barrow and Barter Island. Insets show the relative positions of the stations.

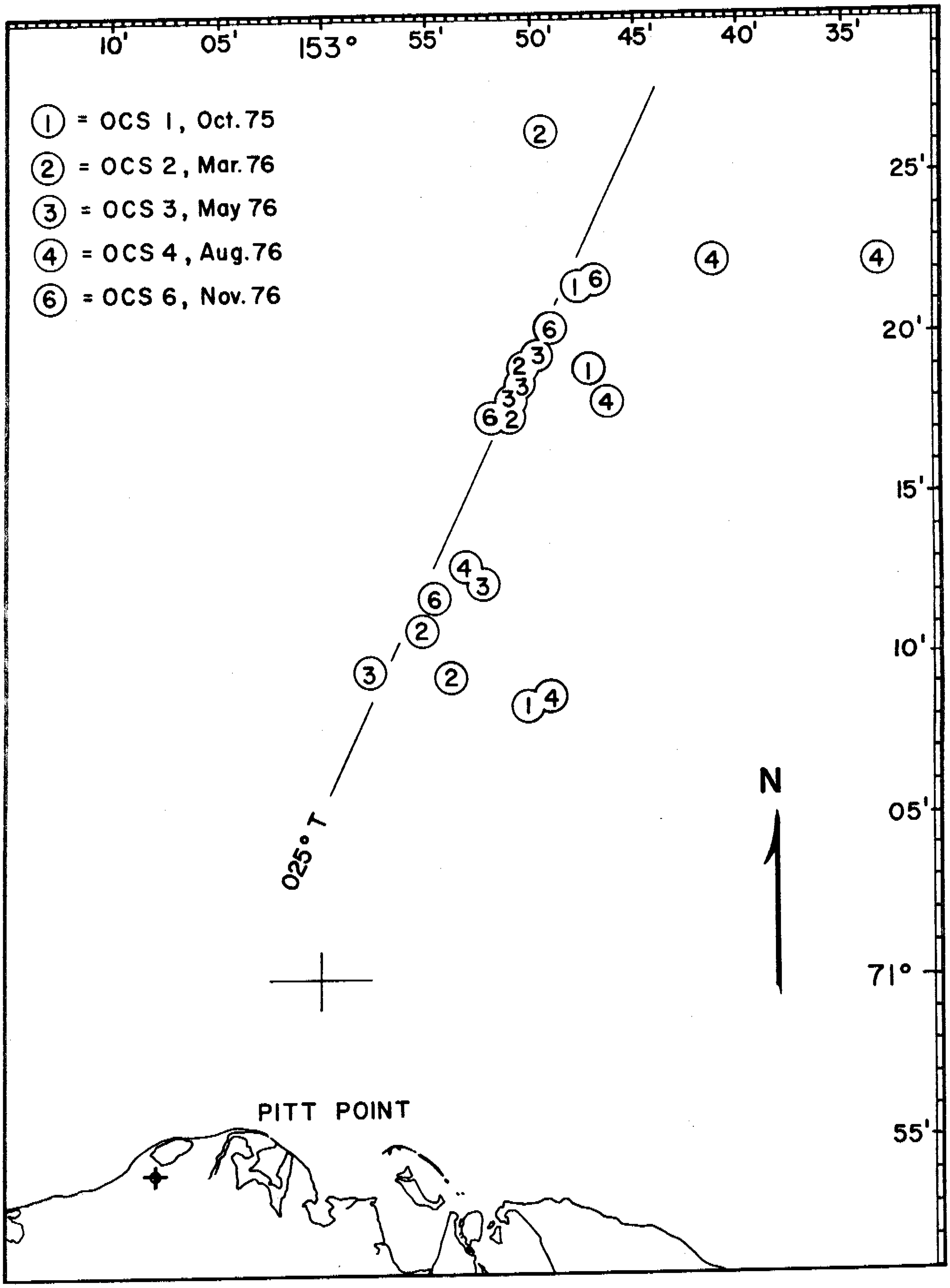

Figure 2. The location of the seasonal Pitt Point stations between 25 and 100 meters.

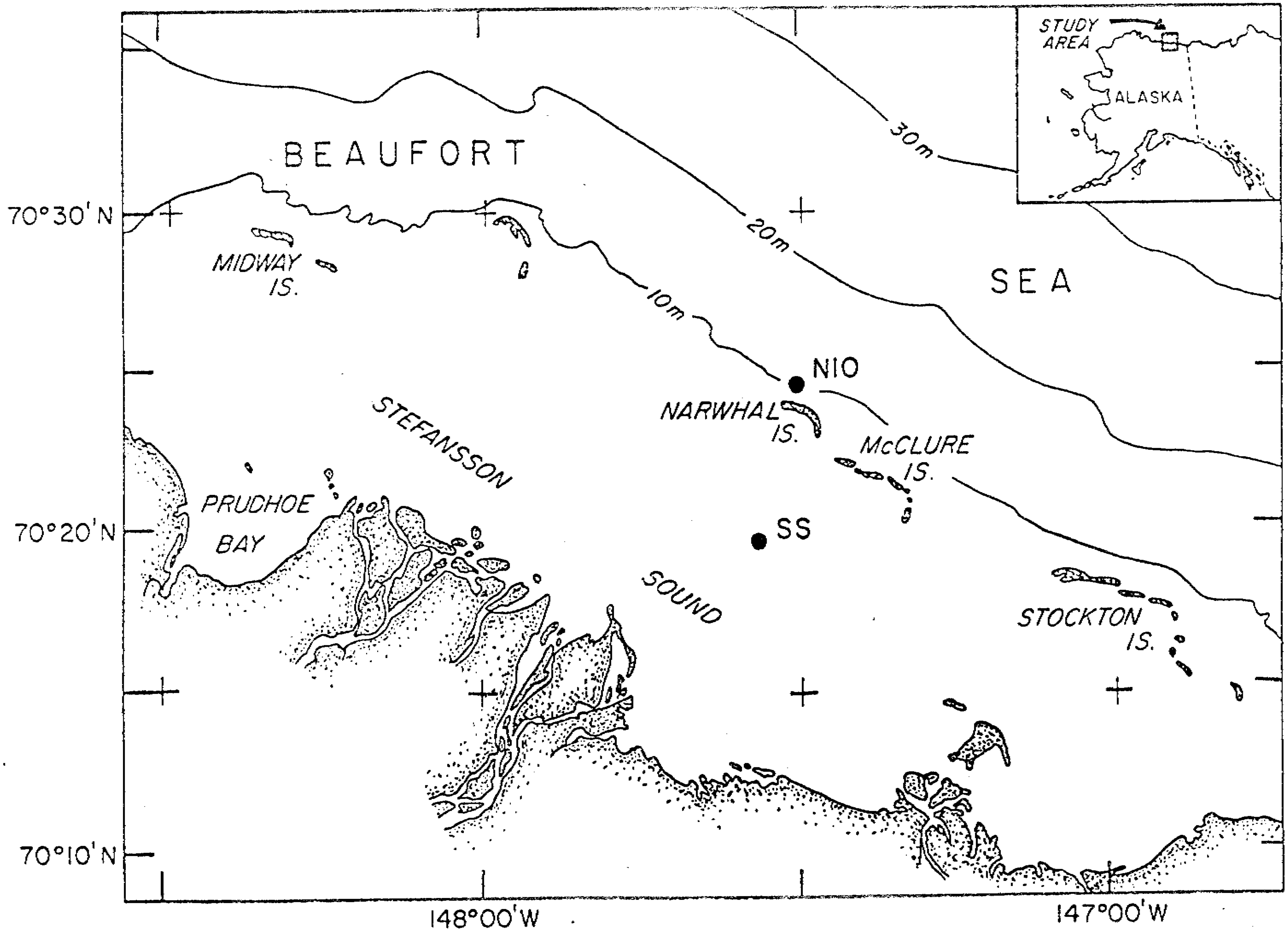

Figure 3. Location map for the 1979 epontic fauna pilot study in Stefansson Sound (SS) and for the 1980 time-series study in the Beaufort Sea offshore of Narwhal Island.

V. Sources, Methods and Rationale of Data Collection

In general, the two areas of continuing benthic ecological research are: (1) the accumulation of data from existing samples to document zoogeography, delineate the key prey organisms, and define the recruitment, growth, life histories, and reproductive activities of the characteristic benthic invertebrate species; and (2) the examination of the epontic ice algal community to determine its character and to gain an understanding of the relationships between the epontic and the benthic communities.

The existing benthic samples derive from numerous field efforts conducted throughout the Beaufort Sea since 1971. The majority are Smith-McIntyre 0.1 m^2 grab samples which have been washed through a 0.5 mm aperature sieve and sorted in the laboratory at Oregon State University. The infaunal organisms from these grabs form the basis for large-scale studies on the total benthic community structure, and for detailed looks at growth and life histories of selected species. Through the analysis of the faunal information derived from these samples, it is possible to more accurately estimate the natural spatial and temporal variability occurring within the invertebrate populations, and to sort these out from externally induced perturbations.

The seasonal samples of macro-infauna collected at five standard stations across the shelf on the OCS Pitt Point Transect line provide the basis for life history studies of benthic invertebrate species. Work-up of yearly samples from the summers of 1976-77-78 from these stations now provide fundamental data on temporal variability. Dominant species of bivalve molluscs and polychaetous annelids have been examined for life history pattern and recruitment rate by size-frequency analyses. The distribution and seasonal variability of dominant species of gammarid amphipods have also been examined. The gammarids are important sources of food for arctic cod and other critical species, and these analyses add to our understanding of repopulation rates for benthic communities decimated by predators or by pollution events.

The work on the epontic community has been a necessary step in understanding the role of the benthos in the arctic ecosystem. The degree of linkage between the under-ice and sedimentary communities has been examined to determine potential energy pathways and possible reproductive cues to the underlying benthic communities.

Rigorous procedures for field sample collection have been maintained during all phases of the project to ensure sample integrity. Field data sheets have been completed at the time of collection recording observations on sampling conditions, sample quality, and biological information of note. Double labeling of the samples has been routinely undertaken to minimize confusion, and complete field as well as laboratory log books have been maintained. Careful preservation techniques have been followed for proper fixation of the tissues, and the samples have been shifted to 70% ethanol in the laboratory for long-term storage. Sampling adequacy has been addressed through accumulation curves for total number of species, absolute number of specimens, and total biomass. Five 0.1 m^2 grab samples now appears to be adequate at most shelf depths to describe the benthic macrofaunal species composition.

Standard analytical methods have been employed to process the Smith-McIntyre grab samples. The quantitative samples have been sieved into two fractions, including the large macro-infauna (>1.00 mm) and the smaller macro-infauna (0.5 - 1.00 mm). The organisms in the larger fraction have been picked from the sediment particles and organic debris under a dissecting microscope, and sorted to major taxonomic category. The organism have been enumerated, wet-weighed, and the dominants have been identified to the species level as far as possible. Identifications have been solicited from and verified by taxonomic specialists whenever necessary. For selected stations the small macro-infaunal organisms (0.5 - 1.00 mm) have also been picked, sorted and enumerated to provide essential life history data on the juveniles of the dominant species.

The epontic underice meiofauna and sediment meiofauna samples have been treated similarly. The ice and sediment cores have been sieved through a 0.064 mm sieve in the laboratory. All fauna (with the exception of the foraminiferans) have been picked quantitatively and sorted into major taxonomic categories. The harpacticoid copepods and nematodes have then been identified as far as possible for the intercomparison studies.

Data acquisiton has been standardized, and the data from the quantitative grab samples, the station information, and environmental parameters have been coded and included into a computer data base. SIR (Scientific Information Retrieval), a package maintained at the Oregon State University Computer Center, has been selected as a data management system for RU #006. It is a heirarchically structured system which is virtually self-documenting and provides for on-line processing of data. All data coded and keypunched for statistical analyses have been subjected to verification before being transferred to magnetic tape. The magnetic tape uses the stored information, thus eliminating a transcription step and providing more flexibility in correcting errors and retrieving data.

The statistical analysis of the data is contingent upon the evenness and richness of the benthic communities. The types of analyses include multiple correlation analysis, species diversity indices, and similarity indices used in ordination techniques. Classification techniques such as multivariate factor analysis or canonical correlation analysis can also be utilized (Cooley and Lohnes, 1971; Sneath and Sokal, 1973; Clifford and Stephenson, 1975).

Statistically, community structure can be defined by the bio-indices of total numerical density and biomass of various size groups, species richness and diversity, as well as trophic and feeding type composition. The calculated expected number of species [E(s)] (Hurbert, 1971) and the standard deviation of E(s) (Heck, van Belle and Simberloff, 1975) for equivalent numbers of individuals (n) are determinable. The empirical effect of differing sample sizes on the species numbers and measures of species diversity (Sanders, 1968) is accounted for by E(Sn) allowing for unbiased comparisons of species richness. When the stations have been sampled adequately and uniformly, comparisons between stations are considered the most accurate indicator of patterns in the species richness of a taxonomic group.

To test the degree of differnece in numbers of species between stations, variations in E(Sn) can be examined for both depth and longitudinal gradient. Results in both parametric and non-parametric analysis of variance determines whether there is a significant difference in the numbers of species between stations for either depth or transect (longitudinal) groups. These results can be reinforced due to the increase in experimental error from employing two one-way analyses instead of a two-way design, a procedure that is often necessitated by an unbalanced data set. Failure to reject the null hypothesis of no difference in species numbers either by depth or transect with increased Type I error is therefore a very conservative test. Any difference in species richness for a region could exist on scales smaller than the sampling regime employed or in a manner less systematic than by overall depth or longitude.

The distribution of the invertebrate species on the Beaufort Sea continental shelf can be examined to identify 'biologically meaningful groups'. Similarities between pairwise camparisons of all stations and species can be calculated using Jaccard (1908), Dice (1945), and Menzies (1973) indices. The similarity values between the stations or species can then be clustered using a single-linkage algorithm (Anderberg, 1973). Trellis diagrams for both species and station clusterings using the Jaccard index of similarity can be constructed, and station by station comparisons based on species composition and species associations can be identified. However, the nature of similarity techniques and clustering strategies (Simberloff and Conner, 1979) makes an objective interpretation of the station or species groupings unclear.

A major difficulty with the use of most similarity indices, and the clustering and/or ordination techniques which employ them, has been the lack of a null hypothesis against which the results may be tested (Conner and Simberloff, 1978; Raup and Crick, 1979). Station or species groups must be judged as representing real differences in distributions based on purely arbitrary criteria. The credibility of these groups rests on the assumption that the similarity indices have objective meaning. This objective meaning, however, cannot be demonstrated (Conner and Simberloff, 1978; Simberloff and Conner, 1979). The arbitrary nature of similarity indices and clustering/ordination strategies has led to the proposal of numerous alternative approaches to viewing compositional similarity, many based on a probabilistic hypothesis (Harper, 1978; Simberloff, 1978; Raup and Crick, 1979).

A null hypothesis is used to account for the distribution of species among stations. As stated in Conner and Simberloff (1978), the observed number of species in common between two stations is no different than would be expected if the species composition of stations was determined by randomly assigning species from some 'common pool'. To test this null hypothesis it is assumed that a common species pool for the area of interest can be defined, and that each species from that pool is equally likely to be found at any station. The definition of the species pool can be minimized by consideration of the species accumulation curves for the region. Although this ignores possible immigrants from outside the area, it is not felt that this greatly biases the results (Walters, in prep.). Assuming that the species are equally likely to inhabit any station in the region is a simplistic, but not unrealistic, assumption. Since non-probabilistic indices of similarity make this same assumption for presence/absence data, results of the probabilistic index represent a baseline for comparison (Simberloff, 1978).

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VI. Results

A. Coastal fauna of the southwestern Beaufort Sea (5-25 m depth).

INTRODUCTION

A survey of benthic macrofauna was undertaken in 1976 in coastal waters along the Alaskan coastline from Point Barrow to Barter Island on the R/V ALUMIAK. The coastal environment was singled out as an important region as this is a zone of active feeding of marine mammals, sea birds and fishes. It is also an area that could be significantly impacted by an oil spill because of the possibility of wave-generated turbulent mixing in the shallow coastal zone. Most of the early exploratory drilling for oil will be accomplished in water depths out to 25 meters.

The sampling strategy was designed to determine patterns of faunal distribution and abundance with depth, distance offshore, and longitude. The initial sample analyses were on the level of major taxa and total densities; however, further research included the identification to species of the polychaetous annelid and bivalve mollusc fauna. Two reports follow on these two groups that involve analyses to determine if the species are differentially distributed within the 5-25 meter depth zone. The following reports are based on draft manuscripts soon to be submitted for publication:

(1) Community ecology of shallow (5-25m) S.W. Beaufort Sea Pelecypoda (Mollusca) by A.G. Carey, Jr., P.H. Scott and K.W. Walters.
PARTIAL FINAL REPORT

(2) Community ecology of shallow (5-25m) S.W. Beaufort Sea Polychaeta (Annelida) by A.G. Carey, Jr., R.E. Ruff and K.W. Walters.
PARTIAL FINAL REPORT

INTRODUCTION

Early works on the molluscan fauna of the Beaufort Sea are few and systematic (Dall, 1919; G. MacGinitie, 1955; N. McGinitie, 1959). Recent reports have appeard in response to interest in the assessment of the offshore environment prior to oil development (Hulseman, 1962; Wacasey, 1975; Wagner, 1977). The most complete description of the bivalve fauna is published by Bernard (1979). This present paper describes the coastal bivalve fauna (5-25 meters depth) in the southwestern Beaufort Sea and analyzes the possible patterns in densities, richness, compositional similarity and feeding morphology.

The region studied lies on the inner Alaskan shelf which grades gently from the shoreline to depths of 30 m (Carsola, 1954). Average depth of the Beaufort Sea continental shelf is 37 m (Sharma, 1979), which is significantly shallower than other portions of the Alaskan shelf. Barrier islands, grouped in 4 discontinuous and irregular chains, occupy 52% of the coast (Short et al., 1974).

The Beaufort Sea coastal environment is subject to seasonal environmental disturbances represented by ice gouging (Barnes & Reimnitz, 1974), variations in salinity, turbulence and turbidity (Sharma, 1979). The greatest frequency of ice gouging and resultant sediment disruption occurs 20-60 km from shore in depths of 20-100 meters. Variations in salinity, temperature and currents occur on the inner shelf because of its proximity to the shoreline and freshwater runoff from the continent (Sharma, 1979). Salinity decreases in coastal waters in the early summer due to ice melt and river discharge. Meltwater decreases salinity in the surface layer often to depths of 20 meters. Summer temperatures range from -1.5 to +14.0°C, and salinities from 0.7 to 31.6°/₀₀ (Sharma, 1979). The winter temperatures are much less variable and range up to +0.5°C, and the salinities from 21.8 to 31.0°/₀₀ (Sharma, 1979).

MATERIALS AND METHODS

The benthic macrofauna and sediments were sampled with a 0.1 m^2 Smith-McIntyre bottom grab (Smith and McIntyre, 1954) aboard the R/V ALUMIAK during August and September 1976. Five grabs were collected at each station, a total of 22 stations occupied (Table 1). Sampling was designed to determine possible faunal variation with depth and longitude. Five transects perpendicular to the coastline and equidistant along the shelf were located at Point Barrow (BRB), Pitt Point (PPB), Pingkok Island (PIB), Narwhal Island (NIB) and Barter Island (BAB). Five stations at 5 meter depth increments were occupied on each transect. Three stations (PIB20, PIB25 and NIB20) could not be occupied because of heavy sea ice concentrations. One grab per station was taken for sediment analyses. Sediment was later analyzed by hydrometer to determine particle size distribution.

On board ship the grab samples were measured for volume, only those with a minimum of 5.5 liters of sediment and with an unwashed appearance were retained as quantitative. The sediment was washed through a new cascading multiple sieve system (Carey et al., unpublished m.s.) with a minimum screen size of 0.42 mm. The ample fraction retained on this sieve was preserved in 10 percent formalin neutralized with sodium borate. In the laboratory, the animals retained on a 1.0 mm sieve were stained with rose bengal and picked from the samples under a dissecting microscope. The macrofauna was sorted into major taxonomic groups, counted, and weighed. The second author identified the Pelecypoda in this study.

Table 1 . Environmental parameters, bivalve abundance and bivalve feeding types in the Beaufort Sea coastal zone.

Transect	Depth(m)	Sediment Type	Bottom Temperature(°C)	Bottom Salinity(°/oo)	% Organic Carbon	# of Species	# of Individuals	% Suspension Feeders	% Deposit Feeders
Pt. Barrow	5	Sand	3.5	27.0	0.10	4	44	100	--
	10	Silty sand	--	--	--	11	215	88	12
	15	Sandy silt	--	--	--	2	5	20	80
	20	Sandy silt	--	--	--	3	22	45	55
	25	Sandy silt	--	--	0.47	5	58	14	86
Pitt Point	5	Silty sand	-1.9	25.1	0.81	14	2454	94	6
	10	Silty sand	-0.8	27.7	0.17	10	243	60	40
	15	Clayey silt	-1.3	31.2	1.0	4	40	2	98
	20	Clayey silt	-1.6	12.7	--	4	98	1	99
	25	Clayey silt	-0.7	31.7	0.78	10	217	4	96
Pingok Island	5	Sand	2.1	22.1	0.09	2	4	--	100
	10	Silty sand	2.2	22.3	0.03	11	422	54	46
	15	Sandy silt	1.9	31.5	--	12	215	73	27
Narwhal Island	5	Gravel-sand	-0.8	30.1	<0.01	1	1	100	--
	10	Sand	-2.0	31.0	0.08	7	53	92	8
	15	Gravel-sand	-2.0	31.8	<0.01	12	35	66	34
	25	Sand-silt-clay	--	--	0.15	12	36	31	69
Barter Island	5	Sand	-1.0	28.5	<0.01	5	19	74	26
	10	Sand	-1.9	30.8	0.03	7	97	60	40
	15	Silty sand	-2.0	30.8	0.17	10	378	66	24
	20	Silty sand	-2.0	31.3	0.31	13	245	73	27
	25	Sand clay	-2.0	31.9	0.34	8	99	33	67

Bivalve species accumulation curves were plotted for the 5 samples at each station to determine if the molluscan assemblage was well-sampled. In most instances the curves became asymptotic, or were becoming so, after adding species from the fifth grab (Figure 4). The bivalves appear to have been adequately sampled for the spatial scales considered in this study.

RESULTS

Density and Richness

Patterns in the numbers of bivalve individuals and species for the 22 stations and 89 quantitative samples were examined. A total of 5000 individuals representing 31 living species were collected (Table 2). Most of the numerically dominant species were found at all depths. Two notable exceptions were *Boreacola vadosa* and *Cyrtodaria kurriana*. *Boreacola vadosa*, the most abundant species present, was only collected inshore of the fifteen meter contour, ninety-eight percent of the individuals being recorded from one station (PPB05). *Cyrtodaria kurriana* was found exclusively at five meters. This limited inshore distribution of *C. kurriana* concurs with previous reports by Wagner (1977) and Bernard (1979). Sixty-four percent of the stations contained fewer than 100 bivalve individuals. Total species numbers per station were consistently low ranging from a high of 14 (PPB05) to a low of 1 (NIB05). Table 1 summarizes station data for the nearshore Beaufort molluscs.

There are apparent small (by grab) and large (by station) scale differences in the numbers of bivalve individuals sampled. Total numbers ranged from 0 to 741 per grab and from 1 to 2454 per station. For one station (NIB05) the only molluscs collected in five grabs was represented by one individual. Another station (BRB20) contained only 22 extant individuals in one grab and numerous shell valves in the remaining four grabs. Since a Smith-McIntyre grab is not an effective sampling device with which to elucidate small-scale patterns of benthic distribution, differences between grabs might easily represent a sampling bias. For this reason numbers of individuals per grab were combined and stations analyzed to determine if any differences existed by depth or transect. Results of a two-way analysis of variance for the log-transformed $[\log_{10}(X+1)]$ numbers of individuals indicates no significant difference either by depth ($F=0.793$, $P=0.55$) or transect ($F=1.654$, $P=0.22$). The interaction and error terms were combined for the test.

Species numbers between grabs and stations expectedly followed similar patterns to those of species density. The five grabs per station were again combined in order to consider large-scale variation in species richness and because of the asymptotic nature of the species accumulation curves for each station (Figure 4). In order to take into account the relationship between numbers of individuals sampled and numbers of species, expected species numbers $[E(S_n)]$ were calcaulated according to Hulbert (1971) along with their associated variance (Heck, van Belle & Simberloff, 1975). The distribution of individuals per species for each of the 22 stations sampled was used in calculating $E(S_n)$. Thirty was chosen as the equivalent number of individuals (n) at which to compare species richness because all but four of the stations (BRB15, BRB20, PIB05, NIB05) could then be included in the analysis. Although species-individuals relationships can effect the calculation of $E(S_n)$ and comparisons based thereon (Peet, 1974), examination of expected species curves for all stations along with the limited range in total numbers of species per station suggests that $E(S_{30})$ is a

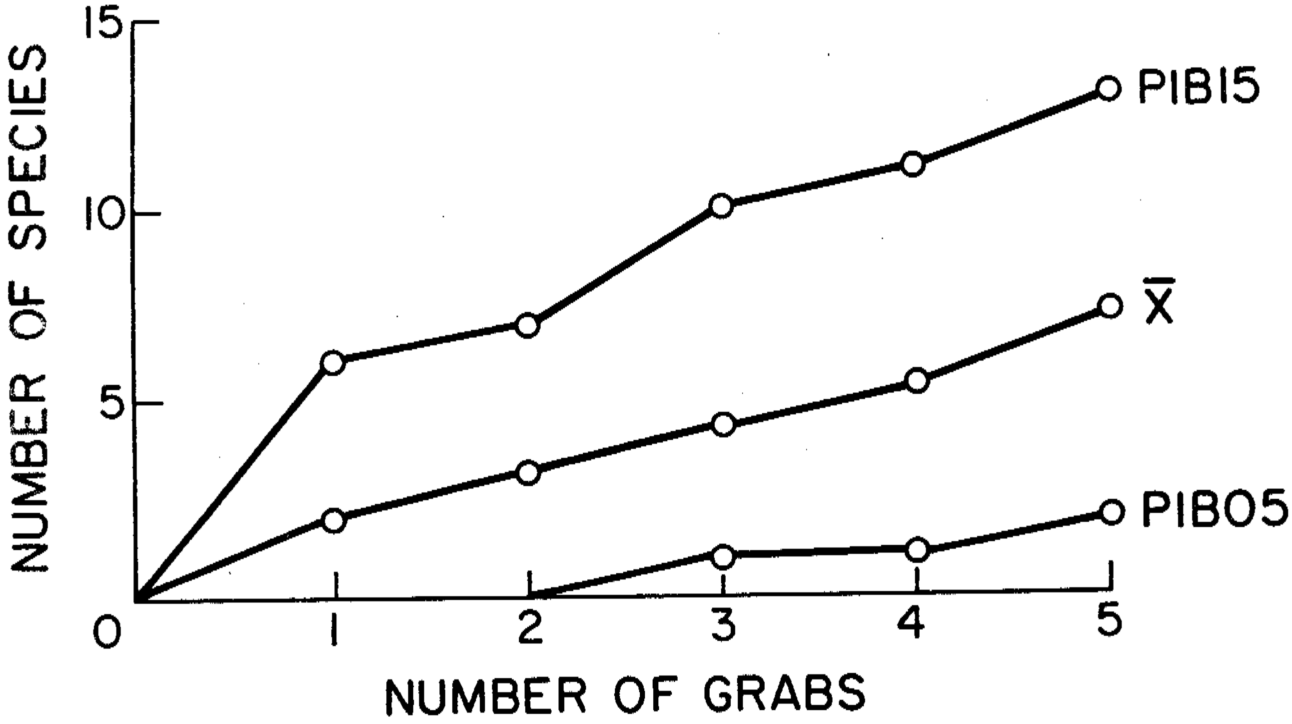

Figure 4. Species accumulation curves for a speciose (PIB-15), depauperate (PIB-05) and average station.

Table 2. Distribution of bivalve species by depth.

Species	Depth(m) 5	10	15	20	25	Total #
Axinopsida orbiculata	x	x	x	x	x	956
Portlandia arctica	x	x	x	x	x	774
Liocyma fluctuosa	x	x	x		x	659
Macoma calcarea	x	x	x	x	x	313
Arctinula greenlandica	x	x	x	x	x	89
Pandora glacialis	x	x	x	x	x	49
Cyrtodaria kurriana	x					157
Nuculana minuta	x					3
Cyclocardia crebricostata	x					2
Mysella planata	x	x				7
Hiatella arctica	x	x			x	9
Astarte montagui	x		x			87
Boreacola vadossa	x	x	x			1640
Serripes groenlandicus	x	x	x			57
Thracia devexa	x		x	x		7
Yoldia hyperborea		x				2
Yoldia myalis		x			x	6
Portlandia sp. A		x	x			8
Lyonsia arenosa		x	x			18
Macoma inflata		x	x			8
Macoma moesta		x	x		x	58
Nucula bellotii		x	x	x	x	37
Mya pseudoarenaria		x	x	x	x	18
Crenella decussata			x	x		3
Nuculana radiata			x	x	x	7
Portlandia frigida			x	x	x	4
Macoma loveni			x	x	x	3
Nuculana pernula				x	x	6
Portlandia lenticula				x	x	8
Mysella tumida					x	1
Thracia myopsis					x	4
Number of species	15	18	20	14	18	
Number of individuals	2522	1030	673	365	410	
Number of stations	5	5	5	3	4	

valid measure of richness for the Beaufort mollusc fauna. Results of a two-way ANOVA with combined error and interaction terms indicates no significant difference in species richness either by depth (F=1.339, P=0.31) or transect (F=2.301, P=0.11). A Kruskal-Wallis one-way ANOVA confirms these results (by depth: χ^2=2.683, P=0.61; by transect: χ^2=5.871, P=0.21). There are no significant large-scale variations in the numbers of species for the area studied.

Compositional Similarity

The inability to identify any systematic variation in the numbers of bivalve individuals and species does not preclude there being marked differences in species composition across the region. Similarities between all pairwise station and species comparisons were calculated using Jaccard's (1908) index. The similarity values were then clustered by a single-linkage alforithm (Anderberg, 1973) and resulting dendrograms constructed. Figure 5 represents the results for the station by station comparison based on species composition. Only one group of five stations (NIB10, PPB10, PIB10, BAB15, BAB10) and one major group of twelve species (Table 3) were identified as occurring with similarities greater than 0.5. For the station comparisons the group of five does not indicate a systematic difference in species composition either by depth or transect. The species group appears to represent a mixing of deposit and filter feeders and it is difficult to explain why these particular species should be considered a meaningful assemblage.

The difficulty with the above procedure and with the use of most similarity indices and clustering techniques which employ them has been the lack of a null hypothesis against which results may be tested (Connor and Simberloff, 1978; Raup & Crick, 1979). For the Beaufort Sea bivalves, groupings of stations or species must be judged as representing real differences in mollusc distributions by artibrary criteria, i.e. Jaccard similarities greater than 0.5. Credibility of these groups rests on the differences in the Jaccard or any other index having objective meaning, but this cannot be demonstrated (Connor and Simberloff, 1978; Simberloff and Connor, 1980). The arbitrary nature of similarity indicies and clustering strategies has led to the proposal of numerous alternative approaches to viewing compositional similarity, many based on a probabilistic hypothesis (Harper, 1977; Simberloff, 1978; Raup and Crick, 1979).

A null hypothesis was chosen to test whether the distribution of bivalves in the Beaufort was the result of stochastic persistence and dispersal of species. This was the same Null Hypotheses I of Connor and Simberloff (1978). As stated, the observed number of species in common between two stations is no different than would be expected if the species composition was determined by randomly assigning species from a 'common pool'. To test the null hypothesis it is assumed that a common species pool can be defined and that each species is equally likely to be found at any station. Consideration of the species accumulation curves for the mollusc fauna (Figure 4) makes definition of a species pool more accurate. A total of 31 species represent the extant mollusc fauna of the region. To consider these 31 species as equally likely to inhabit any station in the Beaufort is a simplistic, if not biologically unrealistic, assumption. It is therefore extremely important to interpret results of this test of compositional similarity in light of its assumptions.

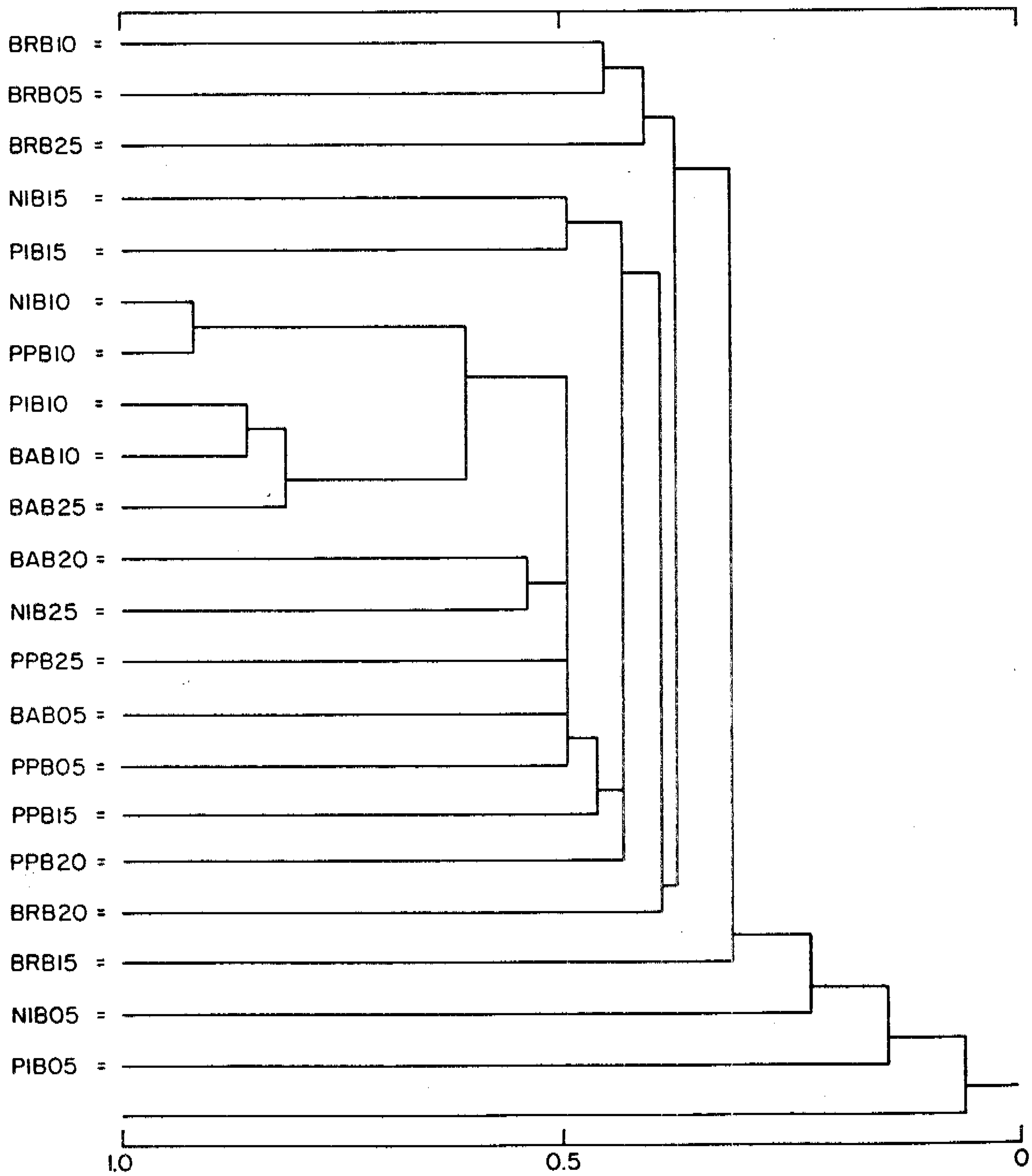

Figure 5. Single linkage clustering of Jaccard station similarities.

Table 3 . The major group of bivalve species which clustered at a Jaccard similarity greater than 0.5.

Macoma inflata
Crenella decussata
Thracia devexa
Astarte montagui
Portlandia arctica
Arctinula greenlandica
Macoma moesta
Axinopsida orbiculata
Nucula bellotii
Pandora glacialis
Macoma calcarea
Liocyma fluctuosa

Table 4 summarizes the results of the test of compositional similarity for the shallow Beaufort bivalve fauna. Based on the calculation of expected taxa shared (E_{ts}) (Connor and Simberloff, 1978), thirty-five percent of all pairwise station comparisons had significantly greater numbers of species in common (P=<.05). A conservative test of the null hypothesis, that in fifty percent of the pairwise station comparisons observed taxa shared (O_{ts}) are greater than expected, indicates that a null hypothesis should be rejected (χ^2=47.73, P=<.005). To examine why this is true given the relatively low (35%) number of comparisons where O_{ts} significantly exceeded E_{ts}, station comparisons were partitioned by depth and transect (Table 4). The overall results of the partitioned analysis again indicates that the null hypotheses should be rejected. In two instances, for those five meter stations and the Pingok Island transect comparisons, the null hypotheses is not rejected. There are no unique explanations, in terms of species numbers or composition, for why stations belonging to these groupings should not follow the overall pattern of rejection of the null hypothesis. The overall result is that the distribution of shallow Beaufort bivalve fauna does not appear to solely be the result of the stochastic persistence and dispersal of equiprobable species from a limited species pool. In all cases there is a significantly small proportion (18-46%) of station comparisons where the O_{ts} is greater than E_{ts}.

Feeding Morphology

Species of bivalves were classified either as deposit or suspension feeders based on their functional morphology. Deposit feeders included all eleven protobranch pelecypods as well as the four macoma species (Table 2). To simplify classification the remaining species, all lamellibranchs, were considered suspension feeders. Feeding behavior for several of the suspension feeding species, i.e. Axinopsida orbiculata, remains questionable without further direct feeding studies. This overall classification divided the total number of bivalve species sampled roughly in half (Table 2). Over 75% of all individuals were suspension feeders though.

The percentage of suspension or deposit feeding species remained relatively constant by depth or transect. Although there is a trend for increasing numbers of deposit feeding species with depth, from 33% at 5 meters to 56% at 25 meters, more samples are needed to determine its statistical significance (Sokal & Rolf, 1969). There is a rather dramatic change in the relative proportions of suspension and deposit feeding individuals (Table 2). Bivalve feeding group densities were associated both with depth (χ^2=1440.47, P=<.005) and transect (χ^2=186.6, P=<.005). For depth this association is the result of a significant positive correlation of deposit feeding individuals with increasing depth (Kendall's T=0.30, P=.026).

Ample evidence exists which established, if not explains, the relationship between bivalves and sediment type. Sediment characteristics were further defined from those of Table 1 into percent clay, silt, sand and gravel. These percentages were then arc sine square root transformed and correlations between sediment type and the density of deposit feeders calculated. There were significant negative correlations with percent gravel (T=-0.51, P=.003) and sand (T=-0.37, P=.021) and positive correlations with percent silt (T=0.49, P=.004) and clay (T=0.30, P=.048).

Table 4. Summary of results obtained under Null Hypothesis I (Connor & Simberloff, 1978). Comparisons by depth and transect are for that depth or transect stations with all other stations in the study area.

Comparisons	Total No. Pairwise Comparisons	OBS>Exp	OBS>Exp (P<.05)	OBS<Exp	OBS<Exp (P<.05)	OBS=Exp (P<.05)	CHI-Square	P
By Depth								
5	95	45	17(18%)	50	0	78(82%)	0.26	>.05
10	95	81	44(46%)	14	0	51(54%)	47.26	<.005
15	95	73	30(32%)	22	0	65(68%)	27.38	<.005
20	60	46	24(40%)	14	0	36(60%)	17.06	<.005
25	78	61	26(33%)	17	0	52(67%)	24.82	<.005
By Transect								
BRB	95	64	20(21%)	31	0	75(79%)	11.46	<.005
PPB	95	77	42(44%)	18	0	53(56%)	36.64	<.005
PIB	60	35	17(28%)	25	0	43(72%)	1.66	>.05
NIB	78	49	23(29%)	29	0	45(71%)	5.12	<.025
BAB	95	78	43(45%)	17	0	52(55%)	29.16	<.005
All Stations	231	168	81(35%)	63	0	151(65%)	47.73	<.005

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INTRODUCTION

Until recently the polychaetous annelid fauna of the Beaufort Sea was known only from a few widely scattered records. First reports on the group were presented by Murdoch (1885a, 1885b) based on collections made during the International Point Barrow Expedition. Between the years 1913-1918 several stations were occupied in the Beaufort Sea as part of the Canadian Arctic Expedition and the polychaetes from these locations were included in a report by Chamberlin (1920). An extensive treatment was given to the polychaete fauna collected in the vicinity of the Naval Arctic Research Laboratory at Point Barrow between 1948-1950 (Pettibone, 1954). In this study, Pettibone reported on a total of 3,270 specimens comprising 88 species from 26 different families. In subsequent years there have been additional reports on the Beaufort Sea polychaetes both from shelf depths (Berkeley & Berkeley, 1956; Berkeley & Berkeley, 1958; Reish, 1965) and from the deep basin (Knox, 1959). It is only within the last few years, however, that significant numbers of benthic collections have been made throughout the Beaufort Sea, thus permitting an extensive examination of the polychaete fauna (Bilyard & Carey, 1979; Bilyard & Carey, 1980). The present paper is a continuation of these benthic studies and addresses a large collection of polychaetes from the shallow Beaufort Sea continental shelf (5-25 meters).

The area studied is situated along the arctic coast of Alaska between Point Barrow and Barter Island (Figure 6). This coastal region is subject to environmental disturbances including seasonal variations in salinity, temperature, turbulence, and turbidity (Sharma, 1979) and the occassional physical disruption of the bottom sediments by impinging sea ice (Barnes & Reimnitz, 1974). Ice scours are attributable to the keels of massive pressure ridges which result from compressional stresses in the shear zone between seasonal fast ice and the moving polar pack (Wadhams, 1980). The gouging phenomenon is fairly frequent at depths of 20-25 meters, and the individual scours can be several meters deep and extend for many kilometers along the shelf (Barnes and Reimnitz, 1974; Reimnitz and Barnes, 1974).

The scope of the present study examines large scale patterns in the distribution of shallow water polychaetous annelids. It provides basic information necessary to addressing questions on the effects of man generated disturbances related to oil development in the region. Since little was known about the fauna and nearshore ARctic environment, the study was designed as a general survey rather than to test specific hypotheses about benthic faunal community structuring.

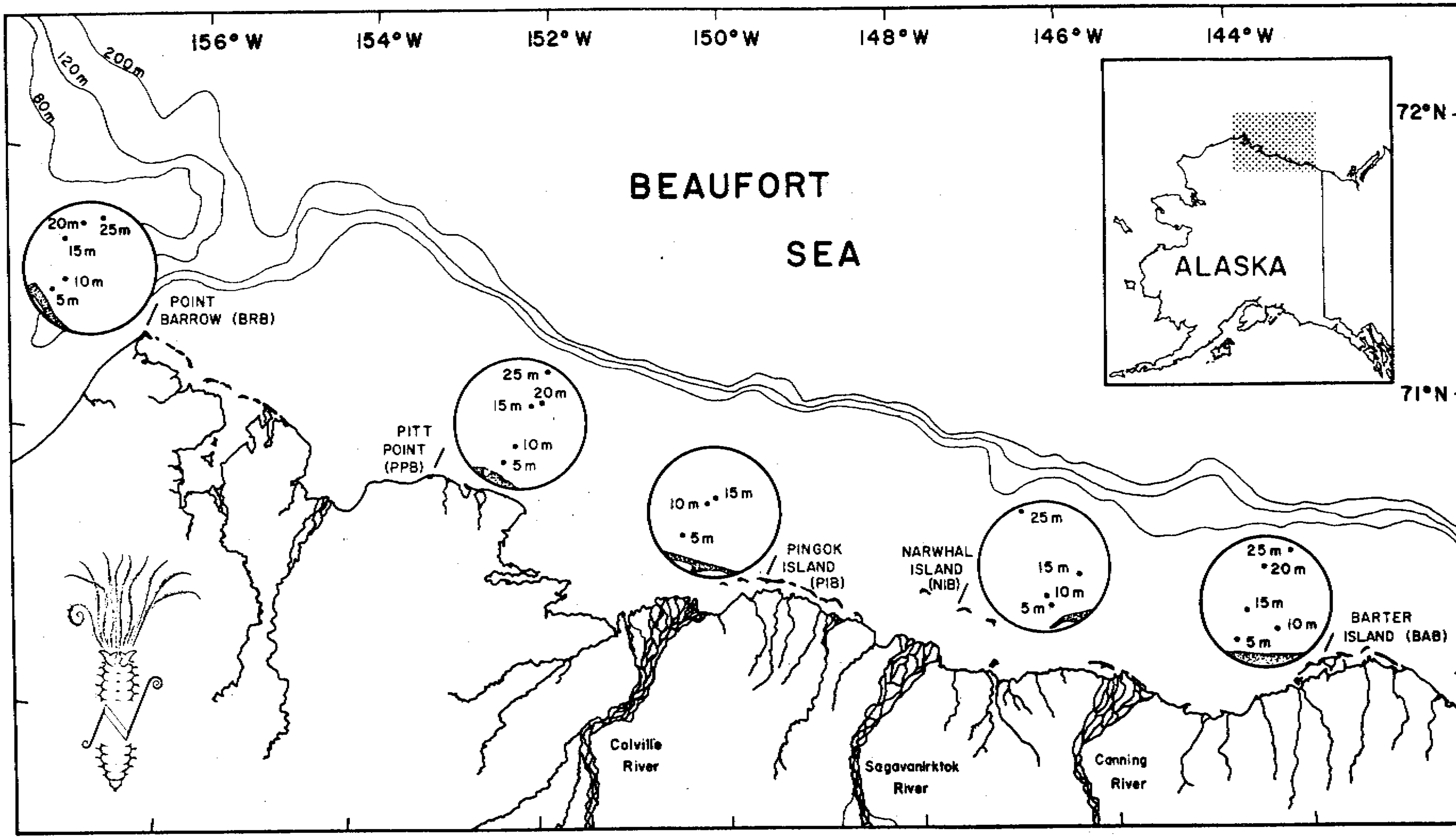

Figure 6. Transect locations for the grab samples taken along the northern coast of Alaska. The insects show the relative positions of the stations.

MATERIALS AND METHODS

Benthic macrofauna samples were collected during August and September, 1976, with a 0.1 m^2 Smith McIntyre bottom grab (Smith and McIntyre, 1954) on five approximately equally-spaced transects off Point Barrow (BRB), Pitt Point (PPB), Pingok Island (PIB), Narshal Island (NIB), and Barter Island (BAB) (Figure 1). Five quantitative grab samples were obtained at each station, the stations positioned at 5 meter depth increments between 5 and 25 meters on each transect. A majority of the stations were occupied by the R/V ALUMIAK, although two stations (PPB25 and NIB25) were sampled from the USCGC GLACIER, and three locations (PIB20, PIB25, and NIB20) could not be reached due to heavy concentrations of sea ice.

The samples were washed on board ship through a cascading multiple siever system (Carey et al., unpub. m.s.) having a 0.42 mm minimum sieve size and were preserved in seawater with 10% formalin neutralized with sodium borate. In the laboratory the samples were resieved and divided into large and small macro-infaunal fractions. The large macroinfauna (≥1.00 mm) were stained with rose bengal, sorted under a dissecting microscope to major taxonomic category, counted and wet-weighed. The polychaetous annelids were then identified to the species level by the second author.

RESULTS

Polychaete Densities

A total of 16,810 polychaete specimens comprising 105 species from 32 families were collected and identified. Densities ranged from 1 to 881 individuals per grab sample and from 159 to 2248 per station. On average polychaetes account for ∿53% of the large (>1 mm) macroinfauna. Apparent small-scale variation in polychaete numbers could not be addressed effectively by the sampling regime so only large-scale (between station) variations in numbers of individuals were considered. Differences in numbers of polychaetes per station either by depth or transect were evaluated by a two-way analysis of variance in which the interaction and error terms were combined. There were no significant differences in the $\log_{10}(X+1)$ numbers of individuals either by depth ($F=1.504$, $P=0.26$) or by transect ($F=0.197$, $P=0.94$).

Certain individual species densities did vary widely across the region. Cistenides hyperborea constituted 53% of all polychaetes by numbers along transect BRB and less than 1% along transect BAB. Minuspio cirrifera was 39% of the polychaetes present at five meters and only 2% at twenty-five meters. To analyze the density differences of individual species, an objective method, principle component analysis (PCA), was required for reducing the number of species considered. The total of 105 species could then be limited to a smaller subset which retained those species most variable in terms of numbers of individuals. Exclusion of those species represented by only one individual was performed as a subjective preliminary step to PCA. The remaining eight-five species were placed in a PCA with densities $\log_{10}(X+1)$ transformed. Four non-rotated factors were extracted which explained greater than fifty percent of the system's variation. The factors themselves were not considered further since their biological meaning could not be interpreted. Rather, each of the four factors was examined to determine which species loaded heavily on them; arbitrarily ±0.5 (Lie and Kelley, 1970). These species are then considered as contributing to the explanation of approximately 50% of the variation in polychaete densities. Sixty-six species loaded on the first four factors with a weight greater than ±0.5, a data set still too large to be rigorously analyzed given the limited number of stations sampled. PCA proved an ineffective method for reducing the dimensionality of the data set.

The total of 85 species considered in the principal component analysis was subjectively reduced to 79 by further exclusion of all species occurring at only one station. These 79 species were then equally divided into five subsets on which a one-way MANOVA was performed. This was required because PCA was ineffective in objectively reducing the data set further and because of the limited number of station observations. The bias caused by five individual MANOVA's in terms of an overall error rate was to be minimized by considering random subsets of species in a series of analyses. This was unnecessary when the original set of MANOVA's resulted in only one subset of species by depth (Wilks F=3.64, P=.015) and one subset of species by transect (Wilks F=3.78, P=.048) demonstrating significant density differences. Individual species which exhibited significant univariate F-tests within these subsets are indicated in table 5. Table 5 also includes those species whose overall MANOVA was not significant but whose univariate test was.

Polychaete Richness

Expected species numbers (Hulbert, 1971) and their associated variance (Heck, van Belle & Simberloff, 1975) were calculated for the Beaufort Sea polychaetes. For each station the distribution of individuals per species was used in calculating the expected species value [$E(S_n)$]. Plots of $E(S_n)$ curves for a series of depth and transect stations are represented in Figure 7. Comparisons based on $E(S_n)$ can be affected by the underlying individual per species relationship (Peet, 1974), but this is not a problem in the current study. Consideration of the associated variance with each value of $E(S_n)$ in Figure 7, which was not included due to readability, indicates that in no case does the crossing of $E(S_n)$ curves represent a significant change in the trend. A two-way analysis of variance for $E(S_n)$ at a comparable individual level of 150 indicates no significant difference in the numbers of species either by depth (F=1.596, P=0.24) or by transect (F=0.409, P=0.79). Again, the interaction and error terms were combined for the analysis.

Distribution by feeding type

Recent investigations have indicated that differences in the distribution of benthic invertebrates based on trophic groups may be more meaningful than consideration of just rachness and censity (Pearson, 1971; Sokolova, 1972; Maurer et al., 1979). Word (1979, 1980) has proposed a trophic index as a means of grouping invertebrate species and feeding guilds have been outlined by Fauchald and Jumars (1979) for defining the feeding groups of polychaetous annelids. Assignment of polychaetes into feeding guilds or other groups often requires species specific information not yet available. A knowledge of the size, composition and availability of potential food items, the mechanisms of food gathering and ingestion, and the behavioral patterns associated with the feeding process are required. Much of this information is not yet known for many

Table 5 . Results of the univariate F-tests on the densities of shallow Beaufort polychaetes. Those species also belonging to an overall significant MANOVA indicated by *.

Effect	Variate	F	P
Depth	**Ampharete vega*	6.51	.003
	**Heteromastus filiformis*	3.39	.034
	Micronephthys minuta	5.86	.004
	Nephtys ciliata	6.37	.003
	Antinoella sarsi	4.06	.019
	Chone aff. C. murmanica	5.18	.007
	Marenzelleria wireni	6.97	.002
Transect	*Neosabellides* sp.	7.01	.002
	Apistobranchus tullbergi	4.23	.016
	Chistomeringos caecus	4.26	.016
	Nereimyra aphroditoides	3.64	.027
	Allia sp. (B)	4.88	.009
	Cistenides hyperborea	16.97	.000
	Anaitides groenlandica	5.72	.005
	**Antinoella sarsi*	3.04	.048
	**Scalibregma inflatum*	3.34	.036
	**Minuspio cirrifera*	6.19	.003
	Polydora quadrilobata	6.48	.003
	Prionospio steenstrupi	20.85	.000
	Spio filicornis	4.02	.019
	Exogone dispar	5.11	.008
	Exogone naidina	5.94	.004
	Pygospio elegans	3.31	.037

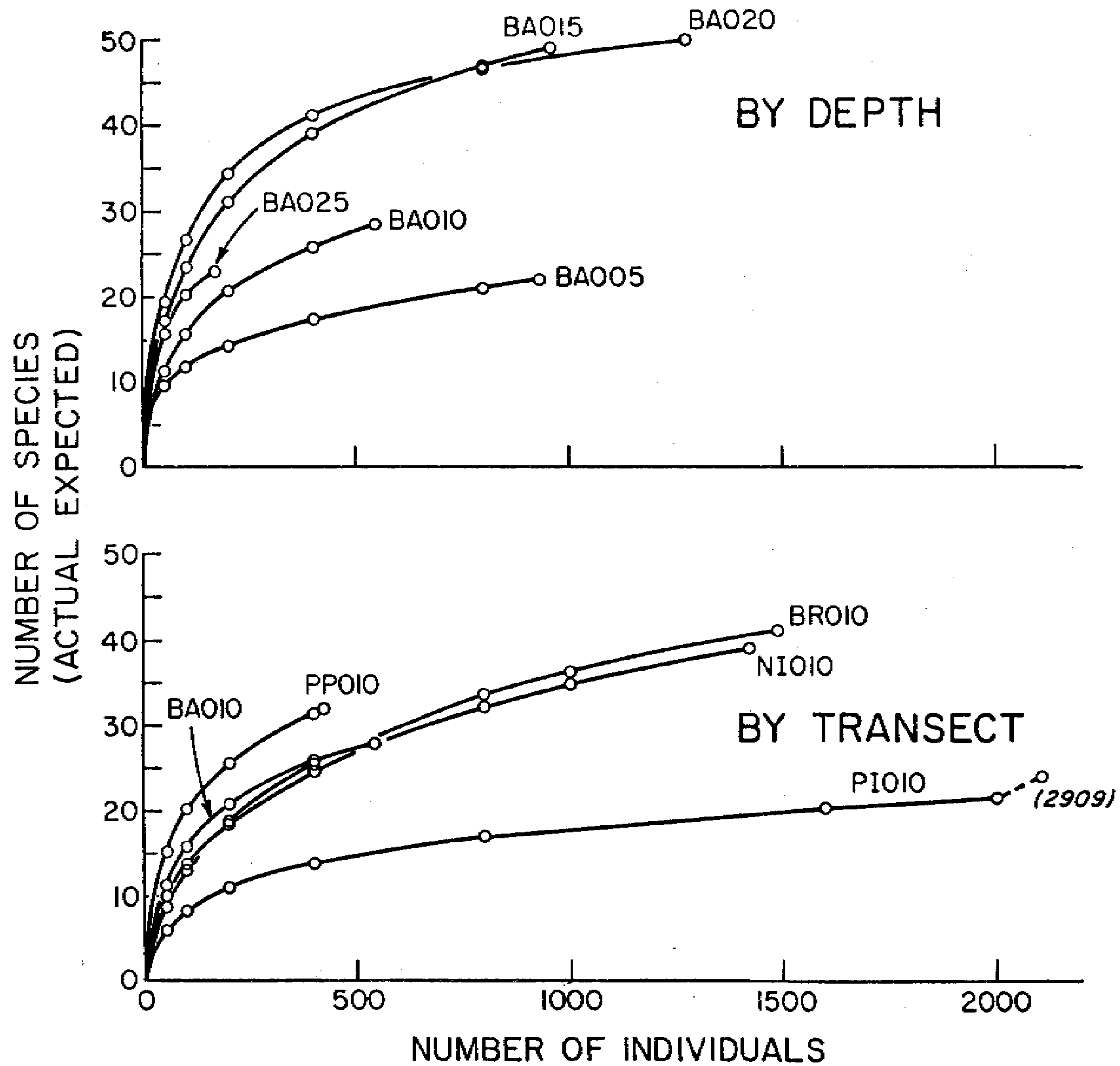

Figure 7: Rarefaction plots for a transect and a depth zone.

Beaufort Sea polychaete species. Therefore the feeding types addressed in this study are limited to three rather broad groups based on observed differences in the morphology of the feeding structures. These categories are:

Tentaculate feeders (TF) - those species having ciliated tentacles or palps which are used to sort out and transport the particles to be ingested. These species tend to be selective deposit feeders, acting on the surface layer of sediment. Forty-eight polychaete species from the shallow Beaufort Sea shelf are assigned to this group.

Burrowers (BF) - those species which have an eversible, sac-like pharynx with which to engulf the sediments. These are burrowing species that generally function as non-selective deposit feeders. There are 28 species included in this category.

Predators (PF) - those species possessing jaws or pharyngeal armature. This group includes the carnivores, herbivores and scavengers, and is represented by 29 total species.

The relative abundance of polychaetes in the three feeding groups is plotted in Figure 8. Tentaculate feeders comprise a major proportion of the number of polychaete individuals both by depth and transect, ranging from a low of 41% to a high of 88%. By transect the relative proportions of all three feeding groups remains fairly constant. This is not true by depth where the percentage of TF decreases steadily with increasing depth. Both depth χ^2_8=2442.8, P<.005) and transect (χ^2_8=1253.7, P<.005) exhibit a strong association with the numbers of individuals in each feeding group. Variations in the numbers of TF, BF and PF with depth and transect were examined by a one-way MANOVA on the $\log_{10}(X+1)$ numbers of individuals. Results for the transect analysis are not significant (Wilks F=1.772, P=0.088). For depth the dependent variables were not correlated (Bartlett's test of sphericity = 6.031, P=0.110) and therefore a multivariate approach with feeding type as the dependent variables is inappropriate (Morrison, 1976). Results of univariate tests for each of the feeding groups indicates there is no significant difference in the number of burrowers (F=0.158, P=0.957) or predators (F=0.188, P=0.941). There is a significant difference in the number of tentaculate feeders by depth (F=5.299, P=0.006). Multiple range tests, both SNK and Schiffe at P=0.05, indicate this difference to be most pronounced between 10 and 25 m.

The relative percentage of species in each of the feeding groups by depth and transect is represented in Figure 9. There are no apparent patterns either by depth or transect. A one-way MANOVA with feeding type as the three dependent variables indicates no significant difference in numbers of species by depth (Wilks F=1.019, P=0.451). There is a significant difference by transect (Wilks F=3.350, P=0.002). Not one of the univariate F-tests is significant for each of the three feeding groups. It appears that the difference in the numbers of species by transect is due to the combined difference for TF, BF and PF groups and not solely to the difference in any one feeding group. Analysis of the mean profiles for the three feeding types tends to confirm this. The profiles for the five transects on the three feeding types are parallel, having basically the same shape (Wilks F=5.238, P=0.000). Patterns across the transects are consistent with no reversal in trends for the feeding types. The mean number of species for each transect across the three feeding types is not level (F=0.457, P=0.766). Differences between group means, especially for burrowers, on the dependent

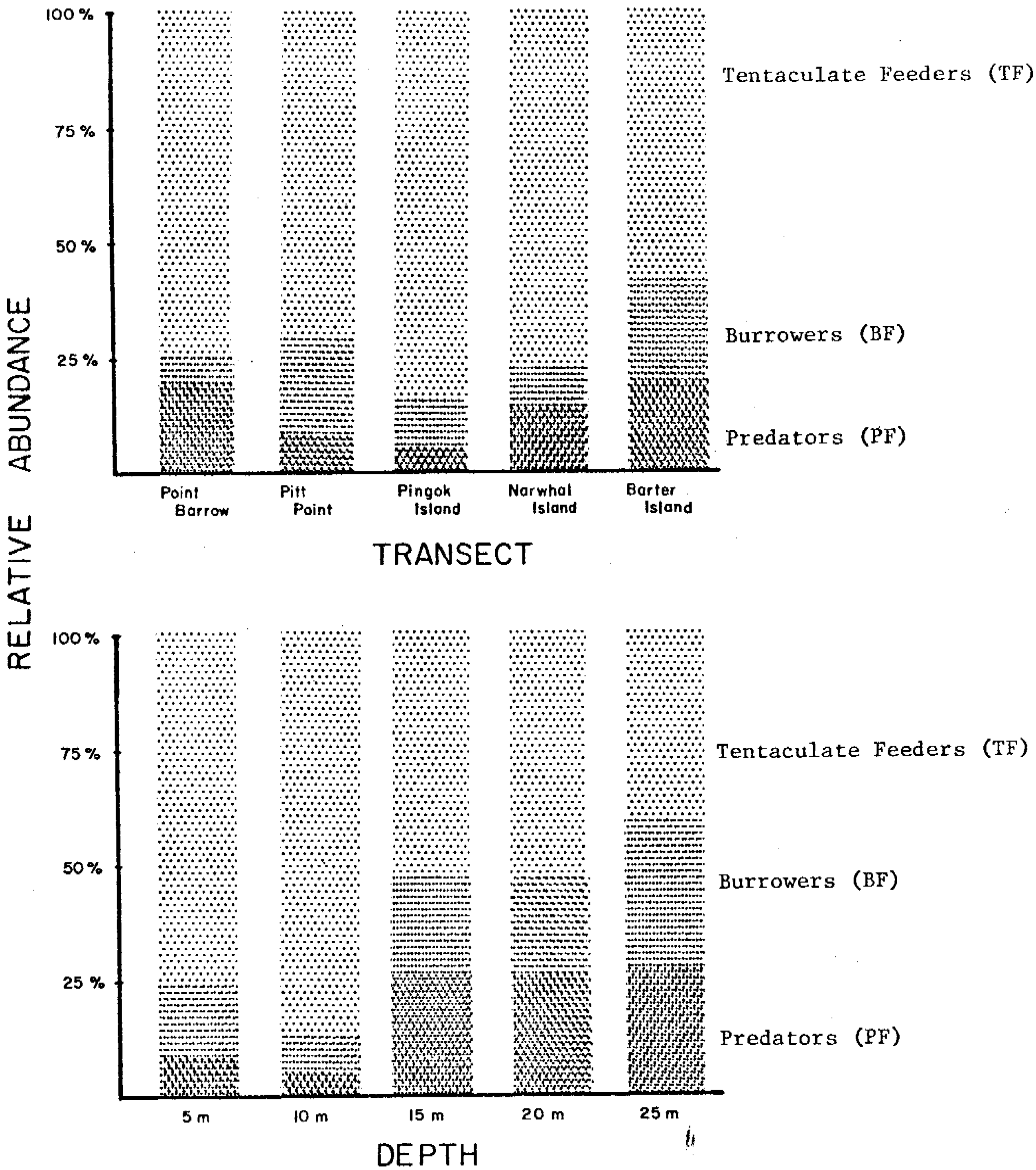

Figure 8: The relative abundances of each of the three polychaete feeding groups on each transect and at each depth sampled.

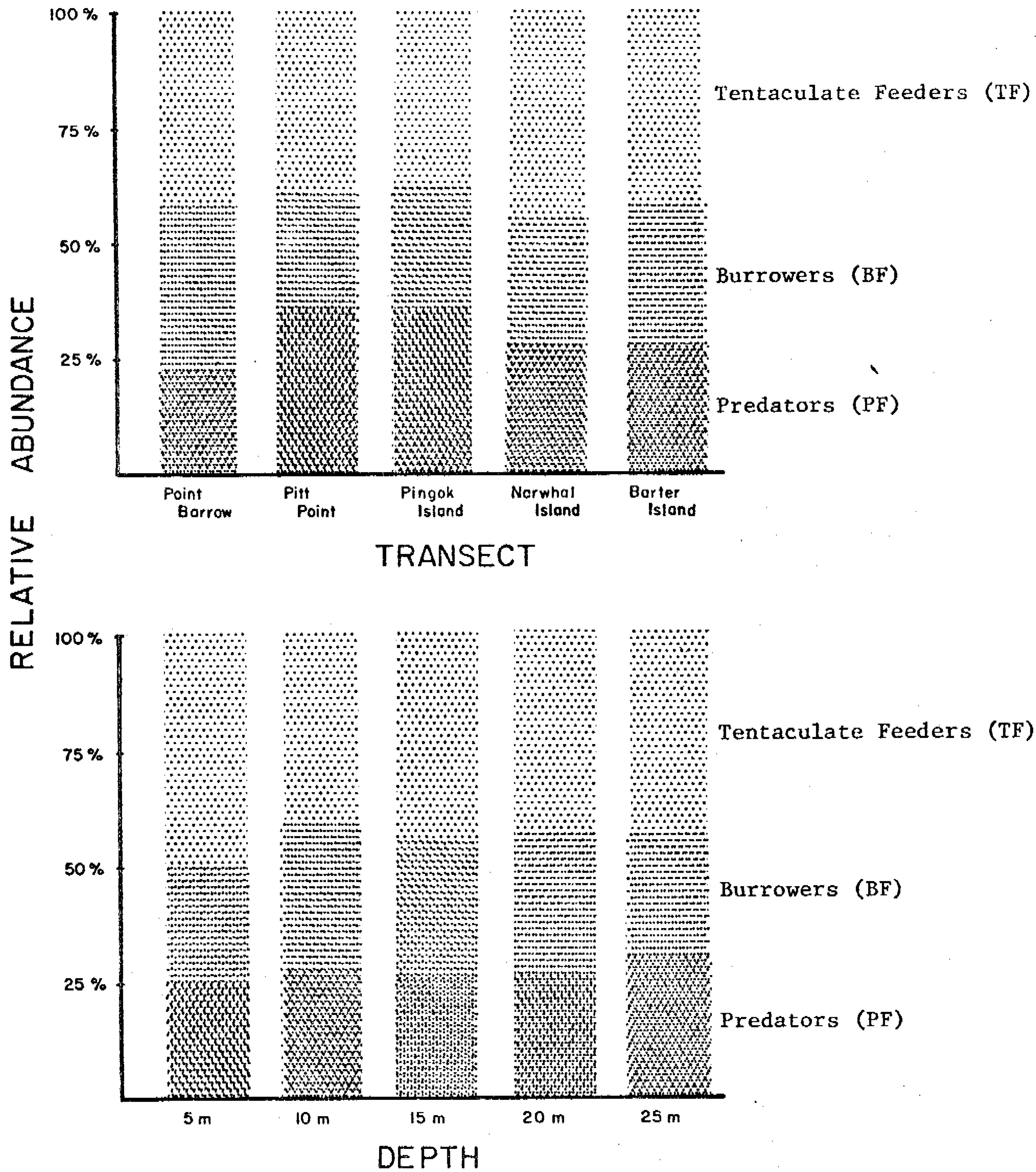

Figure 9. The relative percentage of species of each of the three polychaete feeding groups on each transect and at each depth sampled.

variables is not zero. This is partly due to the unusually low number of BF species along transect BRB. The pooled means for each feeding type across the transects is flat though (Wilks F=21.312, P=.000). There is no statistical difference between the number of TF, BF and CF species.

DISCUSSION

Examination of the data shows that there is no increase in the number of species of surface-deposit feeders occurring at the two shallower depths as might be expected if the environment at 5 and 10 meters were particularly attractive to those polychaete species possessing a tentaculate feeding apparatus. Instead, the overall increase can be attributed to the high densities of 7 particular polychaete species - Ampharete vega, Cistenides hyperborea, Chone aff. C. murmanica, Marenzelleria wireni, Minuspio cirrifera, Spio theeli and Terebellides stroemi. These seven species account for more than 92% of the total tentaculate fauna at the two shallowest stations, and only between 30-60% of the fauna at the three deeper locations.

Although these seven species of polychaetes are lumped together as tentaculate feeders, they function in differing manners and probably act upon different portions of the surface sediments. Ampharete vega and Terebellides stroemi are tubicolous forms which have short, retractable, ciliated tentacles which can be spread out over the sediment surface to pick up food particles. These two species are apparently confined to their tubes, but can move to new locations by adding on to their existing dwellings.

The spionids Marenzelleria wireni, Minuspio cirrifera, and Spio theeli employ a pair of ciliated palps to gather food particles from the adjacent area. These species are also tube-dwellers, but in general the spionids have the capability of leaving their tubes and rebuilding elsewhere when conditions are unfavorable.

Chone aff. C. murmanica is a sabellid, a group which is normally classified as filter-feeding, although selective deposit-feeding has also been frequently observed. The specimens from the Beaufort Sea, however, are all quite small, averaging on the order of ∿3mm in body length. The filtering tentacles, therefore, cannot be very high off the sediment surface, and they are likely feeding on the upper portions of the sediment surface deposits.

The pectinariid Cistenides hyperborea is a motile, tubicolous worm which is oriented head-down in the surface sediments. Although often listed as a burrowing deposit feeder, these polychaetes appear to be feeding upon surface particles by constructing burrows into which the surface particles are drawn or fall (Fauchald & Jumars, 1979; Word, 1980). In addition, the majority of the specimens from the Beaufort Sea collections are very small, ∿5 mm in total length. For these reasons, this species can also be viewed as a tentaculate, selective, surface-deposit feeder.

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B. Shelf fauna of the southwestern Beaufort Sea.

An analysis of the distribution and abundance of benthic macrofauna species from the inner continental shelf to the upper continental slope was undertaken to define possible limits and zones of abundance of coastal, shelf and outer shelf fauna. The shelf data were compiled from two OCS cruises from the summer of 1976 and the slope data from a 1971 WEBSEC cruise. The deeper stations should not be subject to significant yearly variations that would create matching problems caused by samples from different years.

The abundance pattern of the dominant pelecypod mollusc species on the shelf from 5-100 meters depth (Tables 6,7,8 and Figure 10) demonstrates that there is a nearshore fauna and an outer shelf fauna. A fauna consisting of *Cyrtodaria kurriana*, *Axinopsida orbiculata*, *Macoma calcarea*, *Boreacola vadosa* and *Liocyma fluctuosa* live primarily in inshore waters. Two of these, *Macoma calcarea* and *Liocyma fluctuosa* exist across the shelf, but they are most abundant at depths of 5 to 10 meters. Other species such as *Nucula belotti*, *Astarte montagui*, *Thyasira gouldii*, *Astarte crenata* and *Portlandia frigida* are found predominantly on the outer half of the continental shelf. The shifts in the rank order of abundance of the bivalves also demonstrates this general separation of fauna across the shelf (Table 7).

Gammarid amphipods also are distributed in similar patterns with a nearshore and outer shelf fauna (Tables 9,10,11 and Figure 11). The most abundant shallow species, *Onisimus litoralis*, is most numerous at 15 meters though it exists in low numbers out to the edge of the shelf at 100 m. It is clearly the dominant amphipod within the depth zone of its major abundance (Table 11).

Polychaete worms also can be divided into coastal and continental shelf fauna, though this is a more speciose group that exhibits many distributional patterns (Tables 12, 13, 14 and Figure 12).

There is a minimum abundance level reached for the three groups studied at depths of 20-25 meters (Figures 10, 11 and 12). This may be caused by direct or indirect effects of active ice gouging in the shear zone between the fast seasonal ice and the moving polar pack ice.

Table 6.

Pelecypod molluscs - Abundance per m^2 of dominant species at stations along the Pitt Point Transects.

	5m	10m	15m	20m	25m	40m	55m	70m	100m
Cyrtodaria kurriana	304								
Axinopsida orbiculata	438	96			2	2			
Portlandia arctica	58	142	74	182	196				
Macoma moesta		26	2			6			
Macoma calcarea	232	22	2	8	8	4	6		
Boreacola vadosa	3198	2					6		
Liocyma fluctuosa	644	182				4	8	12	12
Nucula bellotti				4	16	20	22	28	28
Astarte montagui	12					24	88	196	66
Thyasira gouldii						2	14	8	2
Astarte crenata								34	14
Portlandia frigida								30	22

Table 7.

Pelecypod molluscs - Rank order of abundance of dominant species at stations along the Pitt Point Transects

	5m	10m	15m	20m	25m	40m	55m	70m	100m	No. of Specimens
Cyrtodaria kurriana	4									152
Axinopsida orbiculata	3	3			5	5				269
Portlandia arctica	-	2	1	1	1					326
Macoma moesta		4	2			3				17
Macoma calcarea	5	5	2	2	3	4	5			141
Boreacola vadosa	1						5			1.603
Liocyma fluctuosa	2	1				4	4	-	-	431
Nucula bellotti				3	2	2	2	4	2	59
Astarte montagui	-					1	1	1	1	193
Thyasira gouldii						5	3	-	-	13
Astarte crenata								2	5	24
Portlandia frigida								1	3	26

Table 8. Rank order of abundance of the dominant bivalve molluscs along the Pitt Point Transect between 5-100 meters. Numbers are totals per $0.5m^2$.

PPB-5 (5m)	*Boreacola vadosa*	1599
	Liocyma fluctuosa	322
	Axinopsida orbiculata	219
	Cyrtodaria kurriana	152
	Macoma calcarea	116
PPB-10 (10m)	*Liocyma fluctuosa*	91
	Portlandia arctica	71
	Axinopsida orbiculata	48
	Macoma moesta	13
	Macoma calcarea	11
PPB-15 (15m)	*Portlandia arctica*	37
	Macoma moesta	1
	Macoma calcarea	1
	Lyonsia arenosa	1
PPB-20 (20m)	*Portlandia arctica*	91
	Macoma calcarea	4
	Nucula bellotti	2
	Arctinula greenlandica	1
PPB-25 (25m)	*Portlandia arctica*	307
	Nucula bellotti	18
	Macoma calcarea	12
	Pandora glacialis	7
	Nuculana radiata	4
PPB-40 (40m)	*Astarte montagui*	12
	Nucula bellotti	10
	Macoma sp.	8
	Macoma moesta	3
	Liocyma fluctuosa	3
	Astarte sp.	3

Table 8 . (cont'd)

PPB-55 (55m)	*Astarte montagui*	146
	Nucula bellotti	53
	Thyasira gouldii	33
	Astarte borealis	20
	Liocyma fluctuosa	19
PPB-70 (70m)	*Astarte montagui*	96
	Astarte crenata	17
	Portlandia frigida	15
	Nucula bellotti	14
	Nuculana minuta	12
PPB-100 (100m)	*Astarte montagui*	40
	Nucula bellotti	16
	Portlandia frigida	14
	Musculus discors	13
	Astarte crenata	8

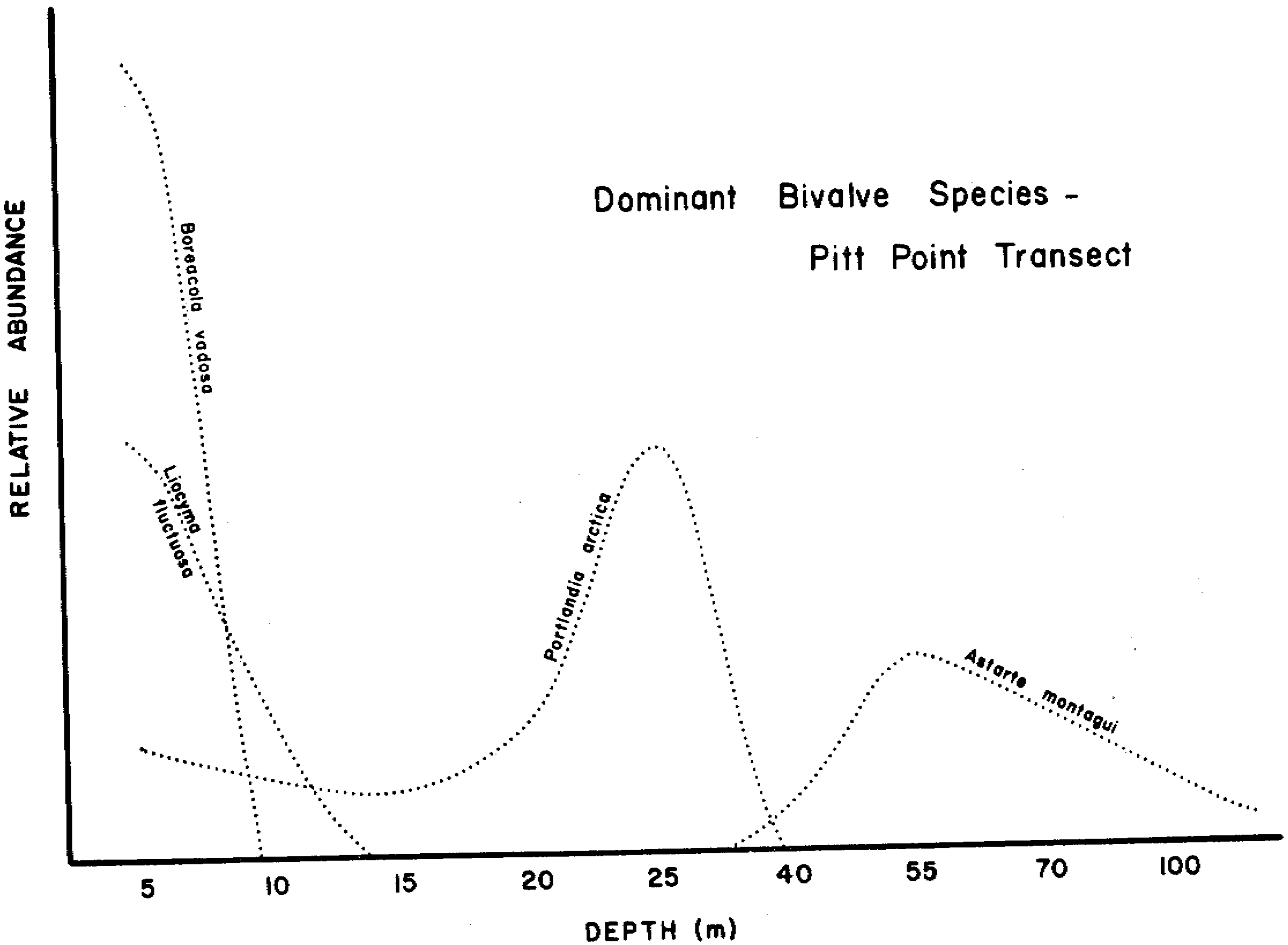

Figure 10. The relative abundances of the dominant bivalve molluscs across the Pitt Point line from 5 to 100 meters.

Table 9.

Gammarid Amphipoda - Abundance per m^2 of dominant species at stations along the Pitt Point Transects.

	DEPTH								
	5m	10m	15m	20m	25m	40m	55m	70m	100m
Acanthostepheia malmgreni		4	2						
Pontoporeia femorata		10	28						
Ampelisca macrocephala		14				4			4
Monoculopsis longicornis	12		26	18					
Onisimus litoralis		28	194	24					2
Acanthostepheia behringiensis	2	4	4						
Rozinante fragilis	4	2		14					
Aceroides latipes	2	2	14	2	14	32	22		
Haploops tubicola				16	10	6	10	14	2
Protomedeia fasciata				2		168	12	10	20
Harpinia serrata						92	106		82
Haploops laevis					10	8	58	2	6
Byblis arcticus					10	102	116	92	12
Unciola leucopsis						24	28	12	168
Paraphoxus oculatus						40	22	46	18
Photis vinogradova						22	16	18	136
Melita dentata						6		138	8
Tiron spiniferum								66	388
Podoceropsis lindahli								130	148
Guernia nordenskjoldi							8	74	64

Table 10.

Gammarid Amphipoda - Rank order of abundance of dominant species at stations along the Pitt Point Transects.

	DEPTH									No. of Specimens
	5m	10m	15m	20m	25m	40m	55m	70m	100m	
Acanthostepheia malmgreni		4	7							3
Pontoporeia femorata		3	2	5						23
Ampelisca macrocephala		2				-			-	11
Monoculopsis longicornis	1		3	2						28
Onisimus litoralis		1	1	1					-	124
Acanthostepheia behringiensis	3	4	6							5
Rozinante fragilis	2	5		4						10
Aceroides latipes	3	5	4	8	1	5	6			44
Haploops tubicola				3	2	-	-	-	-	
Protomedeia fasciata				-		1	9	-	-	106
Harpinia serrata						3	2		5	140
Haploops laevis					2	-	3	-	-	42
Byblis arcticus					2	2	1	3	-	166
Unciola leucopsis						6	4	-	2	116
Paraphoxus oculatus						4	6	6	-	63
Photis vinogradova						7	8	9	4	96
Melita dentata						-		1	-	76
Tiron spiniferum								5	1	227
Podoceropsis lindahli								2	3	139
Guernia nordenskjoldi							-	4	5	76
										1521

Table 11. Rank order of abundance of the dominant gammarid amphipods along the Pitt Point Transect between 5-2400 meters. Numbers are totals per $0.5m^2$.

PPB-5 (5m)	*Monoculodes sp.*	9
	Monoculopsis longicornis	6
	Rozinante fragilis	2
	Aceroides latipes	1
	Acanthostepheia behringiensis	1
	Atylus carinatus	1
PPB-10 (10m)	*Onisimus litoralis*	14
	Monoculodes sp.	12
	Ampelisca macrocephala	7
	Pontoporeia femorata	5
	Acanthostepheia behringiensis	2
PPB-15 (15m)	*Onisimus litoralis*	61
	Pontoporeia femorata	9
	Monoculopsis longicornis	6
	Aceroides latipes	3
	Pontoporeia affinis	3
PPB-20 (20m)	*Onisimus litoralis*	10
	Monoculopsis longicornis	9
	Haploops tubicola	8
	Rozinante fragilis	7
	Pontoporeia femorata	2
	Hippomedon abyssi	2
PPB-25 (25m)	*Aceroides latipes*	7
	Byblis arcticus	5
	Haploops laevis	5
	Haploops tubicola	5
	Posoceropsis inaequistylis	2
	Hippomedon abyssi	2

Table 11. (cont'd)

PPB-40 (40m)	*Protomedeia fasciata*	84
	Byblis arcticus	51
	Harpinia serrata	46
	Paraphoxus oculatus	20
	Aceroides latipes	16
PPB-55 (55m)	*Byblis arcticus*	58
	Harpinia serrata	53
	Haploops laevis	29
	Unciola leucopsis	14
	Westwoodilla megalops	11
PPB-70 (70m)	*Melita dentata*	69
	Podoceropsis lindahli	65
	Byblis arcticus	46
	Guernia nordenskjoldi	37
	Tiron spiniferum	33
PPB-100 (100m)	*Tiron spiniferum*	194
	Unciola leucopsis	84
	Podoceropsis lindahli	74
	Photis vinogradova	68
	Harpinia serrata	41
WBS-36/CG-75 (132-140m)	*Harpinia serrata*	34
	Unciola leucopsis	23
	Bathymedon obtusifrons	14
	Pardalisca tenuipes	8
	Ampelisca eschrichti	4
WBS-41/CG-83	*Anonyx nugax*	25
	Arrhis phyllonyx	7
	Aceroides latipes	2
	Harpinia kobjakoyae	2
	Harpinia serrata	1
	Pontoporeia femorata	1

Table 11. (cont'd)

WBS-42/CG-84 (540-831m)	*Pardaliscella lavrovi*	20
	Tryphosella rusanovi	4
	Harpinia kobjakovae	2
	Byblis sp. D	2
	Pontoporeia femorata	1
	Orchomene serrata	1
WBS-43/CG-85 (821-997m)	*Pardaliscella lavrovi*	8
	Harpinia kobjakovae	5
	Aceroides latipes	2
	Hippomedon holbolli	1
WBS-44/CG-86 (2139-2400m)	*Tryphosella pusilla*	10
	Aceroides latipes	2
	Harpinia mucronata	2
	Monoculodes packardi	1

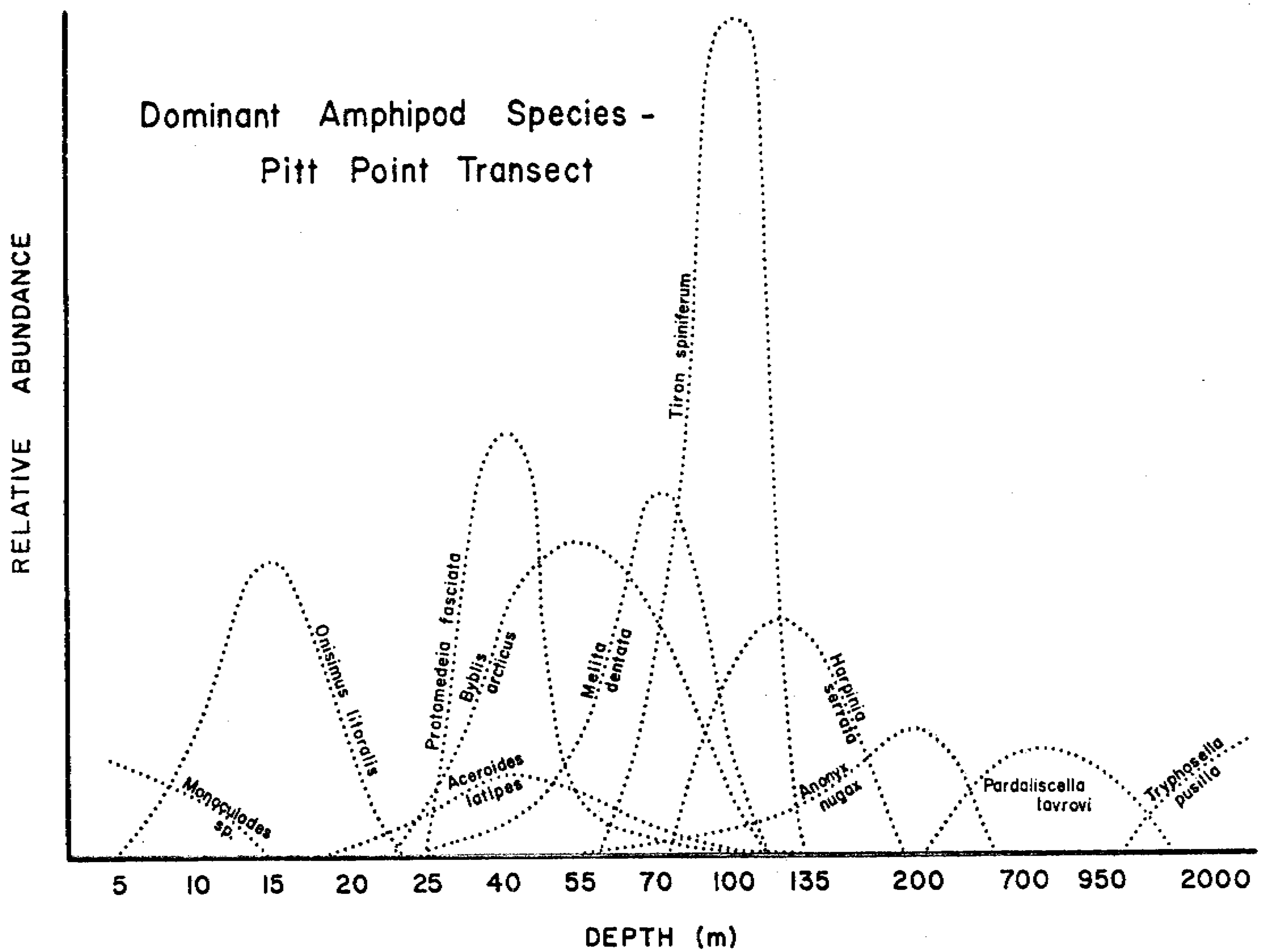

Figure 11. The relative abundances of the dominant gammarid amphipods across the Pitt Point line from 5 to 2000 meters.

Table 12.

Polychaetous Annelids - Abundance per m^2 of dominant species at stations along the Pitt Point Transect

	DEPTH						
	5m	10m	15m	20m	25m	55m	100m
Sphaerodoropsis minuta	220						
Ampharete vega	540						
Scoloplos armiger	476	12					
Marenzelleria wireni	24	18					
Paramphitrite tetrabranchia	26	46		4			
Spio theeli	1060	28	2				
Scalibregma inflatum		16				14	28
Eteone longa	86	34	4	4	2	12	6
Minuspio cirrifera	934	100	484	46	8	2	
Capitella capitata	84	14	22	66	8	2	2
Chone nr murmanica	412	276		2		24	228
Terebellides stroemi	350	28			4	170	102
Scoloplos acutus		34			14	96	78
Tharyx ?acutus	120	118	2	32	136	574	122
Micronephthys minuta	2	2	10	16	122	444	110
Allia nr suecica		16	2	50	52	62	134
Nereimyra aphroditoides			6	8	2	2	160
Nephtys ciliata		4	4		14	18	2
Apistobranchus tullbergi	14	2	2		24		6
Allia sp. B		2	14	10	20		
Cossura longocirrata	2		8	16	22	28	16
Polydora caulleryi				16	2	10	24
Cistenides hyperborea				8	6	2	
Pholoe minuta	22			2	54	204	462
Chaetozone setosa				4	36	104	416
Schistomeringos caeca					24	6	2
Sternaspis scutata		12		2	20	48	
Onuphis quadricuspis						168	8
Tauberia gracilis						150	2
Maldane sarsi						100	24
Lysippe labiata					2	94	240
Lumbrineris impatiens						2	344

Table 13.

Polychaetous Annelids - Rank order of abundance of dominant species at stations along the Pitt Point Transect

	DEPTH 5m	10m	15m	20m	25m	55m	100m	No. of Specimens
Sphaerodoropsis minuta	7							110
Ampharete vega	3							270
Scoloplos armiger	4	-						244
Marenzelleria wireni	-	7						21
Paramphitrite tetrabranchia	-	4		-				38
Spio theeli	1	6	8					545
Scalibregma inflatum		8				-	-	29
Eteone longa	9	5	7	-	-	-	-	74
Minuspio cirrifera	2	3	1	3	-	-		787
Capitella capitata	-	-	2	1	-	-	-	99
Chone nr murmanica	5	1		-		-	5	471
Terebellides stroemi	6	6			-	4	-	327
Scoloplos acutus		5			-	9	-	111
Tharyx ?acutus	8	2	8	4	1	1	8	562
Micronephthys minuta	-	-	4	5	2	2	9	353
Allia nr suecica		8	8	2	4	-	7	158
Nereimyra aphroditoides			6	7	-	-	6	89
Nephtys ciliata		-	7		-	-	-	21
Apistobranchus tullbergi	-	-	8		6		-	24
Allia sp. B		-	3	6	8			23
Cossura longocirrata	-		5	5	7	-	-	46
Polydora caulleryi				5	-	-	-	26
Cistenides hyperborea				7	-	-		8
Pholoe minuta	-			-	3	3	1	372
Chaetozone setosa				-	5	7	2	279
Schistomeringos caeca					6	-	-	16
Sternaspis scutata		-		-	8	-		41
Onuphis quadricuspis						3	-	88
Tauberia gracilis						6	-	76
Maldane sarsi						8	-	62
Lysippe labiata					-	-	4	168
Lumbrineris impatiens						-	3	173

Table 14. Rank order of abundance of the dominant polychaetous annelids along the Pitt Point Transect between 5-2400 meters. Numbers are totals per $0.5m^2$.

PPB-5 (5m)	*Spio theeli*	530
	Minuspio cirrifera	467
	Ampharete vega	270
	Scoloplos armiger	238
	Chone nr murmanica	206
	Terebellides stroemi	175
PPB-10 (10m)	*Chone nr murmanica*	138
	Tharyx ?acutus	59
	Minuspio cirrifera	50
	Paramphitrite tetrabranchia	23
	Scoloplos acutus	17
	Eteone longa	17
PPB-15 (15m)	*Minuspio cirrifera*	242
	Capitella capitata	11
	Allia sp. B	7
	Micronephthys minuta	5
	Cossura longocirrata	4
	Nereimyra aphroditoides	3
PPB-20 (20m)	*Capitella capitata*	33
	Allia nr suecicia	25
	Minuspio cirrifera	23
	Tharyx ?acutus	16
	Cossura longocirrata	8
	Polydora caulleryi	8
PPB-25 (25m)	*Tharyx ?acutus*	68
	Micronephthys minuta	61
	Pholoe minuta	27
	Allia nr suecica	26
	Chaetozone setosa	18
	Apistobranchus tullbergi	12
	Schistomeringos caeca	12

Table 14. (cont'd)

PPB-55 (55m)	*Tharyx ?acutus*	287
	Micronephthys minuta	222
	Pholoe minuta	102
	Terebellides stroemi	85
	Onuphis quadricuspis	82
	Tauberia gracilis	75
PPB-100 (100m)	*Pholoe minuta*	231
	Chaetozone setosa	208
	Lumbrineris impatiens	172
	Lysippe labiata	120
	Chone nr murmanica	114
	Nereimyra aphroditoides	80
WBS-36/CG-75 (132-140m)	*Lysippe labiata*	186
	Tharyx ?acutus	172
	Lumbrineris minuta	162
	Spiochaetopterus typicus	123
	Micronephthys minuta	121
	Chaetozone setosa	71
WBS-41/CG-83 (169-232m)	*Tharyx ?acutus*	407
	Micronephthys minuta	302
	Scoloplos acutus	180
	Allia nr suecica	168
	Tauberia gracilis	123
	Cossura longocirrata	100
WBS-42/CG-84 (540-831m)	*Minuspio cirrifera*	852
	Owenia fusiformis	550
	Maldane sarsi	390
	Lumbrineris minuta	75
	Scoloplos acutus	37
	Tauberia gracilis	35

Table 14. (cont'd)

WBS-43/CG-85 (821-997m)	*Minuspio cirrifera*	701
	Owenia fusiformis	56
	Maldane sarsi	44
	Tauberia gracilis	36
	Laonice cirrata	28
	Lumbrineris minuta	19
WBS-44/CG-86 (2139-2400m)	*Minuspio cirrifera*	313
	Tharyx ?acutus	38
	Lumbrineris minuta	21
	Sigambra tentaculata	16
	Maldane sarsi	11
	Tauberia gracilis	11

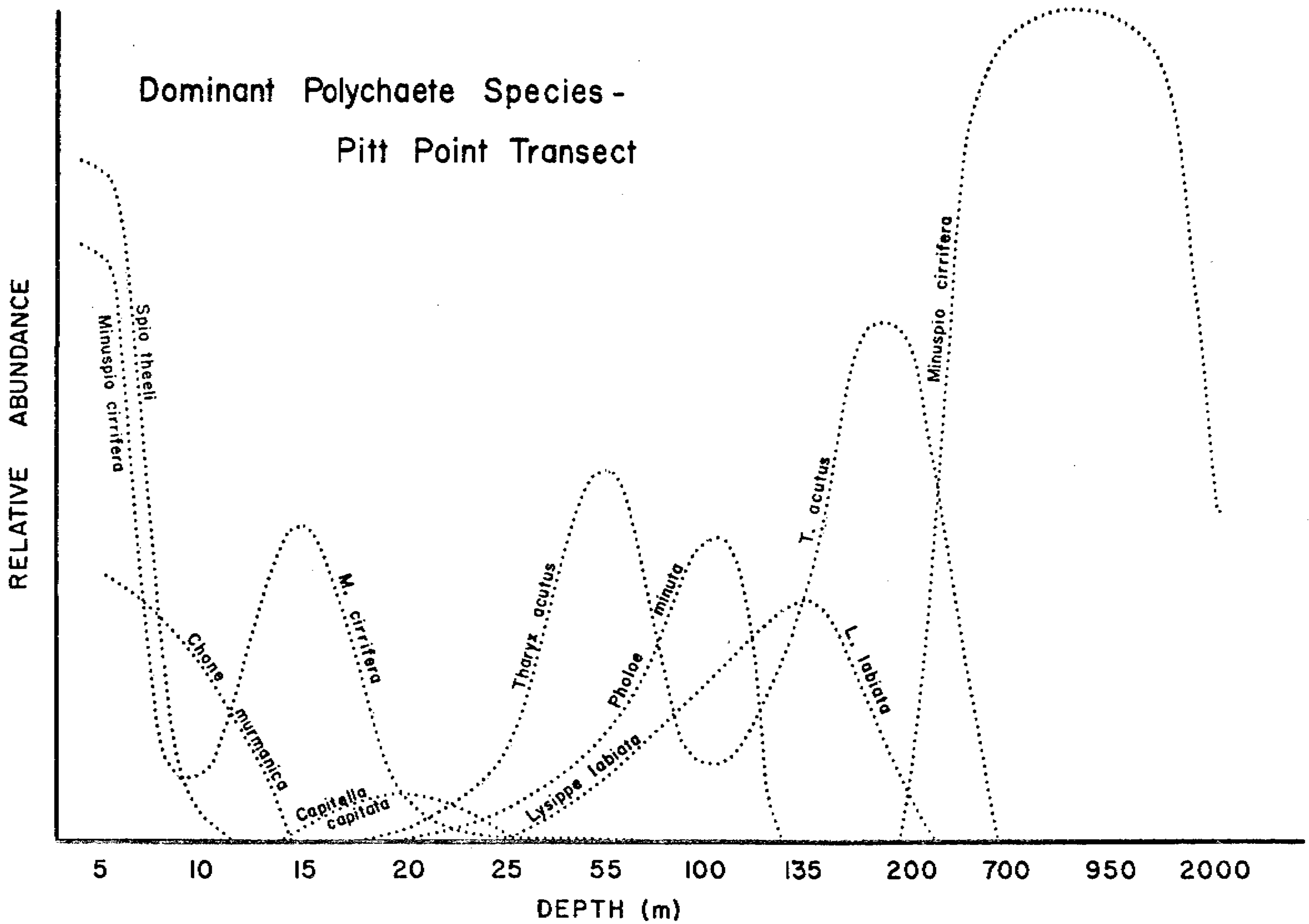

Figure 12. The relative abundances of the dominant polychaetous annelids across the Pitt Point line from 5 to 2000 meters.

C. Seasonal variability of benthos-Pitt Point OCS Transect Line.

INTRODUCTION

A seasonal time series study was undertaken across the continental shelf off Pitt Point, Alaska to further define the natural variability of the structure of benthic invertebrate communities. The basic rationale was to provide some limits to spatial and temporal variability of the shelf communities so that a "baseline" community could be described within its envelope of natural variability.

It has been amply demonstrated in more southern and temperate climates that there is marked seasonal variability in the species rank order of abundance and biomass and in species composition of shelf benthic assemblages (Frankenberg and Leiper, 1977; Buchanan et al., 1978). These seasonal changes can be caused by reproductive and larval recruitment variability, predation, competition, environmental change and other factors. The rate and amplitude of benthic reproduction and recruitment still remain unknown for the majority of the benthos. These processes may or not add significantly to temporal variability in the arctic environment. In fact, it was not known upon the initiation of the OCS research effort whether there was much temporal variability in the benthic fauna across the continental shelf of the southwestern Beaufort Sea.

To study this aspect of benthic ecology, five stations were chosen across the shelf from 25 to 100 meters depth. These locations were defined by position and depth on the standard OCS Transect Line (025°T from the Lonely radio beacon). The minimum depth was fixed because of depth restrictions of the U.S. Coast Guard icebreakers during the summer months; time constraints for field work also precluded seasonal sampling in thick fast ice found inshore of this depth. (The actual techniques for through-the-ice sampling of benthic infauna to depths of 100 meters are described in the RU #006 OCSEAP Research Progress Report, First Annual Report, March 22, 1976.) Sampling was by Smith-McIntyre 0.1m^2 bottom grab with logistics support by helicopter during the ice-covered months and by USCG icebreaker in the summer season.

Earlier work by RU #006 found indications that there are seasonal changes in the total numbers of animals at PPB-55, PPB-70 and PPB-100 and that this variation occurred mainly in the 0.5-1.0 mm size class. At station PPB-25 there was essentially no change in total abundance of the fauna. At the conclusion of this first phase of the seasonal study, a number of basic questions remained - which and how many species were causing the seasonal changes; was there a particular season of the year when dominant species were recruited into the benthic populations as an influx of juveniles; does PPB-25 consist of species whose life histories are different - for one reason or another, from the communities further out on the continental shelf; how variable is the species composition and rank order of abundance of the macro-infauna (>0.5 mm) across the shelf? These and other questions could only be answered by identifying individual species at the PPB stations and determining seasonal variability in abundance and species population size structure (see next Section D of this report).

RESULTS

Three animal groups, gammarid amphipods, bivalve molluscs and polychaetous annelids were examined from standard seasonal stations set up by RU #006. Data on dominant species are listed for each seasonal field trip in Tables 15 through 24 . For molluscs and amphipods there are no significant temporal changes in total numbers of individuals nor for the total numbers of species. Further analyses will be run to determine if individual species are varying significantly in abundance from one season to the next.

Table 15. Statistical analyses of temporal variance for pelecypod molluscs and gammarid amphipods.

SEASONAL RESULTS

Stations		Cruises		
Stations -	PP025	Cruises -	OCS1:M+A	(Nov.'75)
	PP055		OCS2:M+A	(Mar.'76)
	PP100		OCS3:M+A	(May '76)
			OCS4:M+A	(Aug.'76)
			OCS6:M+A	(Nov.'76)
			OCS7:M	(Aug.'77)
			OCS8:M	(Aug.'78)

All runs for interaction + error term combined, only 1-way effects considered.

MOLLUSCS:

Log10(X+1) Individuals			Total Species Number			Number Expected Species (n=)		
means			means			means		
TOTAL	STA	CRU	TOTAL	STA	CRU	TOTAL	STA	CRU
2.10	1.97	2.02	16.29	10.29	13.33	5.96	4.28	5.31
	2.27	2.12		21.57	16.67		7.08	5.80
	2.07	2.14		17.00	21.33		6.51	7.09
		2.44			21.67			6.19
		1.68			12.00			6.75
		2.24			14.00			4.90
		2.07			15.00			5.64

EFFECTS	F	P	EFFECTS	F	P	EFFECTS	F	P
CRU	2.086	.131	CRU	1.835	.175	CRU	1.361	.305
STA	2.066	.169	STA	9.349	.004	STA	11.553	.002

AMPHIPODS:

Log10(X+1) Individuals			Total Species Number			Number Expected Species (n=)		
means			means			means		
TOTAL	STA	CRU	TOTAL	STA	CRU	TOTAL	STA	CRU
2.25	1.42	2.08	23.40	9.20	22.33	8.25	7.79	8.74
	2.61	2.36		29.40	22.67		8.38	7.36
	2.72	2.34		31.60	25.67		8.56	9.29
		2.21			21.33			7.42
		2.27			25.00			8.43

EFFECTS	F	P	EFFECTS	F	P	EFFECTS	F	P
CRU	0.683	.623	CRU	0.303	.868	CRU	1.551	.277
STA	46.088	.001	STA	22.561	.001	STA	0.594	.575

Table 16. Seasonal variability in the abundance of the dominant bivalve molluscs at station PPB-25 (25m). Numbers are totals per $0.5m^2$.

	OCS-1 OCT	OCS-2 MAR	OCS-3 MAY	OCS-4 AUG	OCS-6 OCT
Arctinula greenlandica	4			2	
Astarte borealis					3
Astarte crenata					
Astarte montagui					2
Cyclocardia crebricostata					
Liocyma fluctuosa	6			1	2
Macoma calcarea	6	4		12	
Macoma loveni					
Nucula bellotti	10	10	4	18	5
Portlandia arctica	85	59	15	307	
Portlandia frigida	1				
Thyasira gouldii	1	14	2		1

Table 17. Seasonal variability in the abundance of the dominant bivalve molluscs at station PPB-55 (55m). Numbers are totals per $0.5m^2$.

	OCS-1 OCT	OCS-2 MAR	OCS-3 MAY	OCS-4 AUG	OCS-6 OCT
Arctinula greenlandica	7	16	33	11	8
Astarte borealis		6	4	20	4
Astarte crenata	3	5	23	1	3
Astarte montagui	49	50	126	146	33
Cyclocardia crebricostata	1	4	19	17	4
Liocyma fluctuosa		13	3	19	1
Macoma calcarea		1		18	
Macoma loveni	6	4	11	9	1
Nucula bellotti	10	13	20	53	5
Portlandia arctica			1		
Portlandia frigida	31	36	41	13	4
Thyasira gouldii	5			33	3

Table 18. Seasonal variability in the abundance of the dominant bivalve molluscs at station PPB-100 (100m). Numbers are totals per $0.5m^2$.

	OCS-1 OCT	OCS-2 MAR	OCS-3 MAY	OCS-4 AUG	OCS-6 OCT
Arctinula greenlandica		2	1	4	
Astarte borealis		11	15	5	2
Astarte crenata		1	20	8	10
Astarte montagui	19	57	75	40	35
Cyclocardia crebricostata		2	21	1	6
Liocyma fluctuosa		3	5	7	
Macoma calcarea					
Macoma loveni	2	4	11	6	2
Nucula bellotti	24	37	37	16	10
Portlandia arctica					
Portlandia frigida		4	10	14	7
Thyasira gouldii	13	2	8	3	2

Table 19. Seasonal variability in the abundance of the dominant gammarid amphipods at station PPB-25 (25m). Numbers are totals per $0.5m^2$.

	OCS-1 OCT	OCS-2 MAR	OCS-3 MAY	OCS-4 AUG	OCS-6 OCT
Byblis arcticus	5		3	5	2
Goesia depressa	1		1		
Guernia nordenskjoldi					
Harpinia serrata					
Onisimus litoralis		4	1		2
Paraphoxus oculatus					
Photis reinhardi					
Photis vinogradova					
Podoceropsis inaequistylis				2	
Podoceropsis lindahli					
Protomedeia fasciata					
Tiron spiniferum					
Unciola leucopsis					

Table 20. Seasonal variability in the abundance of the dominant gammarid amphipods at station PPB-55 (55m). Numbers are totals per $0.5m^2$.

	OCS-1 OCT	OCS-2 MAR	OCS-3 MAY	OCS-4 AUG	OCS-6 OCT
Byblis arcticus	17	8	85	58	37
Goesia depressa	19	19	12	1	6
Guernia nordenskjoldi	16	12	38	4	6
Harpinia serrata	27	10	52	53	38
Onisimus litoralis			1		3
Paraphoxus oculatus	17	43	45	11	27
Photis reinhardi	20	8	40		
Photis vinogradova	163	98	210	8	34
Podoceropsis inaequistylis			7	1	
Podoceropsis lindahli	12	10	14		8
Protomedeia fasciata	10	4	13	6	3
Tiron spiniferum	35	15	132		13
Unciola leucopsis	39	182	37	14	27

Table 21. Seasonal variability in the abundance of the dominant gammarid amphipods at station PPB-100 (100m). Numbers are totals per $0.5m^2$.

	OCS-1 OCT	OCS-2 MAR	OCS-3 MAY	OCS-4 AUG	OCS-6 OCT
Byblis arcticus	1	3	4	6	1
Goesia depressa		9	15	4	8
Guernia nordenskjoldi	15	51	121	32	17
Harpinia serrata	20	125	34	41	27
Onisimus litoralis		4		1	61
Paraphoxus oculatus	17	21	8	9	6
Photis reinhardi		46	58	17	41
Photis vinogradova		53	36	68	62
Podoceropsis inaequistylis			88	22	35
Podoceropsis lindahli		4	38	74	54
Protomedeia fasciata	2	21	32	10	24
Tiron spiniferum	1		38	194	53
Unciola leucopsis	17	204	222	84	155

Table 22. Seasonal variability in the abundance of the dominant polychaetous annelids at station PPB-25 (25m). Numbers are totals per $0.5m^2$.

	OCS-1 OCT	OCS-2 MAR	OCS-3 MAY	OCS-4 AUG	OCS-6 OCT
Allia nr suecica	16	91	61	26	13
Apistobranchus tullbergi	2	8	1	12	1
Barantolla sp.					1
Chaetozone setosa	4	34	6	18	4
Chone nr murmanica					
Cossura longocirrata	19	33	13	11	7
Lumbrineris impatiens					
Lysippe labiata					5
Maldane sarsi					4
Micronephthys minuta	88	58	44	61	21
Myriochele heeri					1
Nereimyra aphroditoides				1	
Onuphis quadricuspis					
Pholoe minuta			4	27	2
Polydora caulleryi				1	
Scoloplos acutus	4	4	8	7	10
Sternaspis scutata	56	7	44	10	30
Tauberia gracilis	5	5	2		34
Terebellides stroemi			8	2	16
Tharyx ?acutus	72	126	120	68	99

Table 23 . Seasonal variability in the abundance of the dominant polychaetous annelids at station PPB-55 (55m). Numbers are totals per $0.5m^2$.

	OCS-1 OCT	OCS-2 MAR	OCS-3 MAY	OCS-4 AUG	OCS-6 OCT
Allia nr suecica	15	28	25	31	20
Apistobranchus tullbergi	2	5	3		3
Barantolla sp.	15	21	14	25	20
Chaetozone setosa	65	26	70	52	61
Chone nr murmanica	39	21	59	12	11
Cossura longocirrata	1		1	14	6
Lumbrineris impatiens	26	13	42	1	15
Lysippe labiata	35	31	53	47	13
Maldane sarsi	8	14	21	50	22
Micronephthys minuta	57	43	110	222	52
Myriochele heeri	30	20	35	11	6
Nereimyra aphroditoides	7	10	23	1	1
Onuphis quadricuspis	14	5	9	82	18
Pholoe minuta	124	48	166	102	43
Polydora caulleryi	5	22	53	5	8
Scoloplos acutus	14	2	17	48	46
Sternaspis scutata				24	
Tauberia gracilis				75	1
Terebellides stroemi	71	84	150	85	49
Tharyx ?acutus	33	7	92	287	64

Table 24. Seasonal variability in the abundance of the dominant polychaetous annelids at station PPB-100 (100m). Numbers are totals per $0.5m^2$.

	OCS-1 OCT	OCS-2 MAR	OCS-3 MAY	OCS-4 AUG	OCS-6 OCT
Allia nr suecica	30	11	54	67	22
Apistobranchus tullbergi	22	1	6	3	2
Barantolla sp.	51	20	17	22	6
Chaetozone setosa	12		147	208	133
Chone nr murmanica	14	30	104	114	35
Cossura longocirrata	25	2	3	8	1
Lumbrineris impatiens	31	56	193	172	103
Lysippe labiata	22	46	121	120	75
Maldane sarsi	2	12	20	12	7
Micronephthys minuta	129	86	189	55	50
Myriochele heeri	7	28	36	50	48
Nereimyra aphroditoides	2	2	44	80	6
Onuphis quadricuspis	29	25		4	7
Pholoe minuta	69	71	339	231	134
Polydora caulleryi		85	132	12	9
Scoloplos acutus	48	32	51	39	34
Sternaspis scutata	1				
Tauberia gracilis	40	1	1	1	
Terebellides stroemi	37	40	58	51	39
Tharyx ?acutus	90	65	115	61	33

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D. Macrofaunal species population dynamics.

INTRODUCTION

Analyses of the size-frequency structure of abundant species populations at selected Pitt Point Transect stations have been undertaken to determine knowledge about their life histories. A basic question about the rates, magnitude and frequency of benthic reproduction recruitment and growth arose from earlier OCS and WEBSEC survey studies by RU #006. Large standing stocks of numerically abundant benthos were observed at the edge of the shelf and upper slope down to 700 m depth (Carey et al., 1974; Carey and Ruff, 1977). The benthic abundance was greater than expected in the food poor Beaufort Sea; so it was possible that these were old age and were reproducing and growing slowly. The year-round sampling program on the Pitt Point station line was designed to help answer this question.

By studying the population size-frequency structure of dominant species at standard stations across the shelf, it was possible to determine the pattern of juvenile recruitment to the population and perhaps growth, mortality and production rates if recruitment was discrete in time and identifiable to species.

The whole animal along the greatest dimension or a portion of it strongly correlated with the greatest dimension was measured for each of the selected dominant species of pelecypod mollusc or polychaete worm for each of the sampling periods. For example, the relationship of width to length was very highly correlated for the bivalve Astarte montagui (Figure 13); width was used in those length-frequency plots. Three bivalve species, Nucula belotti, Astarte montagui, and Portlandia arctica and four polychaete species, Microphthys minuta, Pholoe minuta, Terebellides stroemi, and Sternaspis scutata have been measured and are under analysis for life history and growth patterns. Some of these data are summarized in Figures 14 through 20 and 21 through 26 ; Tables 25 and 26.

RESULTS

Though only preliminary analyses of the data are available, Portlandia arctica at 25 m depth appears to recruit into the benthic population over a long period of time - from early spring through late summer. Recruitment of Astarte montagui probably recruits most actively from late spring through late summer. No major episodes of strong delineated recruitment preclude size-frequency modal analysis for estimates of growth and mortality.

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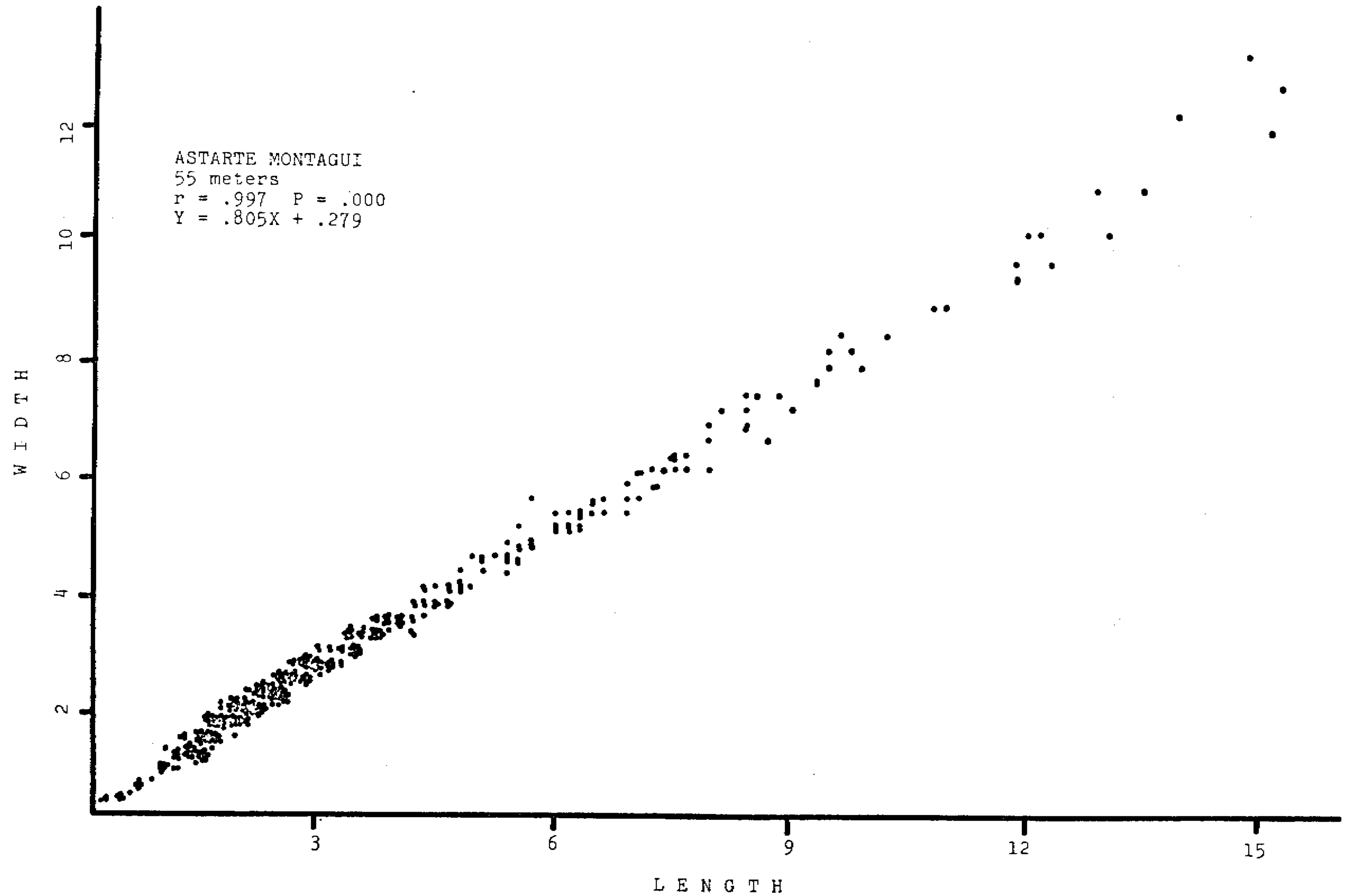

Figure 13. The relationship of shell width to length for the bivalve Astarte montagui. Measurements are in millimeters.

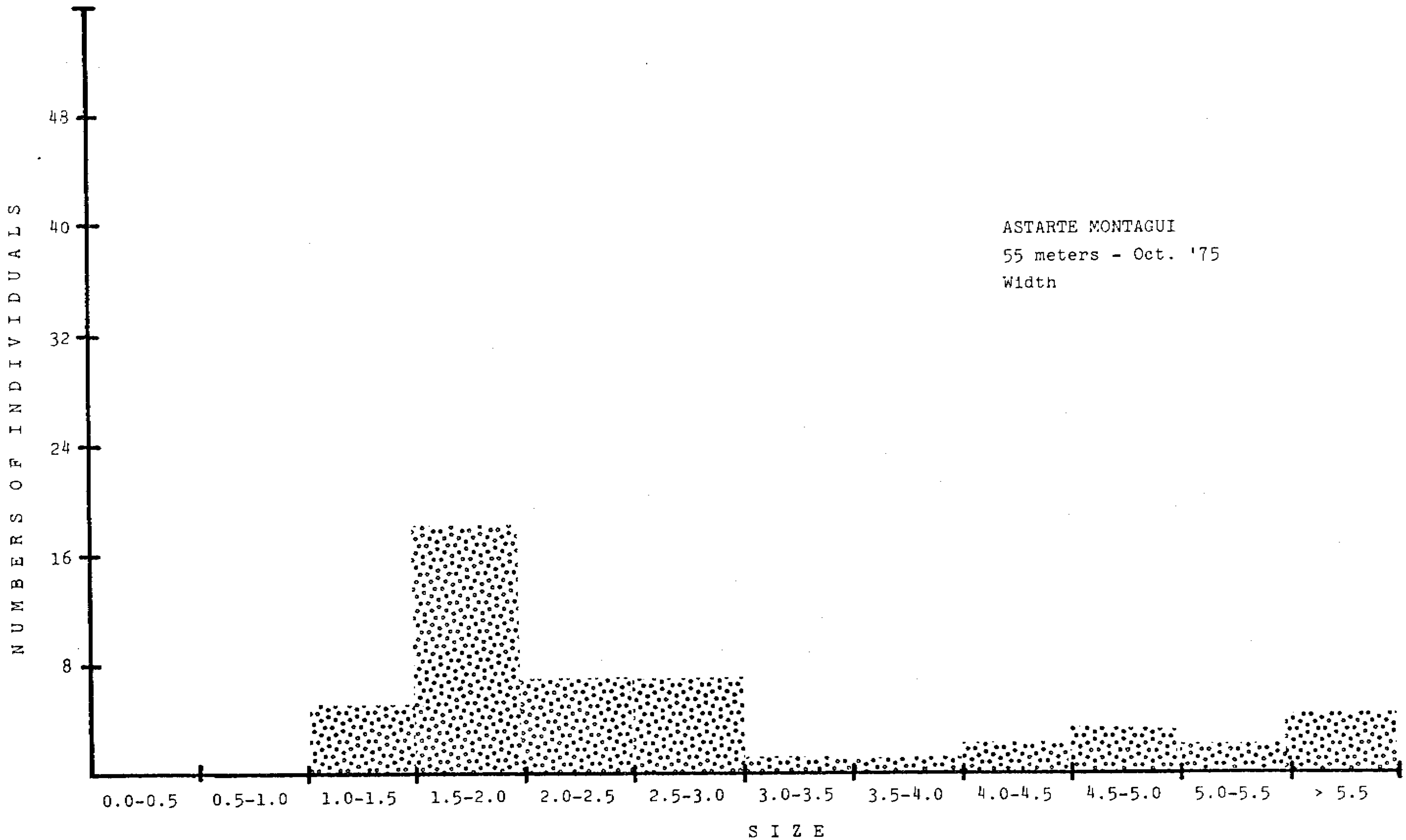

Figure 14. The population size-frequency structure of <u>Astarte montagui</u> at station PPB-55 in October of 1975. Measurements are in millimeters.

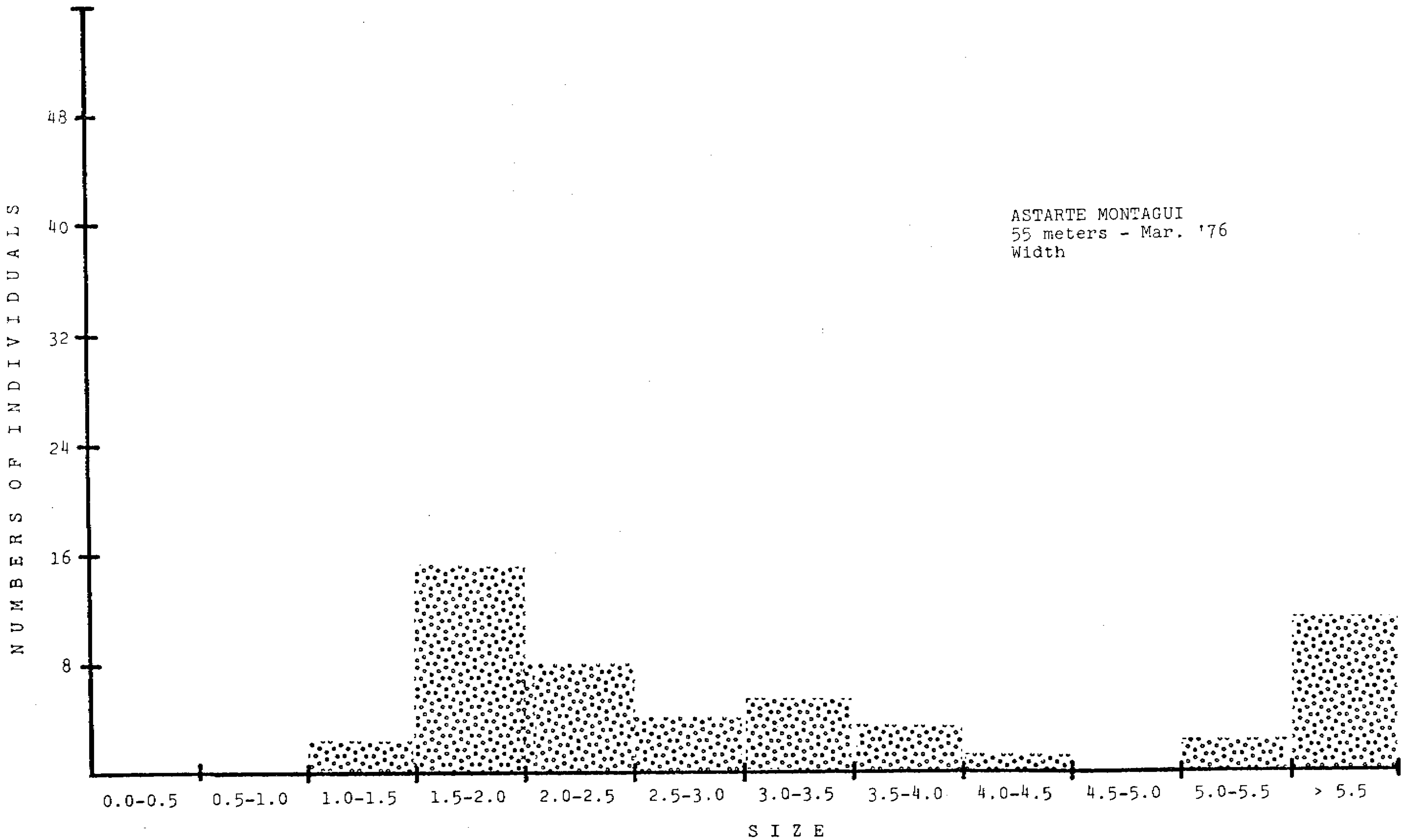

Figure 15. The population size-frequency structure of Astarte montagui at station PPB-55 in March of 1976. Measurements are in millimeters.

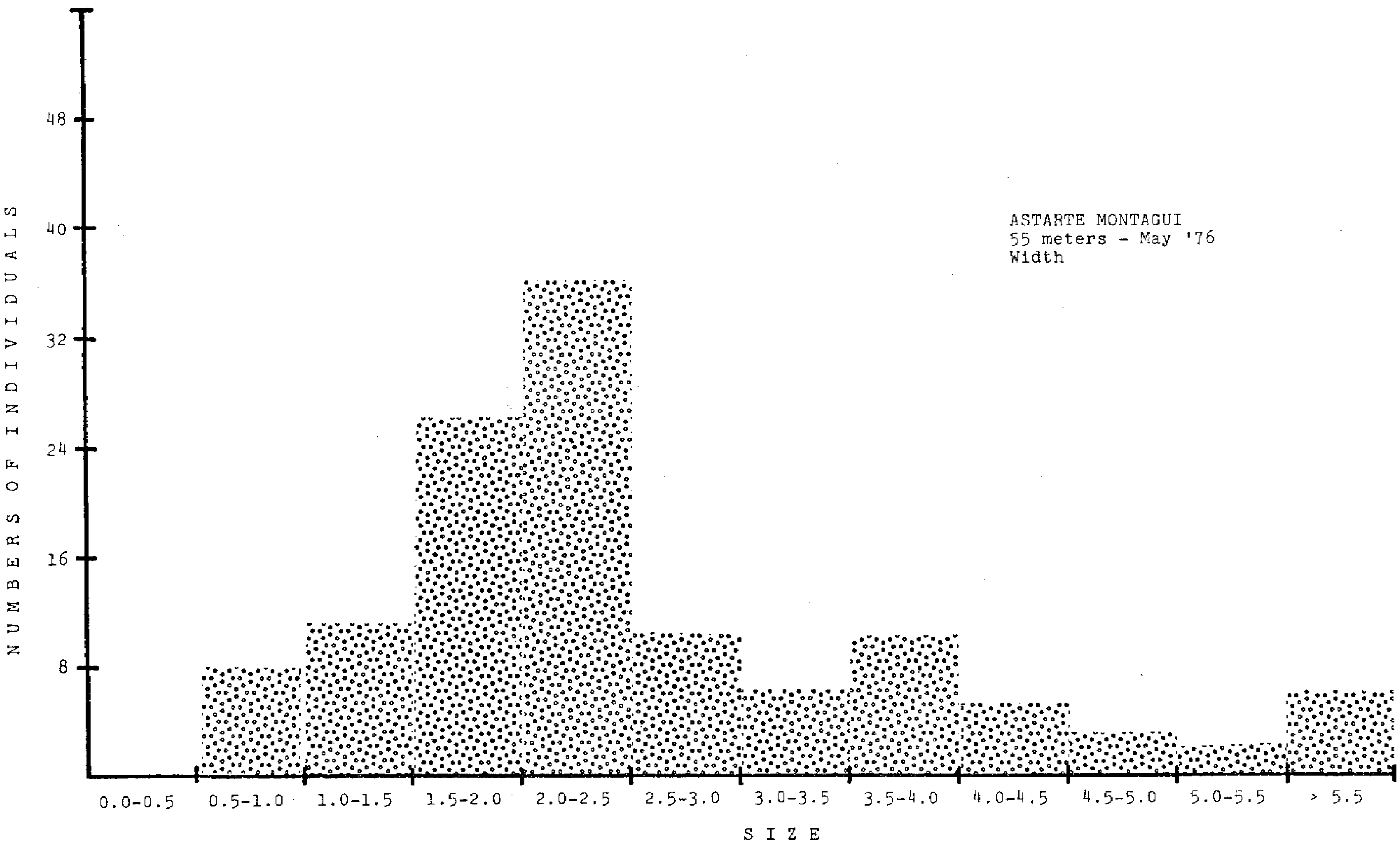

Figure 16. The population size-frequency structure of <u>Astarte montagui</u> at station PPB-55 in May of 1976. Measurements are in millimeters.

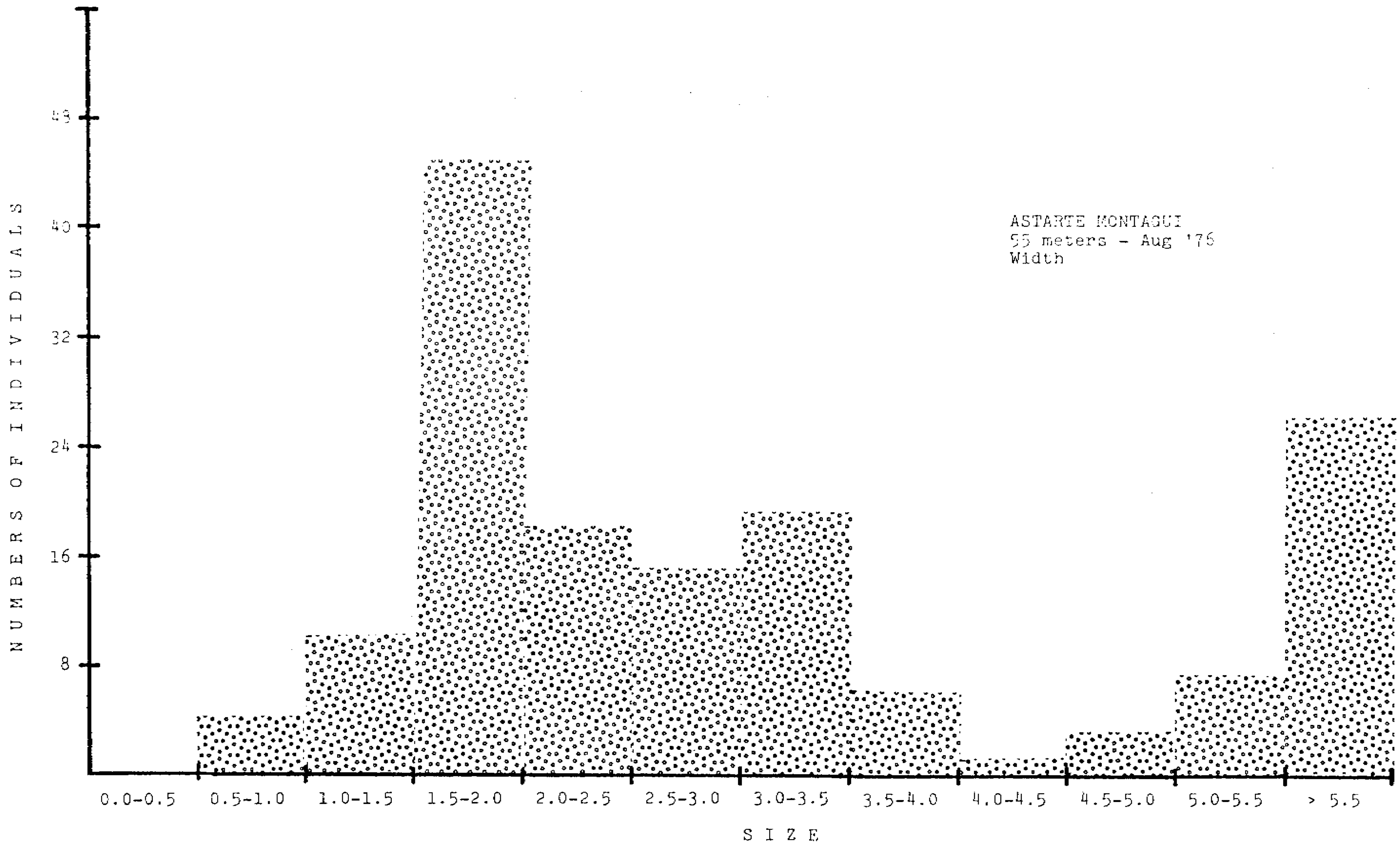

Figure 17. The population size-frequency structure of *Astarte montagui* at station PPB-55 in August 1976. Measurements are in millimeters.

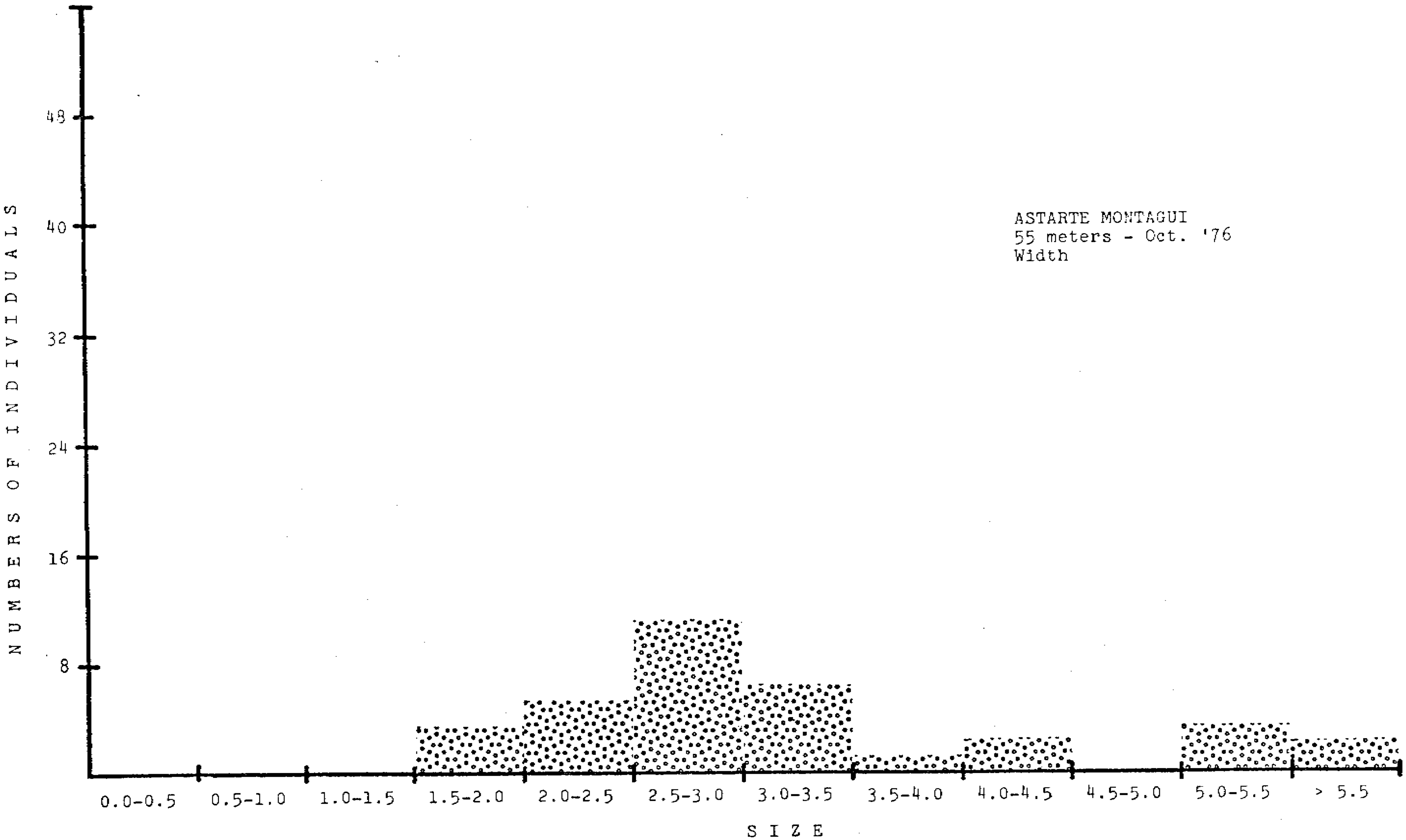

Figure 18. The population size-frequency structure of *Astarte montagui* at station PPB-55 in October 1976. Measurements are in millimeters.

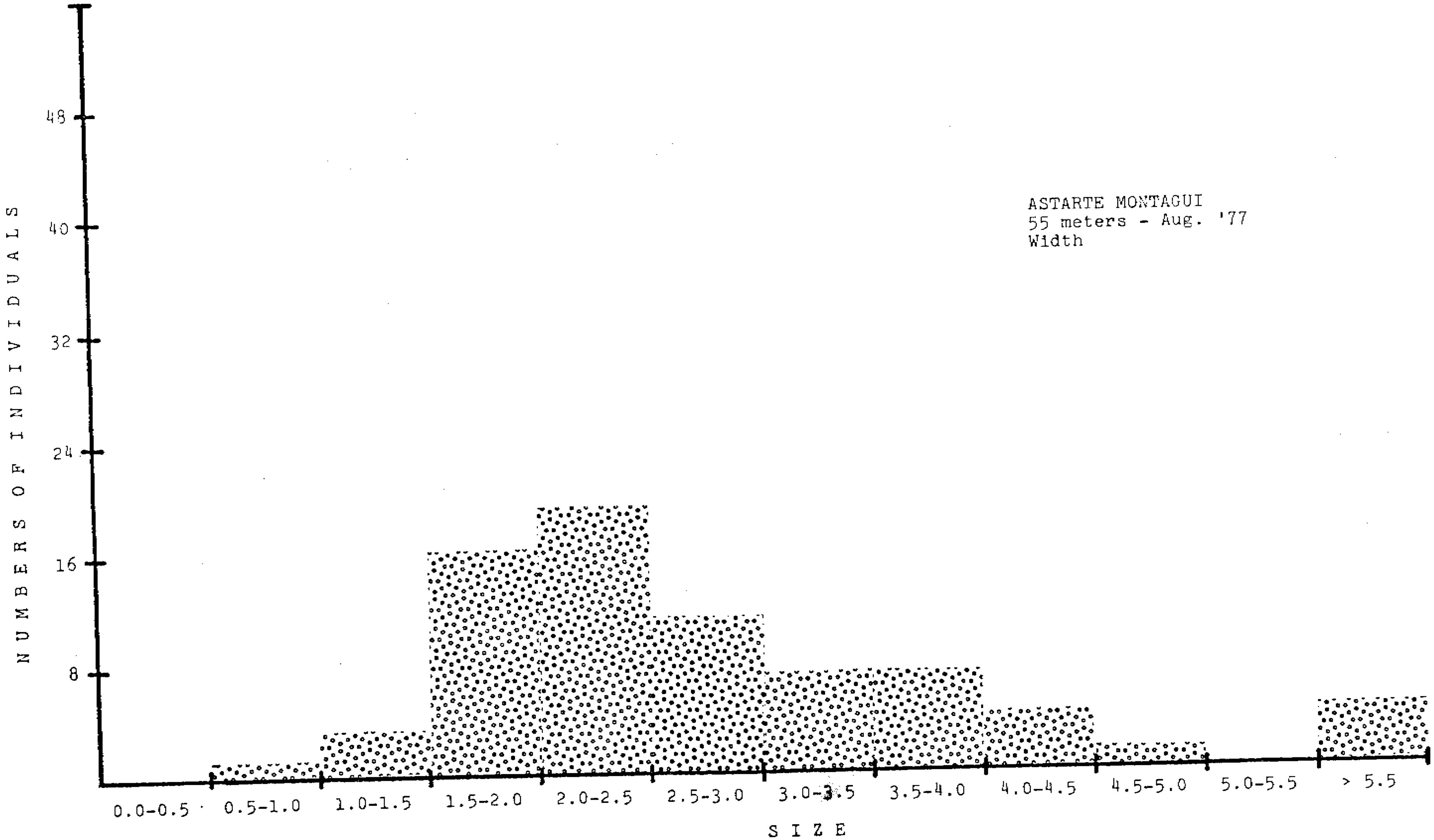

Figure 19. The population size-frequency structure of Astarte montagui at station PPB-55 in August 1977. Measurements are in millimeters.

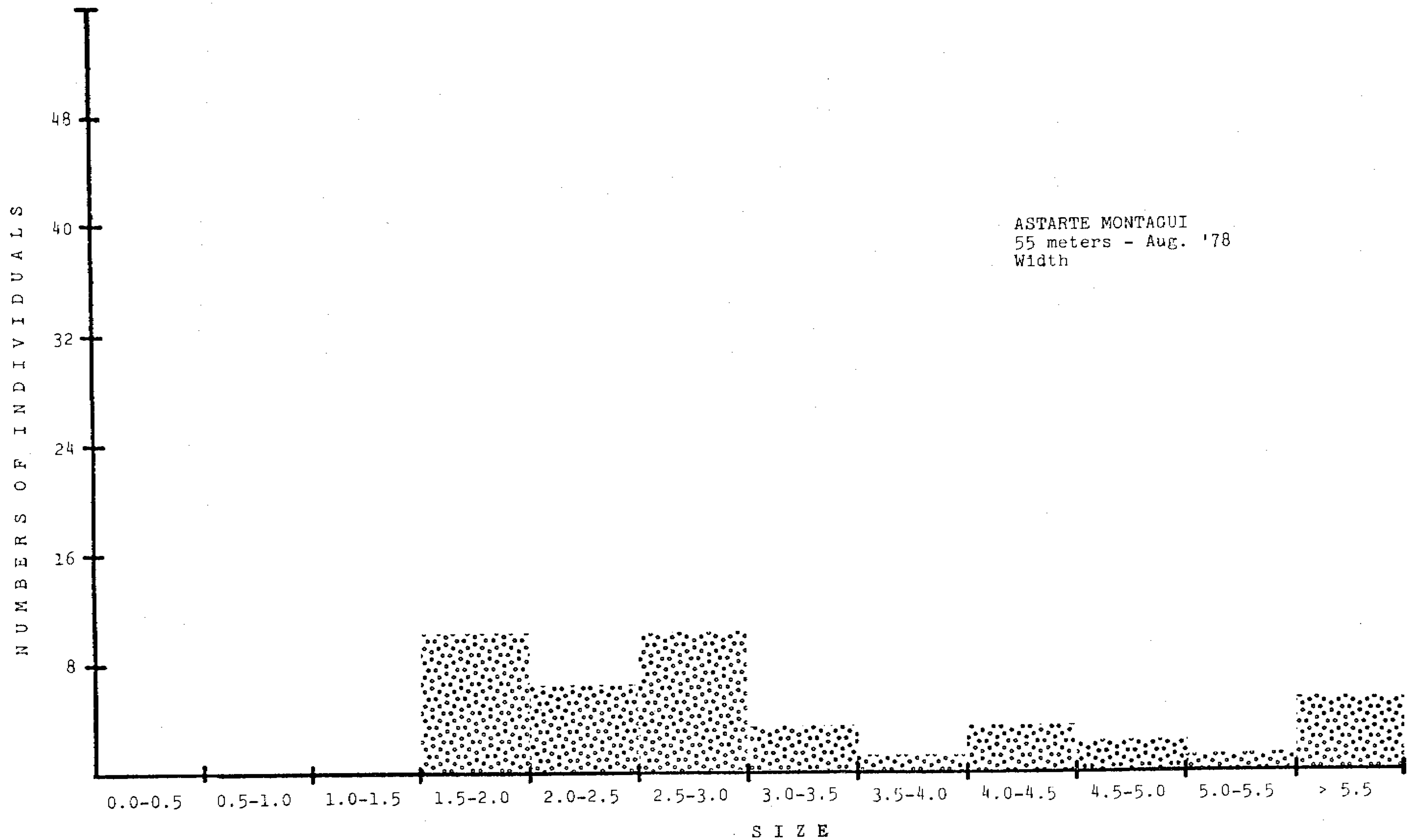

Figure 20. The population size-frequency structure of _Astarte montagui_ at station PPB-55 in August 1978. Measurements are in millimeters.

Table 25. Relative size frequency (%) of Astarte montagui from 55 meters along the Pitt Point Transect.

Size Class	October 1975	March 1976	May 1976	August 1976	October 1976	August 1977	August 1978
0.0–0.5 mm							
0.5–1.0			5.7	2.6		1.4	
1.0–1.5	10.0	4.0	9.0	6.5		4.1	
1.5–2.0	36.0	30.0	21.3	29.2	9.1	21.9	24.4
2.0–2.5	14.0	14.0	29.5	11.7	15.2	26.0	14.6
2.5–3.0	14.0	8.0	8.2	9.7	33.3	15.1	24.4
3.0–3.5	2.0	10.0	11.9	12.3	18.2	9.6	7.3
3.5–4.0	2.0	6.0	8.2	3.9	3.0	9.6	2.4
4.0–4.5	4.0	2.0	4.1	0.6	6.1	5.5	7.3
4.5–5.0	6.0		2.5	1.9		1.4	4.9
5.0–5.5	4.0	4.0	1.6	4.5	9.1		2.4
> 5.5	8.0	22.0	4.9	16.9	6.1	5.5	12.2

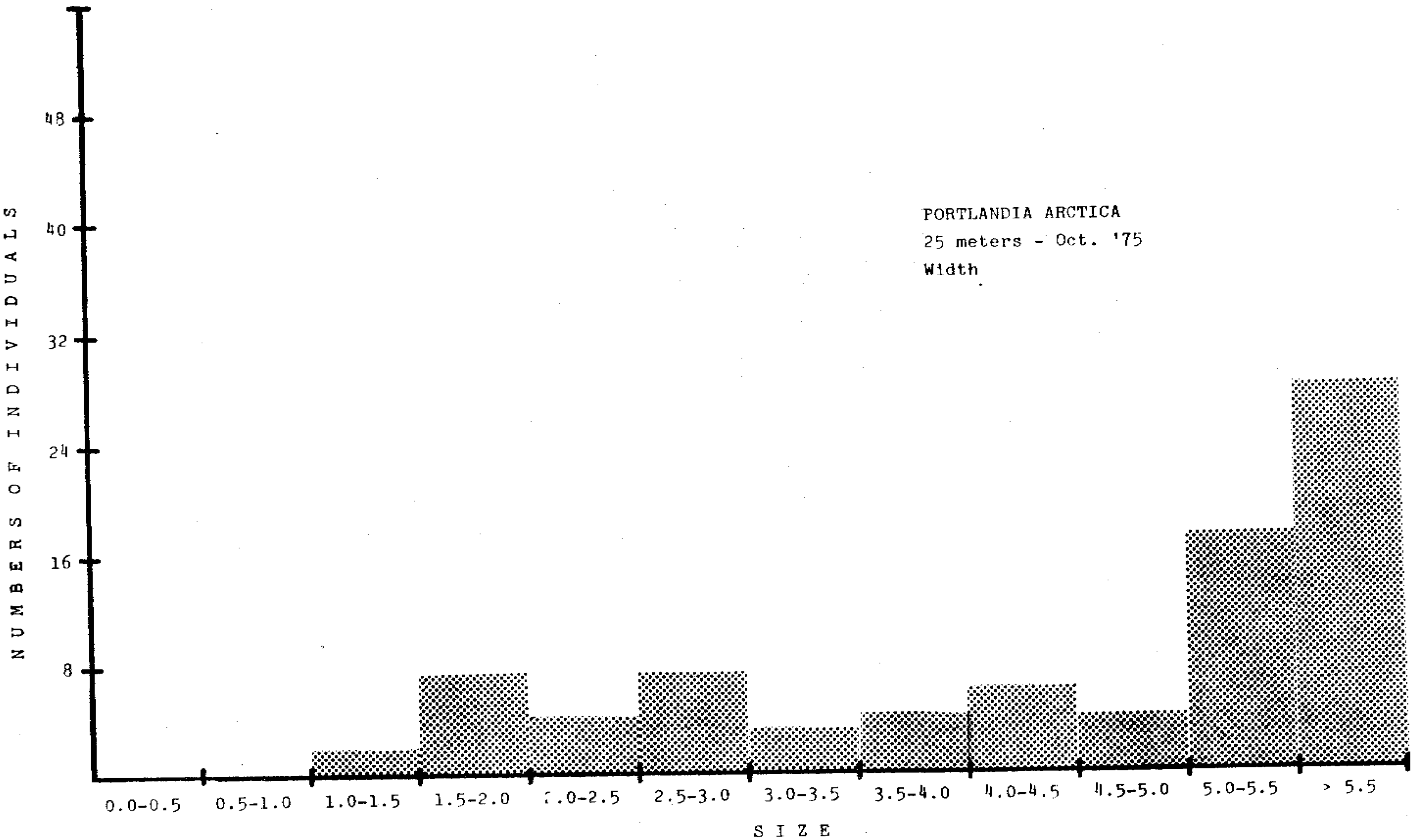

Figure 21. The population size-frequency structure of *Portlandia arctica* at station PPB-25 in October of 1975. Measurements are in millimeters.

Figure 22. The population size-frequency structure of Portlandia arctica at station PPB-25 in March of 1976. Measurements are in millimeters.

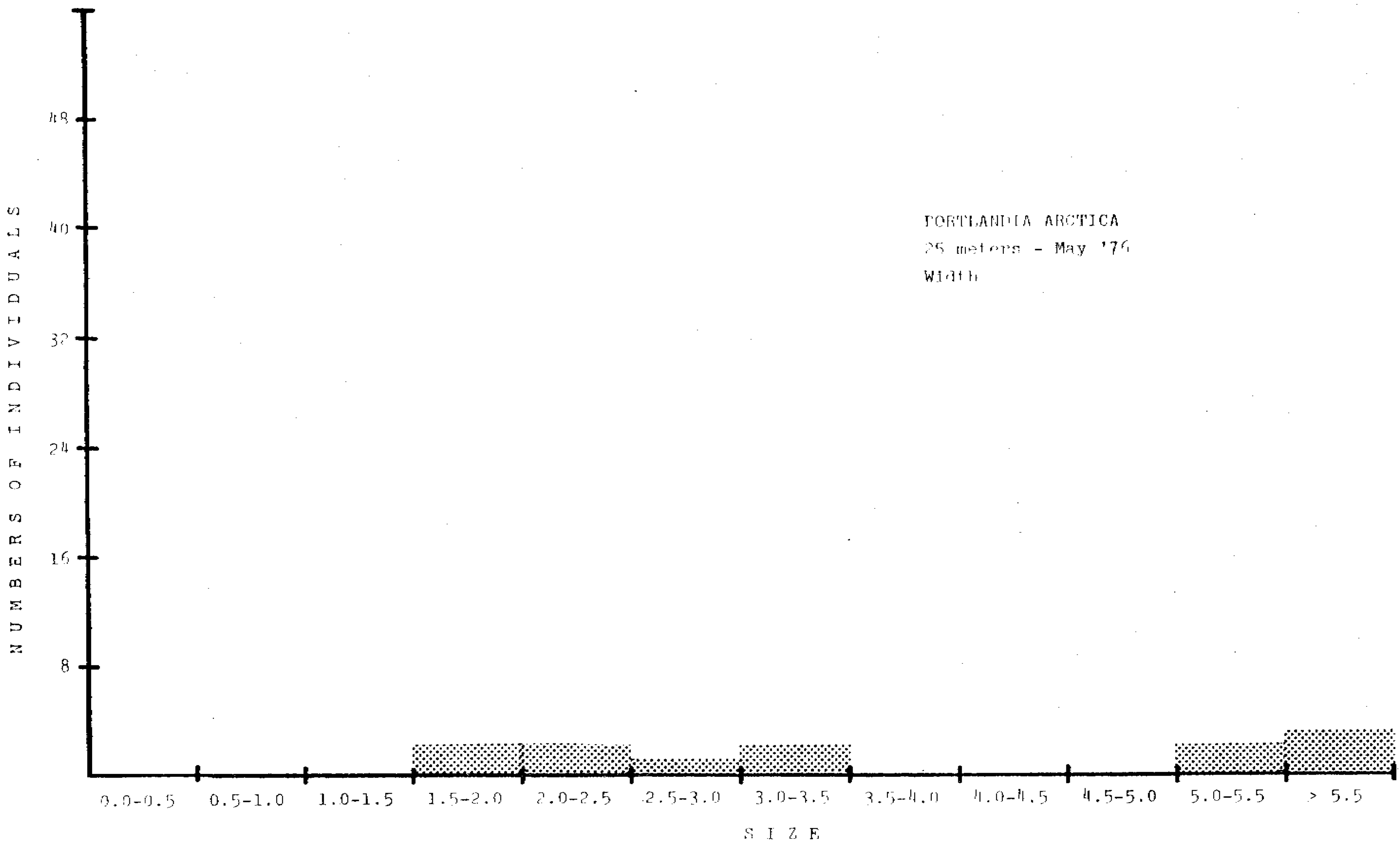

Figure 23. The population size-frequency structure of Portlandia arctica at station PPB-25 in May of 1976. Measurements are in millimeters.

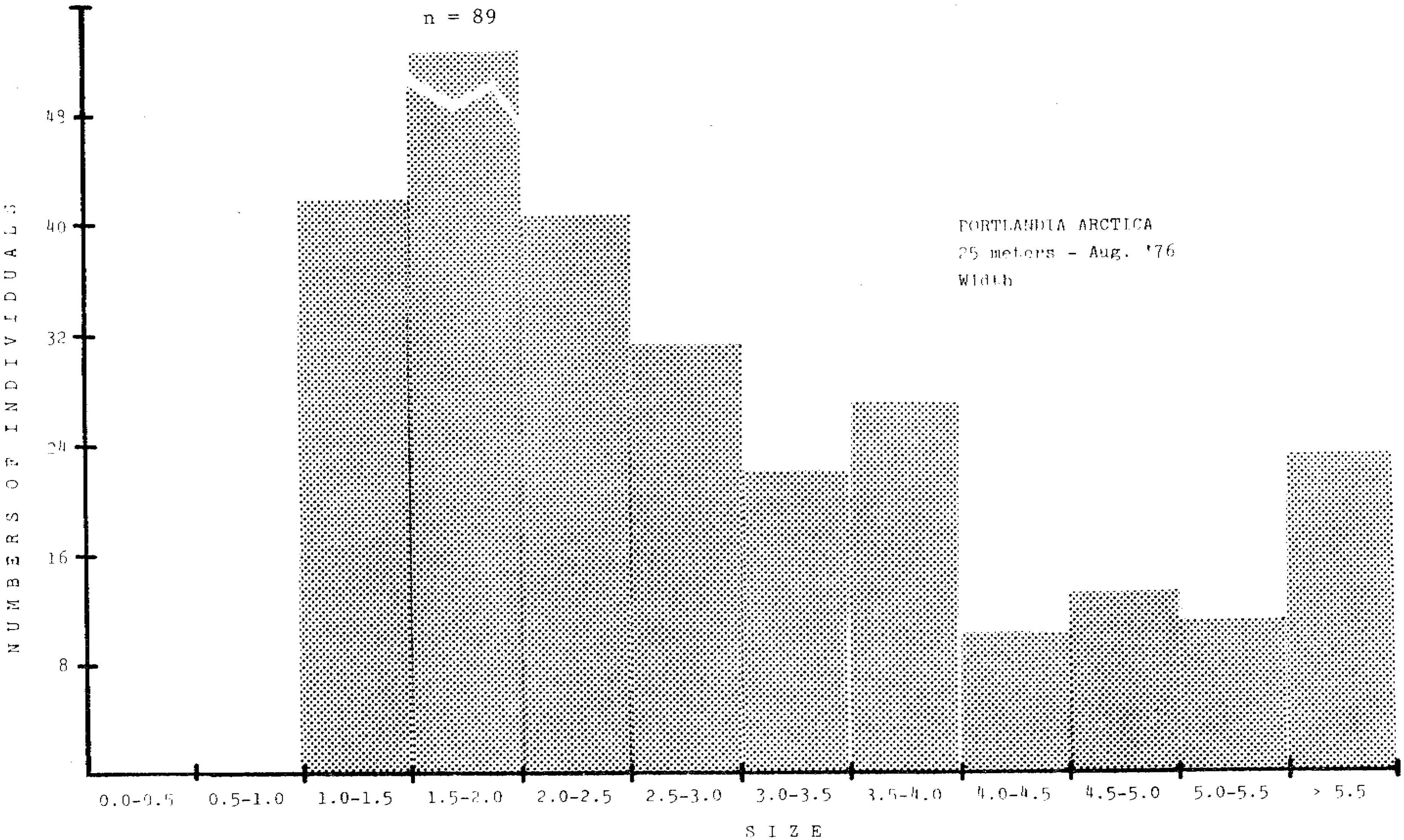

Figure 24. The population size-frequency structure of Portlandia arctica at station PPB-25 in August of 1976. Measurements are in millimeters.

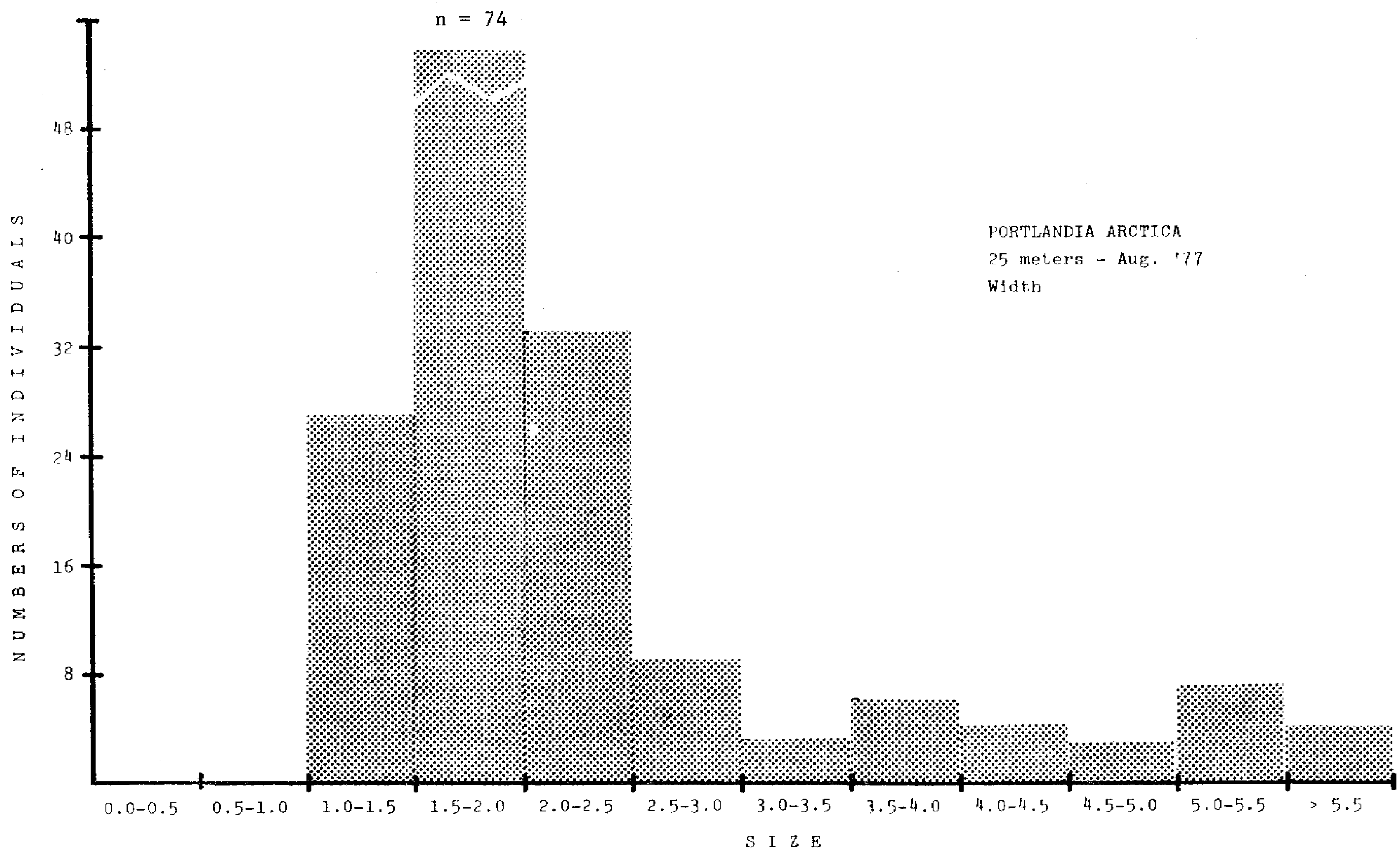

Figure 25. The population size-frequency structure of Portlandia arctica at station PPB-25 in August of 1977. Measurements are in millimeters.

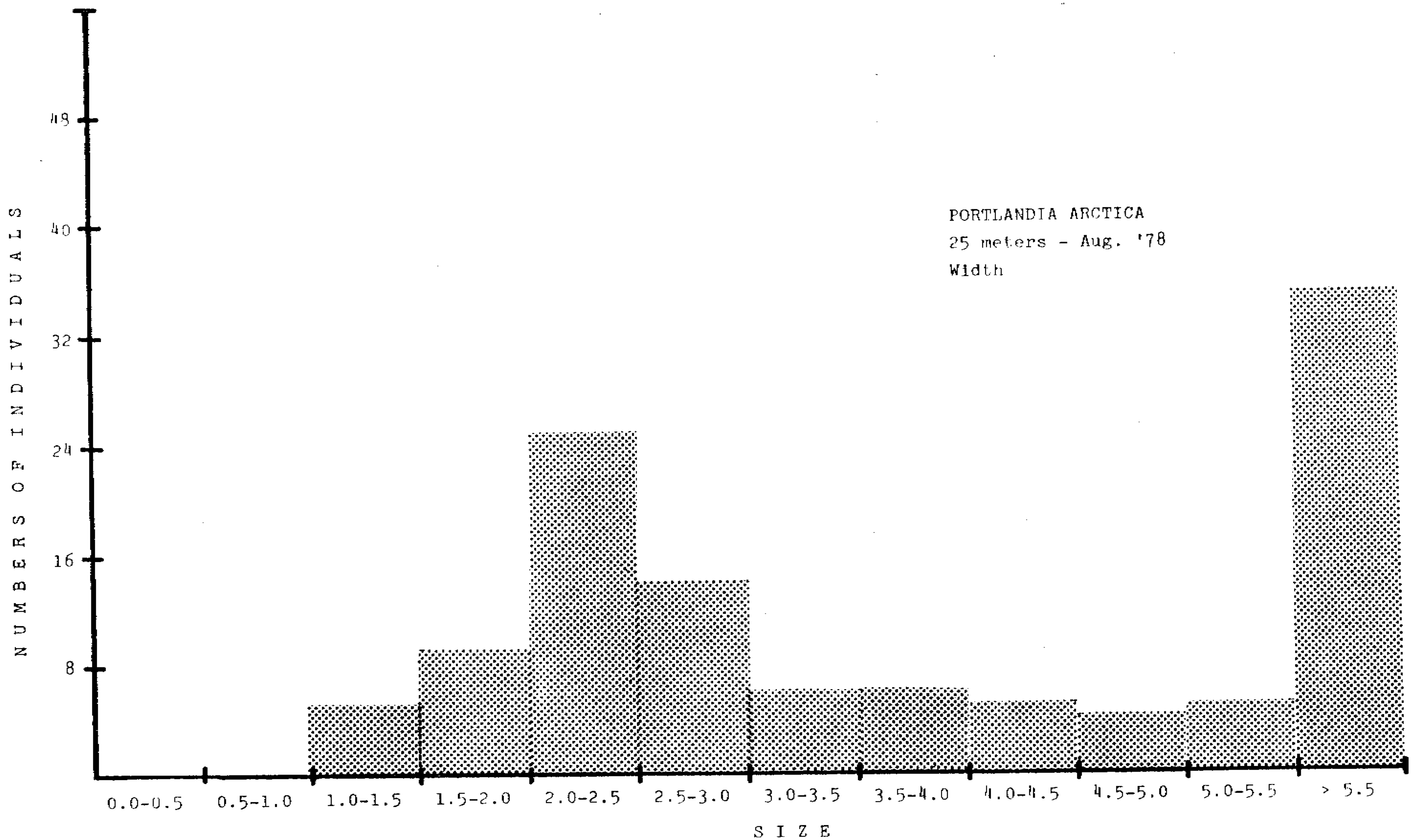

Figure 26. The population size-frequency structure of Portlandia arctica at station PPB-25 in August of 1978. Measurements are in millimeters.

Table 26. Relative size frequency (%) of _Portlandia arctica_ from 25 meters along the Pitt Point Transect.

Size Class	October 1975	March 1976	May 1976	August 1976	October 1976	August 1977	August 1978
0.0-0.5 mm							
0.5-1.0							
1.0-1.5	2.4	10.9		13.6		15.9	4.4
1.5-2.0	8.5	21.9	16.7	28.8		43.5	7.9
2.0-2.5	4.9	4.7	16.7	13.3		19.4	21.9
2.5-3.0	8.5	9.4	8.3	10.0		5.3	12.3
3.0-3.5	3.7	9.4	16.7	7.1		1.8	5.3
3.5-4.0	4.9	3.1		8.7		3.5	5.3
4.0-4.5	7.3	4.7		3.2		2.4	4.4
4.5-5.0	4.9	6.3		4.2		1.8	3.5
5.0-5.5	20.7	12.5	16.7	3.7		4.1	4.4
> 5.5	34.1	17.2	25.0	7.4		2.4	30.7

E. Yearly Variability of Macrobenthos, Standard OCS Pitt Point Transect Line.

Seasonal and yearly time series samples have been collected by RU #006 from 5 stations on the OCS Pitt Point Transect for the purpose of defining natural temporal variability across the southwestern Beaufort Sea continental shelf. As it is evident from studies on benthos elsewhere that benthic community structure can change markedly from one season to another and from one year to another, yearly quantitative samples have been collected from the southwestern Beaufort Sea to determine the magnitude of yearly change of the benthic macrofauna.

The standard (RU #006) Pitt Point stations (PPB) at 25, 40, 55, 70 and 100 meters depth were sampled by 0.1 m^2 Smith-McIntyre grab during August from the USCGC GLACIER in 1976, 1977 and 1978. Position and depth were used as the criteria for station location. Five to ten grab samples were collected at each location during each cruise. Ten samples were generally obtained at PPB-25 and 40 where the population densities were low, while five were obtained at the other locations. The samples were retained only if they were undisturbed and if they contained at least 5.5 l of sediment. They were washed through a new cascading multiple sieve system (Carey et al., unpublished) with a minimum screen size of 0.42 mm. In the laboratory the macrofauna larger than 1.0 mm in size were picked from the samples under a dissecting microscope and sorted into major categories. The numerical densities for the major taxa have been summarized in Tables 27 through 29 and in Figures 27 through 29.

RESULTS

The total numbers and total species numbers of amphipods and bivalves do not change significantly from one year to the next from 1976-1978 (Table 30). Species diversity as determined by expected species for each station also does not vary significantly from 1976 through 1978. A preliminary analysis of the abundance of the top 25 species of pelecypods and 24 species of polychaetes indicates no marked changes over the three year period. Rank order of abundance indicates changes in the dominant species during the study period, but generally dominant species tend to remain in the top three or four.

Figure 27 . Yearly variability of pelecypod molluscs from Pitt Point 25 meters. Biomass is given as wet weight in grams of the total molluscan fauna. Samples were collected in August-September of 1976, 1977 and 1978.

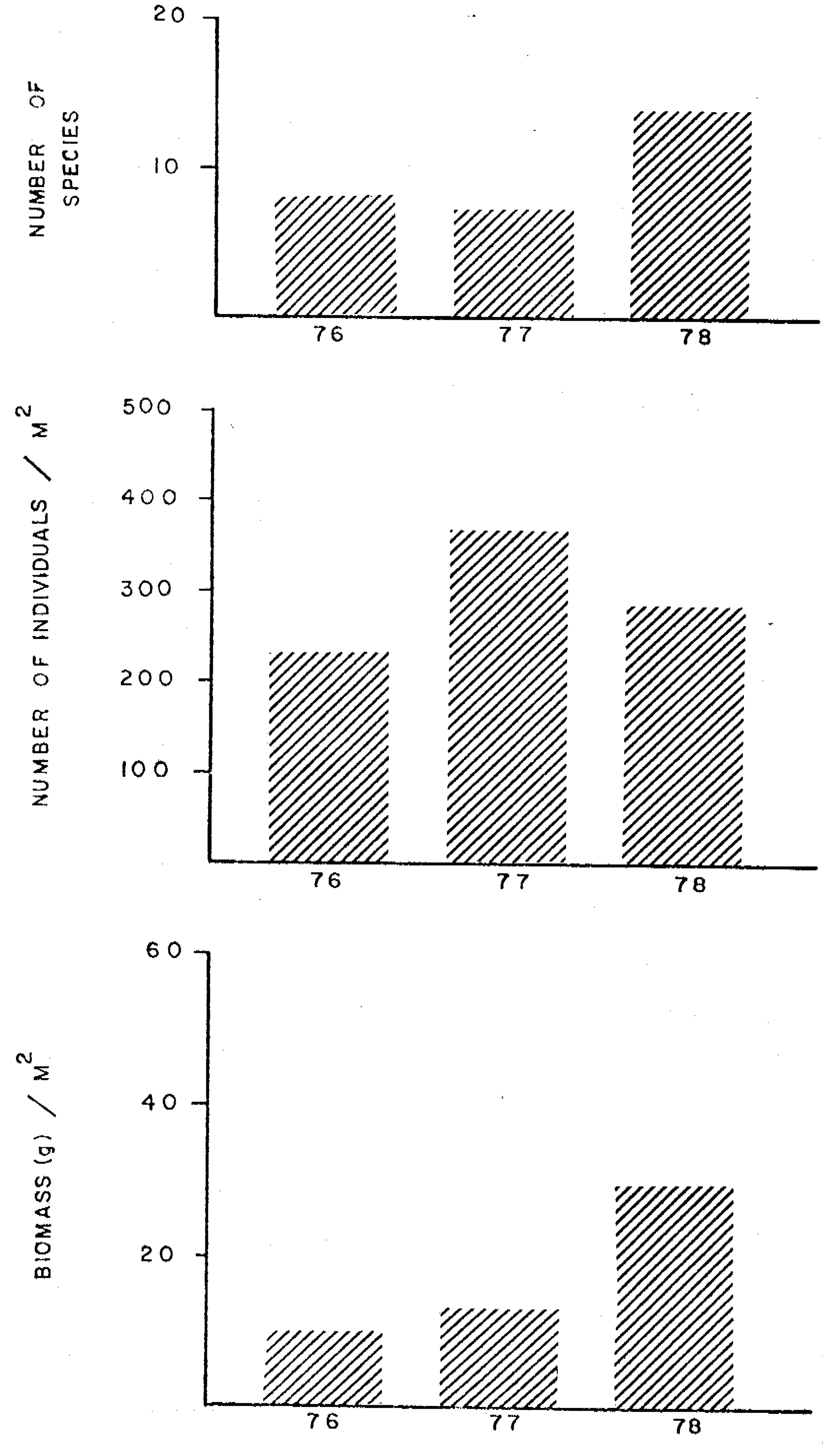

Figure 28. Yearly variability of pelecypod molluscs from Pitt Point 55 meters. Biomass is given as wet weight in grams of the total molluscan fauna. Samples were collected in August-September of 1976, 1977 and 1978.

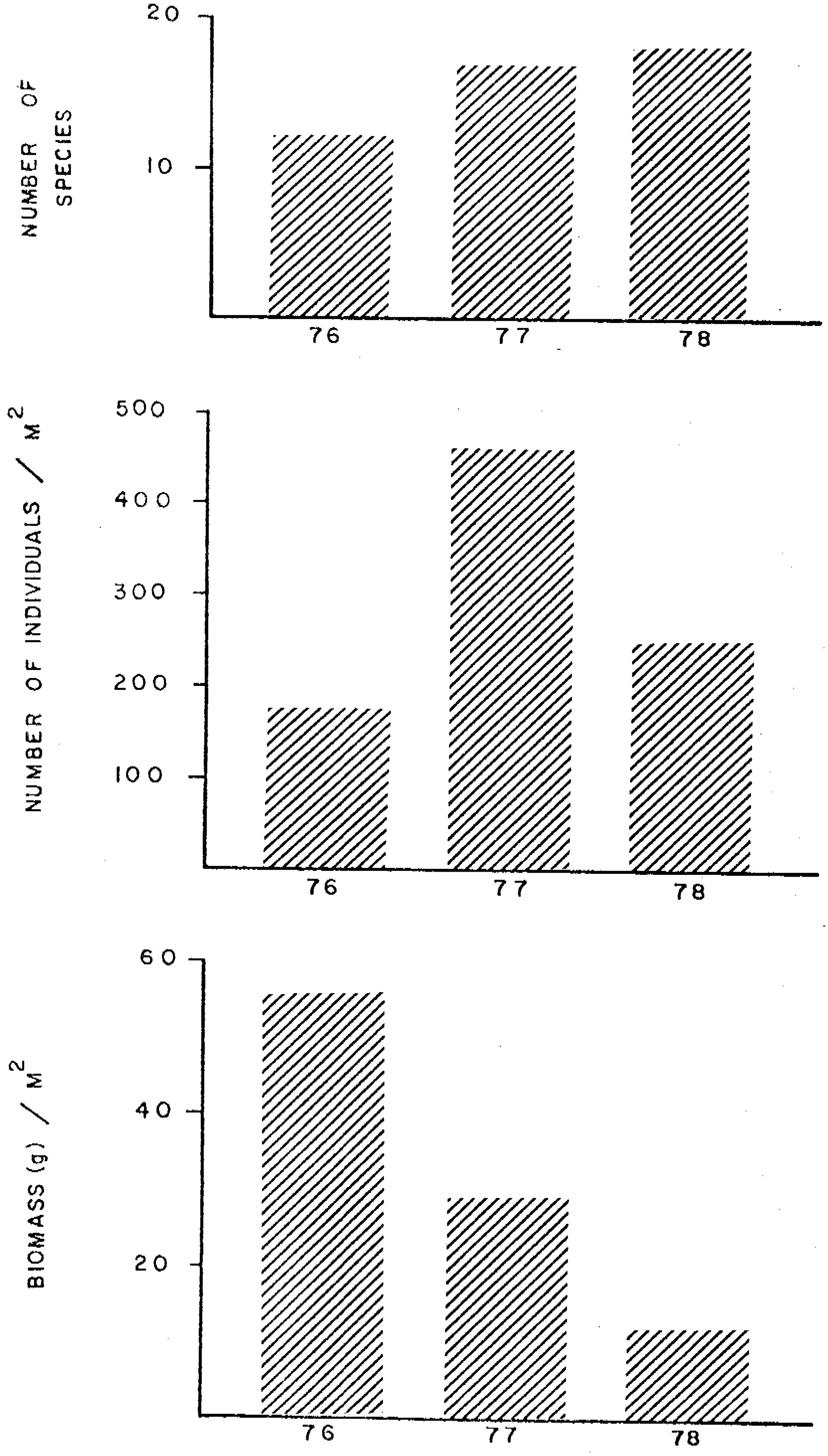

Figure 29. Yearly variability of pelecypod molluscs from Pitt Point 100 meters. Biomass is given as wet weight in grams of the total molluscan fauna. Samples were collected in August-September of 1976, 1977 and 1978.

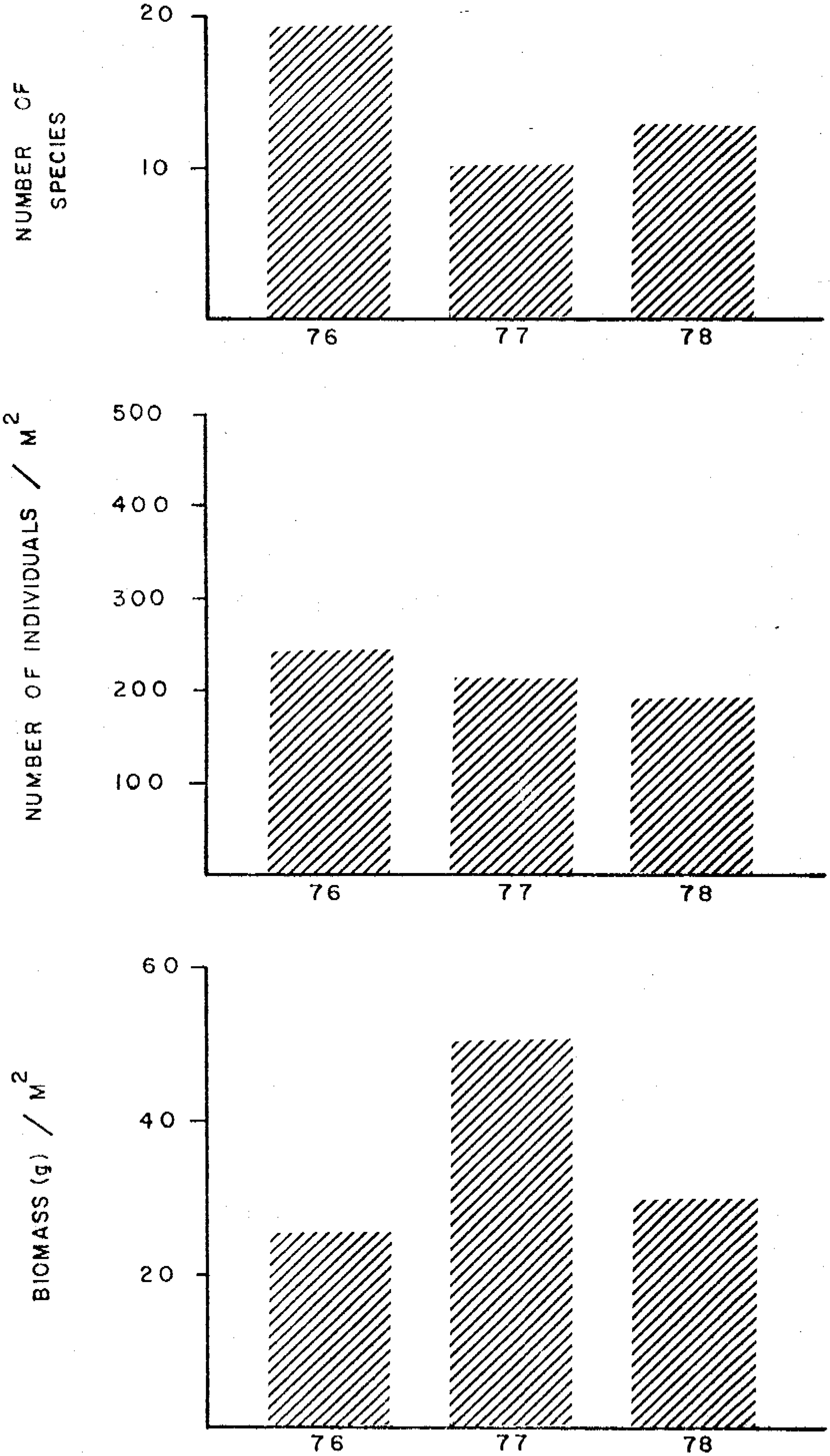

Table 27. Yearly variability of pelecypod mollusc rank/order abundance (per $0.5m^2$) at Pitt Point 25 meters. Samples were collected in August-September of 1976, 1977 and 1978.

	1976	1977	1978
Portlandia arctica	98	127	114
Nucula bellotii	8	3	4
Macoma calcarea	4	13	2
Pandora glacialis	3	1	2
Nuculana radiata	--	--	9
Liocyma fluctuosa	--	--	3
Musculus niger	--	1	--
Musculus discors	1	--	1
Musculus corrugatus	1	--	--
Dacrydium vitreum	1	--	--
Axinopsida orbiculata	1	--	2
Macoma moesta	--	1	2
Arctinula greenlandica	--	--	1
Lyonsia arenosa	--	--	1
Thracia myopsis	--	--	1
TOTAL	117	146	142

Table 28. Yearly variability of pelecypod mollusc rank/order abundance (per $0.5m^2$) at Pitt Point 55 meters. Samples were collected in August-September of 1976, 1977 and 1978.

	1976	1977	1978
Astarte montagui	44	76	41
Portlandia frigida	--	49	26
Nucula bellotii	11	19	8
Cyclocardia crebricostata	2	38	9
Astarte borealis	4	--	4
Musculus discors	--	2	7
Nuculana radiata	--	14	3
Nuculana pernula	2	--	3
Nuculana minuta	--	3	2
Astarte crenata	--	4	4
Macoma calcarea	3	3	--
Macoma loveni	--	2	1
Liocyma fluctuosa	4	--	3
Thracia myopsis	--	2	1
Arctinula greenlandica	--	4	1
Pandora glacialis	--	2	1
Lyonsia arenosa	--	1	3
Thyasira gouldii	7	--	--
Axinopsida orbiculata	--	3	--
Boreacola vadosa	3	--	--
Thracia devexa	3	--	--
Yoldia hyperborea	1	--	--
Mysella tumida	1	--	--
Dacrydium vitreum	--	2	--
Serripes groenlandicus	--	3	--
TOTAL	85	227	117

Table 29. Yearly variability of pelecypod mollusc rank/order abundance (per $0.5m^2$) at Pitt Point 100 meters. Samples were collected in August-September of 1976, 1977 and 1978.

	1976	1977	1978
Astarte montagui	33	36	26
Nucula bellotii	14	35	29
Astarte borealis	4	5	4
Thyasira gouldii	1	3	4
Macoma loveni	5	2	2
Nuculana radiata	1	2	--
Mysella planata	--	17	--
Cyclocardia crebricostata	1	--	3
Portlandia frigida	11	--	1
Musculus discors	9	--	3
Astarte crenata	7	--	3
Mysella tumida	--	2	1
Nuculana minuta	7	--	--
Nuculana pernula	1	--	--
Dacrydium vitreum	3	--	--
Arctinula greenlandica	4	--	--
Liocyma fluctuosa	6	--	--
Hiatella arctica	1	--	--
Periploma aleutica	--	3	--
Pandora glacialis	1	--	--
Thracia devexa	1	--	--
Thracia myopsis	2	--	--
Cyclocardia crassidens	2	--	--
Macoma inflata	1	--	--
TOTAL	115	105	76

Table 30. Annual changes in the rank order of abundance of the dominant bivalves at stations along the Pitt Point Transect. Numbers are totals per $0.5m^2$.

Station	OCS-4 Aug 1976		OCS-7 Aug 1977		OCS-8 Aug 1978	
PPB-25 25m	*Portlandia arctica*	307	*Portlandia arctica*	166	*Portlandia arctica*	114
	Nucula bellotti	18	*Macoma calcarea*	15	*Nuculana radiata*	9
	Macoma calcarea	12	*Nucula bellotti*	4	*Nucula bellotti*	4
	Pandora glacialis	7	*Pandora glacialis*	2	*Macomq calcarea*	3
			Portlandia lenticula	2	*Liocyma fluctuosa*	3
PPB-55 55m	*Astarte montagui*	146	*Astarte montagui*	73	*Astarte montagui*	41
	Nucula bellotti	53	*Portlandia frigida*	49	*Portlandia frigida*	26
	Thyasira gouldii	33	*Cyclocardia crebricostata*	38	*Cyclocardia crebricostata*	9
	Astarte borealis	20	*Nucula bellotti*	19	*Nucula bellotti*	8
PPB-55 100m	*Astarte montagui*	40	*Astarte montagui*	35	*Nucula bellotti*	29
	Nucula bellotti	16	*Nucula bellotti*	35	*Astarte montagui*	26
	Portlandia frigida	14	*Montacuta sp. A*	14	*Astarte borealis*	11
	Musculus discors	13	*Astarte borealis*	6	*Thyasira gouldii*	4
					Macoma sp.	4

Table 31. Annual changes in the rank order of abundance of the dominant polychaetes at stations along the Pitt Point Transect. Numbers are totals per $0.5m^2$.

	OCS-4 Aug 1976		OCS-7 Aug 1977		OCS-8 Aug 1978	
PPB-25 25m	*Tharyx ?acutus*	68	*Micronephthys minuta*	58	*Tharyx ?acutus*	43
	Micronephthys minuta	61	*Tharyx ?acutus*	51	*Sternaspis scutata*	35
	Pholoe minuta	27	*Sternaspis scutata*	46	*Micronephthys minuta*	25
	Allia nr suecica	26	*Apistobranchus tullbergi*	35	*Allia nr suecica*	10
	Chaetozone setosa	18	*Allia sp. B*	31	*Ophelina cylindricaudatus*	8
					Prionospio steenstrupi	8
PPB-55 55m	*Tharyx ?acutus*	287	*Terebellides stroemi*	129	*Polydora caulleryi*	166
	Micronephthys minuta	222	*Pholoe minuta*	119	*Terebellides stroemi*	85
	Pholoe minuta	102	*Polydora caulleryi*	73	*Pholoe minuta*	75
	Terebellides stroemi	85	*Chone nr murmanica*	59	*Barantolla sp.*	30
	Onuphis quadricuspis	82	*Lysippe labiata*	52	*Chaetozone setosa*	27
PPB-100 100m	*Pholoe minuta*	231	*Micronephthys minuta*	186	*Micronephthys minuta*	74
	Chaetozone setosa	208	*Tharyx ?acutus*	129	*Barantolla sp.*	63
	Lumbrineris impatiens	172	*Barantolla sp.*	91	*Lumbrineris impatiens*	54
	Lysippe labiata	120	*Lumbrineris sp. X*	84	*Pholoe minuta*	51
	Chone nr murmanica	114	*Scoloplos acutus*	65	*Chaetozone setosa*	46

F. Sea ice community

INTRODUCTION

Sea ice as a firm and vertically stable environment with a productive algal community during the spring months can provide a solid substrate and a food source for benthic fauna. Both these characteristics of sea ice could have important effects on the benthos either *in situ* or as organisms associated with the ice undersurface.

The underice diatom bloom is known to exist in coastal waters in the Chukchi Sea off Barrow, AK (Horner and Alexander, 1972) in Stefansson Sound and just offshore of Narwhal Island in the southwestern Beaufort Sea (Horner, 1981) and in the Eskimo Lakes, an estuarine inlet from the eastern Beaufort Sea (Grainger, 1975). Though its areal extent either in coastal waters or offshore over the continental shelf is not known, it has been suggested that these epontic diatoms could be an important energy source to the southern Beaufort Sea ecosystem (Clasby et al., 1976) and for the Chukchi Sea (Hameedi, 1978). The pennate diatoms may fall to the sea floor upon ice melt in June (Matheke and Horner, 1974). There are very few ice algae data from the Beaufort Sea and no direct measurements to determine if the epontic diatoms fall to the bottom during ice melt. It is not resolved whether the ice algae add to the phytoplankton population (Hameedi, 1978) or fall to the sea floor (Matheke and Horner, 1974).

Of particular interest is the source of carbon that fuels the heterotrophic organisms living within the system. In lower latitude oceanic waters most of the carbon fixed by photosynthesis is ultimately derived from the phytoplankton, but in coastal waters much of the organic material may be land-derived. Water acts as a three dimensional reservoir and transporter of living and non-living organic carbon. The carbon cycle is a complex one that involves a web of interacting organisms. The benthos as an ecological group depend to a large extent on detritus that falls down to them. In the ice-covered waters of the Arctic, the epontic diatoms on the undersurface of the sea ice is an added source of carbon to the system (Horner, 1976), and in shoal waters benthic algae add to the primary production (Matheke and Horner, 1974). In the coastal Beaufort Sea and its bordering lagoons detrital peat from the coastal erosion may also add carbon.

It is most pertinent to note that Schell (RU #537) measured substantial concentrations of chlorophyl on the undersurface of the Beaufort Sea ice to distances of 100 n mi offshore (personal communication). The existence of the algal epontic community in oceanic waters in the Beaufort Sea suggests that primary production in this community is indeed energetically important to the total Beaufort Sea ecosystem. The questions of the fate of the organic particulates associated with the epontic community and the degree of interaction between the benthic and underice surfaces become that much more pressing.

Various organisms become associated with the ice-sea water interface as the diatom bloom progresses through the months of April, May and June (Horner, 1976). Nematode worms are most abundant but harpacticoid copepods, amphipods and polychaete larvae have been observed on the underice surface. A coastal amphipod *Onisimus affinis*, an important member of the demersal fish food chain, has been reported as migrating up to the epontic community presumably to feed (Percy, 1975).

The degree of linkage between the underice epontic community and the benthic community beneath is not known. There is no direct evidence that this "upside down benthic community" is important in the energetics of the bottom communities themselves (Horner, 1976; Hameedi, 1978). It has been hypothesized that the sinking of detritus and diatom cells from the epontic community could provide a sizeable downward organic input to the benthic communities and that the vertical migration of benthic fauna up to the ice undersurface could provide another significant and earlier source of energy-rich organics to certain faunal groups of the benthos.

1. Stefansson Sound Meiofauna - PARTIAL FINAL REPORT

An arctic sea ice faunal assemblage: a first approach to the description and the source of the underice meiofauna

(Carey, A.G., Jr. and P.A. Montagna)
(submitted to: Marine Ecology-Progress Series)

ABSTRACT: The ice meiofaunal assemblage in shallow Stefansson Sound off the northern coast of Alaska included Polychaeta, Nematoda, Rotifera and Crustacea. The crustaceans were comprised of calanoid copepods, nauplii, two species of harpacticoids (*Halectinosoma neglectum* and *Pseudobradya* sp.) shared with the benthos and a cyclopoid copepod (*Cyclopina gracilis*) that is probably a benthic epiphytic form. Much of the ice meiofaunal assemblage was dominated by larvae and juveniles. The ice taxa were found to be sparse in numbers (100-1,000 times less than the sediments) and depauperate in species (e.g., 2 species of harpacticoids versus 28 in the sediments).

The ice meiofauna appears to be derived from both the sediments and the water column. We hypothesize that during the spring months the undersurface of nearshore sea ice acts as a substrate for benthic recruitment and for nourishment of a highly selected fauna; however, the meiofauna is too sparse to be significant in the food web or energy budget in the protected nearshore Beaufort Sea.

INTRODUCTION

In polar oceans where sea ice is present over large areas during all or much of the year, invertebrate organisms are associated with the ice-water interface. Algal blooms on the undersurface of the sea ice often occur during the late spring months and have been extensively studied in both the Arctic and Antarctic (see Horner, 1976, 1977 for reviews). In the Arctic Basin the ice diatoms are mostly pennate (Hsaio, 1980); many species are benthic forms. They can grow into dense concentrations in the lower several centimeters of ice. A burst of primary production by ice algae can precede the blooms of benthic diatoms in shallow water and phytoplankton in the water column (Matheke and Horner, 1974; Horner, 1977).

An ice fauna has also been reported from scattered and generally casual observations made during ice algal studies. These animals are not well-known, and quantitative data are not available. Hypotrichous ciliates, heliozoans, turbellarians, harpacticoid copepods, gammarid amphipods, polychaete worms, polychaete and cirripede larvae and arctic and polar cods have been reported in association with the undersurface of sea ice (Horner and Alexander, 1972; Horner, 1977; Barnard, 1959; Mohr and Tibbs, 1963; Andriashev, 1970; Percy, 1975; Golikov and Averincev, 1977; Dunbar and Acreman, 1980). Dunbar (unpublished MS) states that the invertebrate ice fauna are substrate-seeking forms generally associated with a harder surface, some of which are benthic species. Andrieshev (1968) working in the Antarctic found a distinct animal assemblage associated with the sea ice which he called "true ice animals."

As very little published information exists on the sea ice fauna, basic relationships with the ecosystem are not well understood. The source and fate of these animals are not known. Are they derived from the benthic or pelagic fauna, or is there an assemblage unique to the ice-water interface? It is thought that the spring ice algal blooms are important as a food source in shallow water to some vertically migrating benthic macrofaunal species (Percy, 1975; Horner, 1976), and to selected meiofauna (Clasby, Alexander and Horner, 1976). Furthermore the epontic ice community may provide a significant input into the coastal or oceanic detrital food web; however, this has not yet been proven (Alexander, 1980). The geographic extent, and patchiness of the community's distribution has yet to be determined, but the ice algae are potentially an important energy source in the arctic ecosystem.

The present project was undertaken as the start of a program to define the structure of the inshore seasonal sea ice faunal community and its taxonomic and functional relationships to the benthos, zooplankton and nekton beneath. This paper reports the results of the first year's research, a feasibility project designed to sample and identify the meiofauna, especially the harpacticoid copepods. The primary objective was to study the relationships between the ice fauna and the organisms in the sediments beneath. Since all reports of animals associated with the ice substrate indicate the presence of meiofauna (Horner, 1977) and since their small size obviates large samples, we initially chose to study this ecological group as a segment of the community.

STUDY AREA AND METHODS

Samples were collected at a station (SS) in Stefansson Sound (latitude 70°19.25'N; longitude 147°35.1'W) during 9-14 March and 18-19 May 1979 (Figure 30). Stefansson Sound is an open, shallow lagoon off the northern coast of Alaska that is protected by a series of gravel barrier islands. It is influenced by the Sagavanirktok River that lies about 11 km to the southwest of the station. During the two study periods the under-ice water salinity varied from 31.2 to 33.0‰, and the bottom-water salinity from 31.4 to 33.1‰. Water temperatures were nearly constant, ranging from -1.9 to -2.0°C under the ice and from -1.6 to -2.0°C one meter above the sediments. Water depth was 5.2 to 5.5 m. The sediment was heterogeneous and patchy, with scattered cobbles and boulders resting on stiff consolidated mud. Patches of soft, clayey silt were present in depressions and in the lee of rocks.

In the nearshore region of the Arctic Ocean the sea ice is seasonal. Generally, each year freezing begins in September, and the ice lasts until break-up in early June. It attains a maximum thickness of 1.5-2.0 m (Kovacs and Mellor, 1974) and is covered with snow of varying thickness. The snow cover has been demonstrated to be the major factor controlling light transmission to the underice environment (English, 1961; Clasby, Alexander and Horner, 1976). During the spring growing season the light energy reaching the ice-water interface gradually increases due both to the increasing solar radiation and to reduced snow cover on the ice surface (Matheke and Horner, 1974).

All samples from the ice and sediments beneath were taken by hand-held apparatus operated by SCUBA divers. Random ice samples were routinely taken throughout the study by pushing a 3.5 cm diameter (i.d.) plastic core tube up through the soft ice layer to the hard ice above. Seventeen cores were taken in March, 1979 and nine in May, 1979. The sea floor immediately beneath the ice cores were sampled with a 50 cc plastic syringe barrel modified into a small piston coring device with an i.d. of 2.9 cm. The patchy soft sediment was sampled randomly with 10 cores taken each field trip. The consolidated clay could not be adequately sampled as coring tubes would not penetrate this substrate even with considerable impact force.

Sampling in March 1979 was before the algal bloom began, and during May 1979 was near the height of ice algal growth. The ice at the March site contained observable concentrations of sediment particles in soft ice billows. The physics of these ice formations and the sedimentation processes incorporating particles within the ice are not understood at this time (Barnes, Fox and Reimnitz, 1979). This form of soft ice, though often widespread in coastal waters, is patchy and is thought to be anomalous. At the time of the May field trip it was observed that there were no ice algae at the March ice sampling site; this appears to have been caused by the marked shading effect of particulate material incorporated within the ice. Therefore, the second sampling series was moved 200 meters to the southwest where the ice was cleaner and an algal bloom could be observed. The second location, while covered by a different type of ice, was over the same bottom habitat with scattered boulders covered with macrophytes and fine, soft sediments patchily distributed on the consolidated mud.

The ice samples were washed on a 63 µm sieve in a heated hut at the ice station. The sediment samples were mixed in toto with preservative;

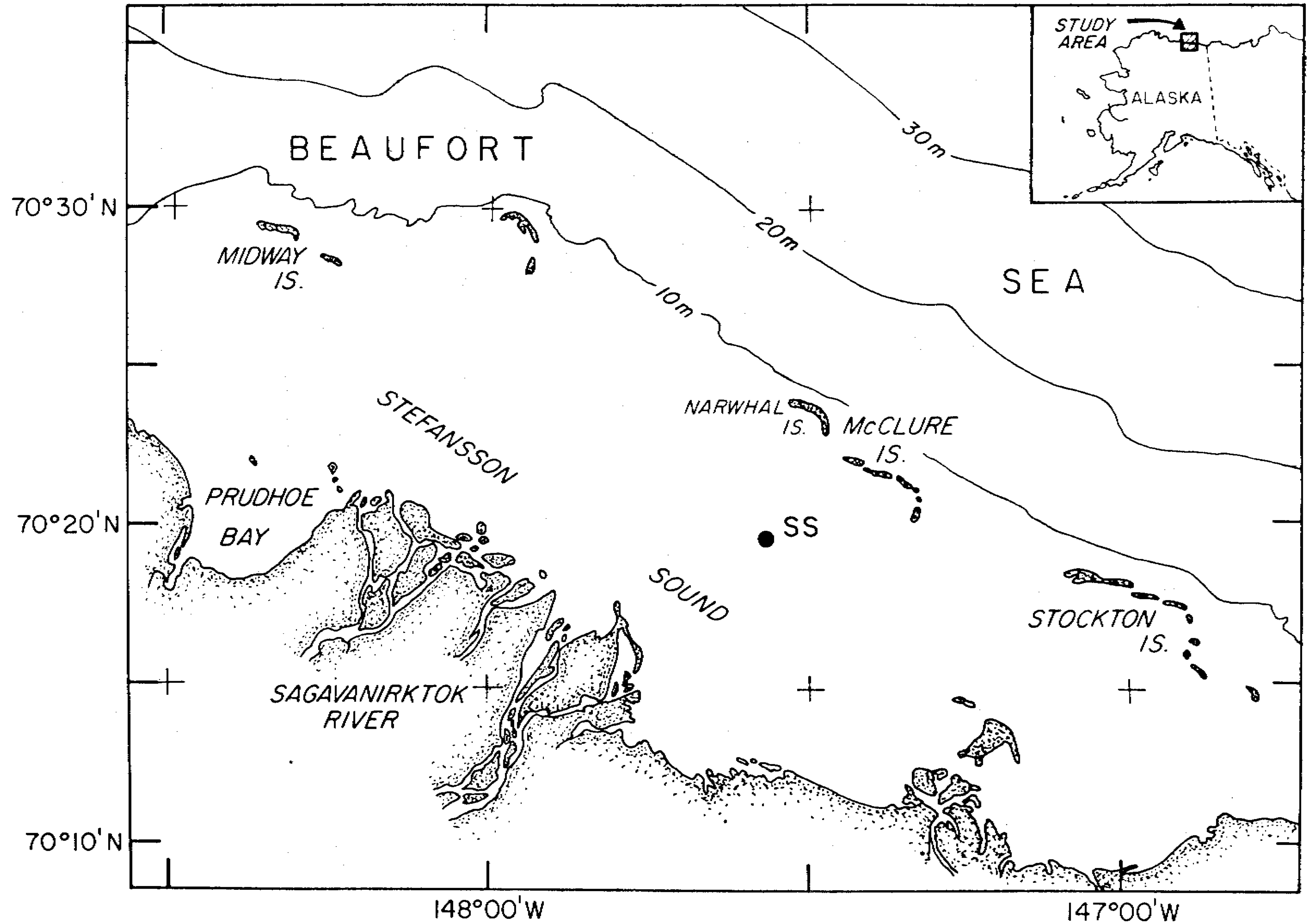

Figure 30. Station SS in Stefansson Sound off the northern coast of Alaska.

all samples were preserved with 10% formalin buffered with sodium borate and were stained with Rose Bengal. In the laboratory the meiofauna were picked under a dissecting microscope and sorted into major taxonomic groups. The fauna were predominately meiofauna. The copepods from the sediments and ice were identified by the second author.

RESULTS

At station SS in Stefansson Sound the meiofauna associated with the sediments were abundant and diverse (Table 32). Total densities averaged $584,300/m^2$. During both March and May nematode worms were the most abundant taxon (90% of the total numbers) with harpactcoid copepods as the second most abundant (3-5%). Small polychaetes were third in abundance (3%).

In contrast, the sea ice meiofauna were sparse in number of individuals and taxa (Table 33). The fauna consisted of few taxonomic groups, i.e. copepods, nematodes, rotifers, polychaetes (larvae) and crustaceans (nauplii). The gross taxonomic composition and relative abundance of the fauna changed markedly from the first to the second sampling period. Nematodes were rare in March (about $60/m^2$) but more abundant in May (about $3,400/m^2$) comprising 76.9% of the meiofaunal community. Polychaete larvae were abundant in March (about $5,380/m^2$), but were not found in the May cores. Crustacean nauplii were collected at both times, $1,770/m^2$ in March and $230/m^2$ in May. Calanoid copepods were present in the ice core samples in March ($610/m^2$) but not May, while the cyclopoids were lacking in March, but had become the second most abundant by May ($580/m^2$).

A one-way MANOVA analysis with 16 dependent variables (species) and 1 independent variable (date: March and May) (Wilks F = 3.606, P = 0.159) demonstrated that the sediment meiofauna did not change overall from March to May sampling periods. However, there were significant temporal differences for two individual benthic taxa (univariate F-tests), Tanaidacea (F = 12.086, P = 0.003) and Ostracoda (F = 43.984, P = 0.000). Significant overall differences in the ice fauna between the two sampling dates was demonstrated by a one-way MANOVA analysis with 7 dependent variables (species) and 1 independent variable (date: March and May) (Wilks F = 16.984, P = 0.000). There was a significant increase in nematode (F = 48.611, P = 0.000) and cyclopoid (F = 11.539, P = 0.002) numbers and a significant decrease in polychaete (F = 32.391, P = 0.000) and nauplii (F = 5.847, F = 0.024) numbers associated with the ice. These univariate F-tests did not demonstrate significant differences in rotifer, harpacticoid or calanoid numerical densities between March and May. An overall comparison of the ice and sediment fauna, undertaken by a three-way ANOVA for log-transformed numbers of nematodes, harpacticoids, and nauplii, demonstrated significant differences between the sediment and ice fauna densities for both sampling dates (Table 34). In spite of the temporal changes in numerical densities for nematodes and nauplii, the substrate effects were the greatest.

The ice fauna consisted of many juvenile forms. Though copepods were scarce in March, there were many crustacean naupliar stages and polychaete larvae (Table 33). In May, 89% of the cyclopoid C. gracilis were copepodites, whereas only 57% of the sediment harpacticoids were at this stage of development. The number of species and abundance of harpacticoid and cyclopoid copepods are larger in the benthic meiofaunal community and are drastically reduced in the ice substrate assemblage (Table 35). Twenty-eight species were present in the sediments during the spring of 1979. The dominant benthic harpacticoid species were Halectinosoma sp., Bradya typica, Danielssenia fusiformis and two undescribed species: Ameira sp. and Haloschizopera sp. Twenty of the twenty-eight harpacticoids were undescribed species previously not encountered in our offshore studies (Montagna and Carey, 1978). The ice

Table 32. Sediment meiofauna (>63 μm): numerical density at station SS, Stefansson Sound (Beaufort Sea). Collection by small core (2.9 cm i.d.).

	March 1979 ($\bar{x}$±SD) $10^2/m^2$	%	May 1979 ($\bar{x}$±SD) $10^2/m^2$	%
Nematoda	5,460.8 ± 3,245.7	90.1	5,071.9 ± 3,671.2	90.2
Harpacticoida	204.2 ± 75.6	3.4	253.3 ± 124.3	4.5
Polychaeta	192.8 ± 181.8	3.2	169.9 ± 140.2	3.0
Crustacea (nauplii)	119.3 ± 105.3	2.0	39.2 ± 43.0	0.7
Ostracoda	60.5 ± 40.1	1.0	0.0 ±	0
Kinorhyncha	11.4 ± 17.3	0.2	11.4 ± 13.4	0.2
Tanaidacea	3.3 ± 6.9	<0.1	65.4 ± 75.5	1.2
Nemertina	3.3 ± 10.3	<0.1	0.0	0
Acarina	3.3 ± 10.3	<0.1	0.0	0
Amphipoda	1.6 ± 5.2	<0.1	0.0	0
Cumacea	0.0	0	6.5 ± 11.4	0.1
Isopoda	0.0	0	1.6 ± 5.2	<0.1
Pelecypoda	0.0	0	1.6 ± 5.2	<0.1
Gastropoda	0.0	0	1.6 ± 5.2	<0.1
Priapulida	0.0	0	1.6 ± 5.2	<0.1
Anthozoa	0.0	0	1.6 ± 5.2	<0.1
TOTALS (per m^2)	606,050		562,560	

Table 33. Sea ice meiofauna (>63 μm): numerical densities at station SS, Stefansson Sound (Beaufort Sea). Collection by small core (3.5 cm i.d.).

	March 1979 ($\bar{x}$±SD) $10^2/m^2$	%	May 1979 ($\bar{x}$±SD) $10^2/m^2$	%
Nematoda	0.6 ± 2.5	0.7	34.6 ± 25.9	76.9
Polychaeta (larvae)	53.8 ± 53.3	67.3	0.0	0
Crustacea				
nauplii	17.7 ± 19.4	22.1	2.3 ± 4.6	5.1
Copepoda - Harpacticoida	1.2 ± 3.4	1.5	2.3 ± 4.6	5.1
Cyclopoida	0.0	0	5.8 ± 7.6	12.9
Calanoida	6.1 ± 12.2	7.6	0.0	0
Rotifera	0.6 ± 2.5	0.7	0.0	0
TOTALS (per m^2)	8,000		4,500	

Table 34. Substrate copepod (families and species) summary for ice and sediment cores taken in March and May 1979 at Station SS, Stefansson Sound (Beaufort Sea).

	March 1979		May 1979	
	Sediment $(\bar{x} \pm SD) 10^2/m^2$ (N=10)	Ice $(\bar{x} \pm SD) 10^2/m^2$ (N=17)	Sediment $(\bar{x} \pm SD) 10^2/m^2$ (N-10)	Ice $(\bar{x} \pm SD) 10^2/m^2$ (N=9)
HARPACTICOIDA				
Ectinosomatidae				
Halectinosoma neglectum (Sars)	1.6 ± 5.2	1.2 ± 3.4	1.6 ± 5.2	0.0
Halectonsoma sp. E	0.0	0.0	0.0	0.0
Halectinosoma sp. F	39.2 ± 29.0	0.0	66.9 ± 75.6	0.0
Halectinosoma sp. G	6.5 ± 8.4	0.0	0.0	0.0
Bradya typica Boeck	22.9 ± 22.1	0.0	80.1 ± 63.7	0.0
Pseudobradya sp. B	1.6 ± 5.2	0.0	1.6 ± 5.2	0.0
Pseudobradya sp. C	3.3 ± 6.9	0.0	1.6 ± 5.2	2.3 ± 4.6
Tachidiidae				
Danielssenia stefanssoni Willey	21.2 ± 18.9	0.0	9.8 ± 31.0	0.0
Harpacticidae				
Harpacticus flexus Brady & Robertson	1.6 ± 5.2	0.0	0.0	0.0
Tisbidae				
Tisbe sp. A	0.0	0.0	1.6 ± 5.2	0.0
Zosime sp. A	0.0	0.0	1.6 ± 5.2	0.0
Disoaccidae				
Stenhelia nuwukensis M. S. Wilson	3.3 ± 10.3	0.0	6.5 ± 11.4	0.0
Stenhelia sp. C	3.3 ± 6.9	0.0	0.0	0.0
Stenhelia sp. E	0.0	0.0	3.3 ± 6.9	0.0
Stenhelia sp. P	1.6 ± 5.2	0.0	0.0	0.0
Amphiascoides sp. A	3.3 ± 6.9	0.0	8.2 ± 11.6	0.0
Paramphiascella fulvofasciata Rosenfield & Coull	16.3 ± 18.9	0.0	0.0	0.0
Haloschizopera sp. A	0.0	0.0	40.8 ± 54.6	0.0
Ameiridae				
Ameira sp. A	53.9 ± 48.7	0.0	17.9 ± 17.9	0.0
Ameirid B	0.0	0.0	3.3 ± 6.9	0.0
Cyclindropsyllidae				
Cylindropsyllid A	0.0	0.0	1.6 ± 5.2	0.0
Cletodidae				
Cletodes tenuipes T. Scott	13.1 ± 20.1	0.0	1.6 ± 5.2	0.0
Cletodes sp. A	1.6 ± 5.2	0.0	0.0	0.0
Cletodes sp. B	1.6 ± 5.2	0.0	0.0	0.0
Rhizothrix sp. A	3.3 ± 6.9	0.0	1.6 ± 5.2	0.0
Eurycletodes sp. A	1.6 ± 5.2	0.0	0.0	0.0
Laophontidae				
Echinolaophonte brevispinosa (Sars)	1.6 ± 5.2	0.0	1.6 ± 5.2	0.0
Laophontid A	0.0	0.0	1.6 ± 5.2	0.0
CYCLOPOIDA				
Cyclopina gracilis Claus	0.0	0.0	0.0	5.8 ± 6.9
TOTAL (per m^2)	204.2 ± 75.6	1.2 ± 3.4	253.3 ± 124.3	8.1 ± 6.9

Table 35. Three-way ANOVA for log-transformed numbers of individuals of Nematoda, Harpacticoid Copepoda and Crustacean nauplii.

Source of Variation	*F*	*P*
Substrate type	239.2	.00001
Date	0.5	.48576
Taxon	96.6	.00001
Substrate type by date	12.3	.00083
Substrate type by taxon	23.4	.00001
Date by taxon	2.7	.07536
Substrate type by date by taxon	0.6	.56218

meiofauna contained only two species of benthic harpacticoids, *Halectinosoma neglectum* and *Pseudobradya* sp., and one species of cyclopoid copepod, *Cyclopina gracilis*.

DISCUSSION

The benthic meiofaunal community in Stefansson Sound is similar in gross taxonomic composition and numerical density to shallow soft bottom environments elsewhere (Mare, 1942; McIntyre, 1969; Coull and Bell, 1979); however the ice meiofauna is neither abundant nor speciose (Tables 2 and 3). Numerical density on the ice averaged about 6,200 individuals per m^2 versus 584,000 per m^2 in the sediments. Few organisms were associated with the ice undersurface and only a small segment of the meiobenthic population inhabits the ice. Pelagic forms associated with the ice canopy included larvae and calanoid copepods. Therefore the ice meiofauna in the protected sounds and lagoons of the Beaufort Sea is not unique. Its gross taxonomic composition suggests that it is derived from both the water column and the sediments.

The extensive changes in taxonomic composition of the ice fauna from March to May suggest a dynamic meiofaunal assemblage. Many of the crustaceans and polychaetes were pelagic juveniles, which could have been attracted by the greater light intensities at the ice-water interface, by the ice algae as a food source, or by the substrate itself during their metamorphosis into bottom-living juveniles. We cannot determine for certain if these changes in ice fauna are due to seasonal reproductive events in the epontic community, or whether the differences in ice substrate caused them. However, the ice undersurface appears to be a recruitment ground for certain benthic meiofaunal early life history stages.

Harpacticoid and cyclopoid copepods were associated with the ice in greater numbers in March than in May. The cyclopoids, *C. gracilis*, collected from the ice only in May, were 89% copepodites. In contrast, during May copepodites formed only 61% of the benthic harpacticoid populations, suggesting that the copepods associated with the sediments are older on the average.

Polychaete larvae were present in the epontic ice environment in March but not May. The larvae were mainly (93%) an undescribed species (gen. nov.) in the family Hesionidae (Ruff, unpublished data). The adults of this species have been collected across the S.W. Beaufort Sea continental shelf at depths between 5 to 100 meters (Carey and Ruff, unpublished data). The specimens collected in the ice cores included nectochaetes (larval forms that can swim or crawl) and the early non-swimming juvenile stage. No late juveniles and adults were encountered. A lecithotrophic planktonic larval development has been reported for similar small species of hesionids (Thorson, 1946; Blake, 1975). In general, the smaller hesionid species feed on diatoms (Fauchald and Jumars, 1979), and the nectochaetes and juveniles of one such species (*Ophiodromus pugettensis*) have been observed to ingest diatoms under laboratory conditions (Blake, 1975). Apparently nectochaetes and juveniles of the new species settle out on the ice undersurface as well as on the sediments, feed on algae on the ice, and as they grow they fall from the ice and sink to the bottom.

Though the cyclopoid copepod *Cyclopina gracilis* was collected only from the ice during the present study, it has been reported as an epiphytic form elsewhere (Sars, 1918). Since dense populations of the arctic kelp, *Laminaria solidungla*, are prevalent on the rock surfaces in the study area (Broad, 1979), *C. gracilis* may normally live on this plant substrate. Horner (personal communication) collected it in the water column near the bottom at station SS during the 1979 project.

Colonization

While it is not known how the benthic meiofauna become incorporated in the ice, it seems likely that advective forces are the primary mechanism of transport for these small organisms just as they seem to be for the horizontal movement of meiofauna in shallow waters (Sherman and Coull, 1980; Bell and Sherman, 1980). The harpacticoids and cyclopoids also may swim (Hauspie and Polk, 1973) and may undergo diel or seasonal vertical migrations related to predator avoidance (Andriashev, 1968), reproduction or feeding. The species collected on the ice could themselves migrate the intervening five meters or could migrate short distances that would then expose them to mixing forces within the water column. The amounts of sediment and organic detritus within the sea ice over the inner continental shelf suggest strong advective forces in the Beaufort Sea.

The occurrence and composition of ice meiofauna offshore over deep water pose other problems because of the large separation between the ice and sediment assemblages. Here the fauna may be recruited from the pelagic fauna or possibly some few meiofaunal species may preferentially and permanently be associated with the ice substrate. Barnard (1959) reports large numbers of pelagic gammarid amphipods associated with the undersurface of pack ice in the Arctic Basin. If these or other species are permanently associated with pack ice, they may be ecologically analagous to the "pseudobenthos" associated with floating sargassum weed over deep water in the Sargasso Sea (Hentschel, 1922; Hesse, Allee and Schmidt, 1951).

Significance

We expected the total numbers of meiofauna to increase in response to the increased ice algal production during the spring, but only the nematodes increased significantly, possibly as a response to the food source. Links between the epontic algae and macrofaunal grazers have been suggested though the observations are scattered and often anecdotal (English, 1961; Apollonio, 1965; Horner, 1977; Horner and Alexander, 1972). Nematodes and copepods have been also reported as feeding on the microalgae (Clasby, Horner and Alexander, 1976).

The ice environment forms a substrate that concentrates biological activities at the water-ice interface. Environmental conditions support an intense but patchy algal bloom. The role of ice algae within the arctic ecosystems is potentially important (Alexander, 1974). After the long, dark winter, this is an early source of energy for the grazers and a later source upon ice melt for the pelagic and benthic fauna beneath. Intuitively, the abundant epontic diatoms should fall to the sea floor during the melting season and provide a significant nutritional source to the benthos before blooms of phytoplankton and benthic diatoms take place (Matheke and Horner, 1974).

From our initial studies on the epontic ice fauna in Stefansson Sound, we have concluded that the nearshore ice meiofaunal assemblage is derived from both the pelagic and benthic biota and that it is transitory and changeable in nature. Because of the large proportion of larval and young benthic forms it is suggested that the epontic underice community is an alternate pathway unique to the sea ice zone for certain species to recruit into the benthic community. The sea ice provides a substrate that has a large food source early in the arctic spring season. However, the ice meiofauna themselves are probably not abundant enough to be a significant factor in the lagoonal food web and energy budget.

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2. Beaufort Sea ice meiofauna - Narwhal Island 1980 (J. Kern)

INTRODUCTION

Although some of the ice fauna is known qualitatively, quantitative information on the fauna and its connections to other arctic marine communities are not available (Horner, 1976). Since the arctic is commonly thought to be relatively unproductive, the potential importance of the epontic community is great. This study was designed to obtain quantitative information on the ice fauna and to test the hypothesis that significant amounts of grazing are occurring on the epontic community by organisms in the water column.

Andriasev, (1968) divided the underice fauna into two groups:

1) Ice fauna - those animals which are present within the lower, soft ice layer and

2) Sub-ice fauna - animals which never enter the loose ice but which are in some trophic connection with the ice community.

In order to investigate the effect of grazing upon the sea ice fauna by large sub-ice grazers, exclusion cages were placed on the ice surface. These cages were designed to prevent arctic cod (Boreogadus saida) and other fishes as well as large amphipods from having access to the underice surface beneath the cages. The assumption behind this experiment is that if grazers are significantly affecting the density of ice fauna then, in their absence, an increase in the density of ice meiofauna should occur. Samples taken from uncaged ice during several weeks of the ice algal bloom are used for comparison with caged samples. These samples also give quantitative abundance estimates of the ice fauna.

MATERIALS AND METHODS

Field operations took place during the spring of 1980 on the Beaufort Sea. The study site was located on a large ice pan approximately 0.4 km north of Narwhal Island. A diver using SCUBA took cores by pushing corers into the soft ice layer. They were removed by sliding a specially designed spatula under the core and then pulling the contained core down from the ice. Caps were placed over the corer and slid on as the spatula was removed. The corers were constructed from 4-inch diameter PVC pipe. The samples were washed into jars in a heated tent and were brought back to the lab at Prudhoe Bay. In the lab, samples were washed through a 64 micron sieve and 10% formalin buffered with sodium borate was added. All cores were taken by the same diver to minimize variation in coring technique.

The cages used in the grazing experiment were constructed from two sizes of black plastic mesh. The cages were round, 25 cm in diameter and 15 cm in height. The sides had two layers of plastic: an inner coarse oval mesh with a largest dimension of 24 mm and an outer fine mesh with a largest dimension of 3 mm. The tops were constructed only of fine mesh. Cages were sewn together using waxed string. Spherical plastic fishing floats were attached to the inside of the cages near the top to provide buoyancy. Two aluminum knitting needles with wooden handles were used to attach each cage to the ice.

The sampling scheme was designed for the grazing experiment, and control cores for this experiment, taken from uncaged ice, also served as the samples for the successional study. Two separate grazing experiments were performed. The first served to test equipment and procedures, the second the grazing experiment itself (Table 36). At each sampling date, three cages and three uncaged areas were sampled. Cage-effect enclosures were placed on the ice, but were not sampled due to limitations in diving time.

All samples were taken back to OSU where they were stained with rose bengal, sorted to major taxonomic groups, and enumerated under a dissecting microscope. Data from the two grazing experiments were analyzed statistically by MANOVA; nematodes, turbellarians, and copepods (harpacticoids and cyclopoids) were included. Amphipods were included in the analysis of the second experiment.

The seasonal data were analyzed separately for copepods, turbellarians, nematodes, and total fauna (including the above groups plus amphipods and polychaete larvae) using a one-way ANOVA.

RESULTS

Statistical analysis of the first caging experiment indicates that there were no significant differences in the density of turbellarians, nematodes, or copepods between the cages and uncaged ice. In the second experiment, there were significantly fewer amphipods and copepods inside the cages over the sampling period than in uncaged ice. No significant differences were found for other taxa.

The plots of mean abundance per core for nematodes (Figure 31), turbellarians (Figure 32), and total fauna (Figure 33) show rapid increases in density over the time interval studied. The same plot for copepod density (Figure 34) does not clearly show this for the entire period. The abundances of all the groups used in these plots were found to change significantly over the sampling period ($<.01$).

DISCUSSION

It is clear from the results obtained in the 1980 samples offshore of Narwhal Island that large numbers of animals do live in the lower layer of seasonal sea ice in the nearshore Arctic Ocean. The highest average density in these samples was over 415 animals/81.1 cm^2. This is only about 5% of normal benthic meiofaunal density (Coull and Bell, 1979), but these densities develop in a short period. It appears from the graphs that the populations of nematodes and turbellarians were still growing at the last sampling date. This suggests that food is not limiting to the fauna in seasonal ice.

There is a great deal of variability in the faunal abundance in the ice. This can also be seen from the abundance plots (Figures 31 - 34). The community is patchy on a very small scale. It was not uncommon for the largest range in abundance between cores taken on one date to occur with paired cores. Some of the variability in the ice faunal abundance might be due to the presence of air bubbles released by the divers beneath the ice. The density estimates should therefore be regarded as being conservative.

Table 36. Experimental Set-up for Sea Ice Grazing Experiments.

A. First Grazing Experiment

(1) April 24
3 cages and 3 cage-effect cages (without tops) were placed on the ice. 9 cores in groups of 3 were taken around these cages from the ice.

(2) May 11
2 cores were taken from each of the 3 cages. 6 cores were taken in 3 pairs nearby.

B. Second Grazing Experiment

(1) May 3
15 complete and 9 cage-effect control cages were placed within a 6x6 m grid at locations taken from a random numbers table.

(2) May 5
9 uncaged ice cores were taken in groups of 3 from within the grid at randomly chosen locations.

(3) May 15
3 cages were sampled by taking 2 cores from within each. 6 cores from uncaged ice were taken in paris.

(4) May 19
The same procedures used May 15 were followed.

(5) May 26
The same procedures used May 15 were followed.

(6) June 2
The same procedures used May 15 were followed.

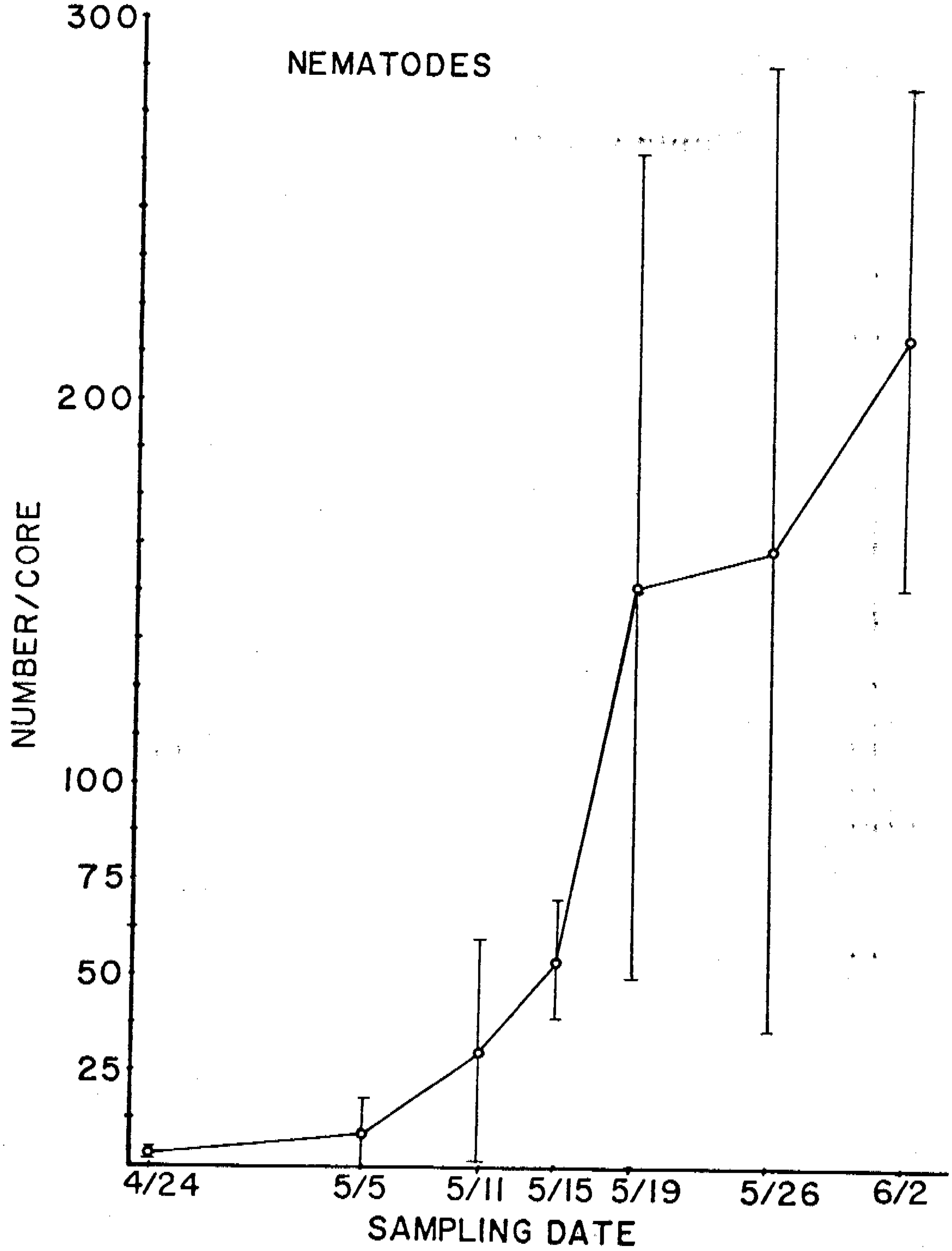

Figure 31. Mean abundance of nematodes in cores taken from the ice. Vertical bars represent ± 1 standard deviation.

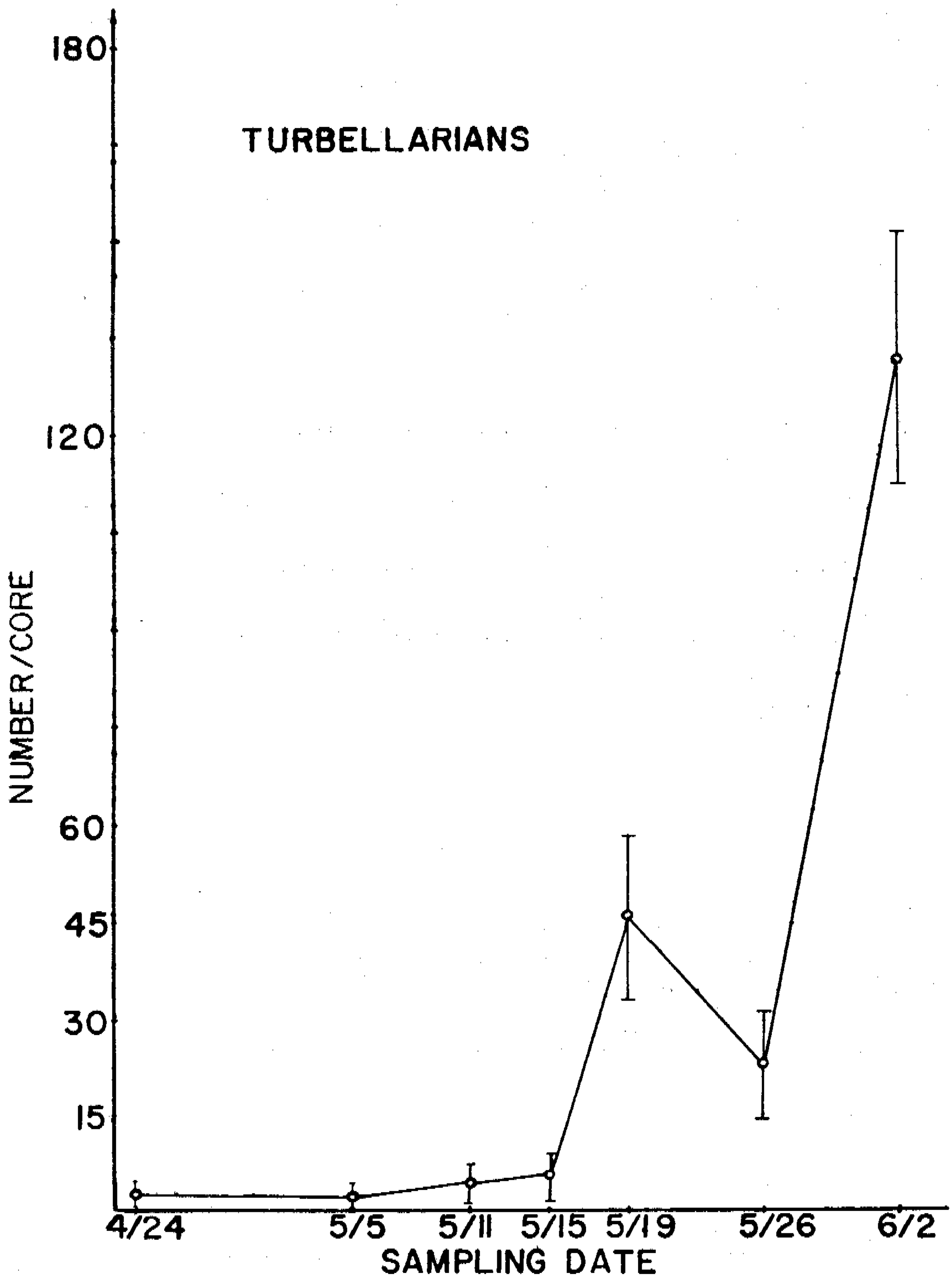

Figure 32. Mean abundance of turbellarians in cores taken from the ice. Vertical bars represent ± 1 standard deviation.

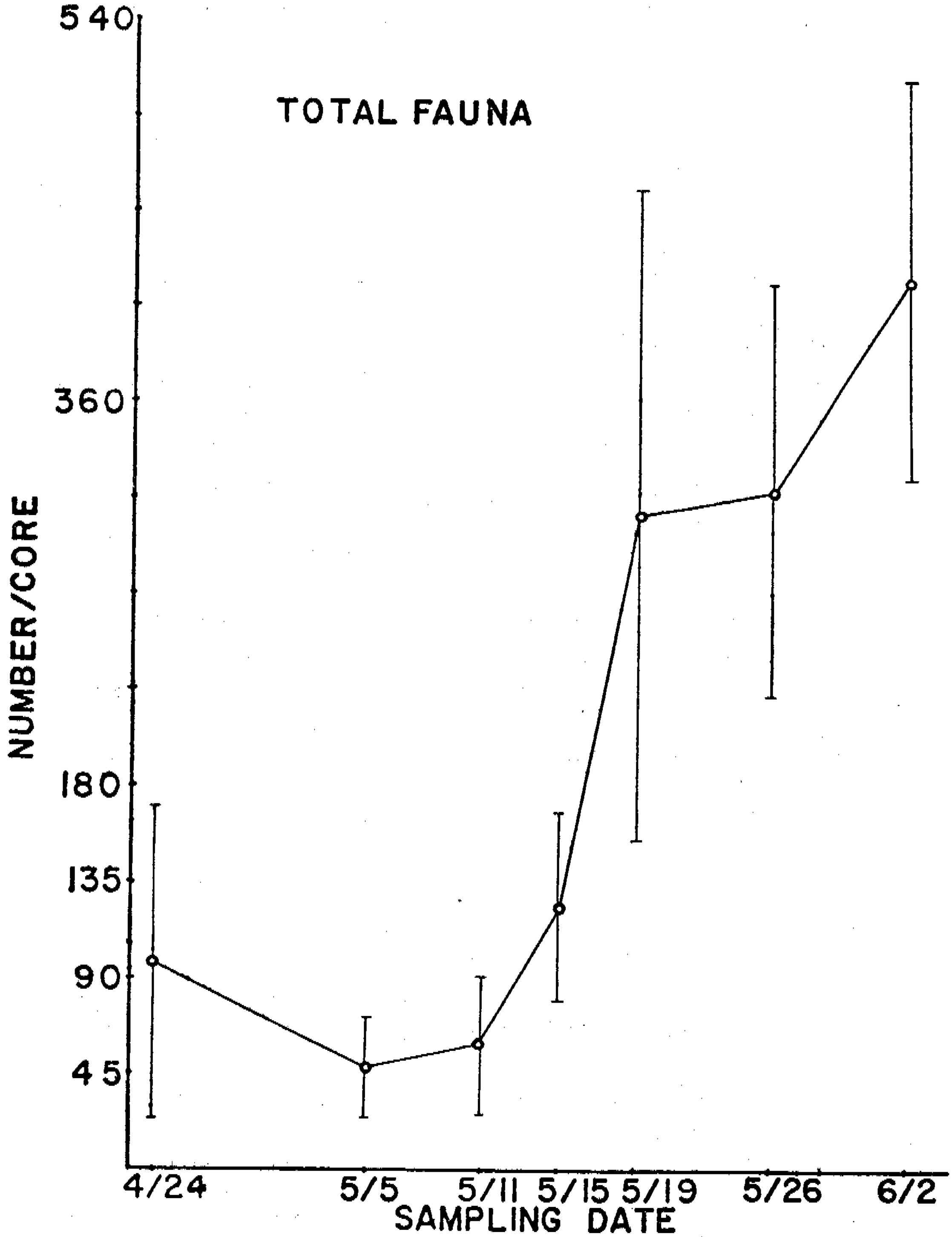

Figure 33. Mean abundance of total fauna in cores taken from the ice. Vertical bars represent ± 1 standard deviation.

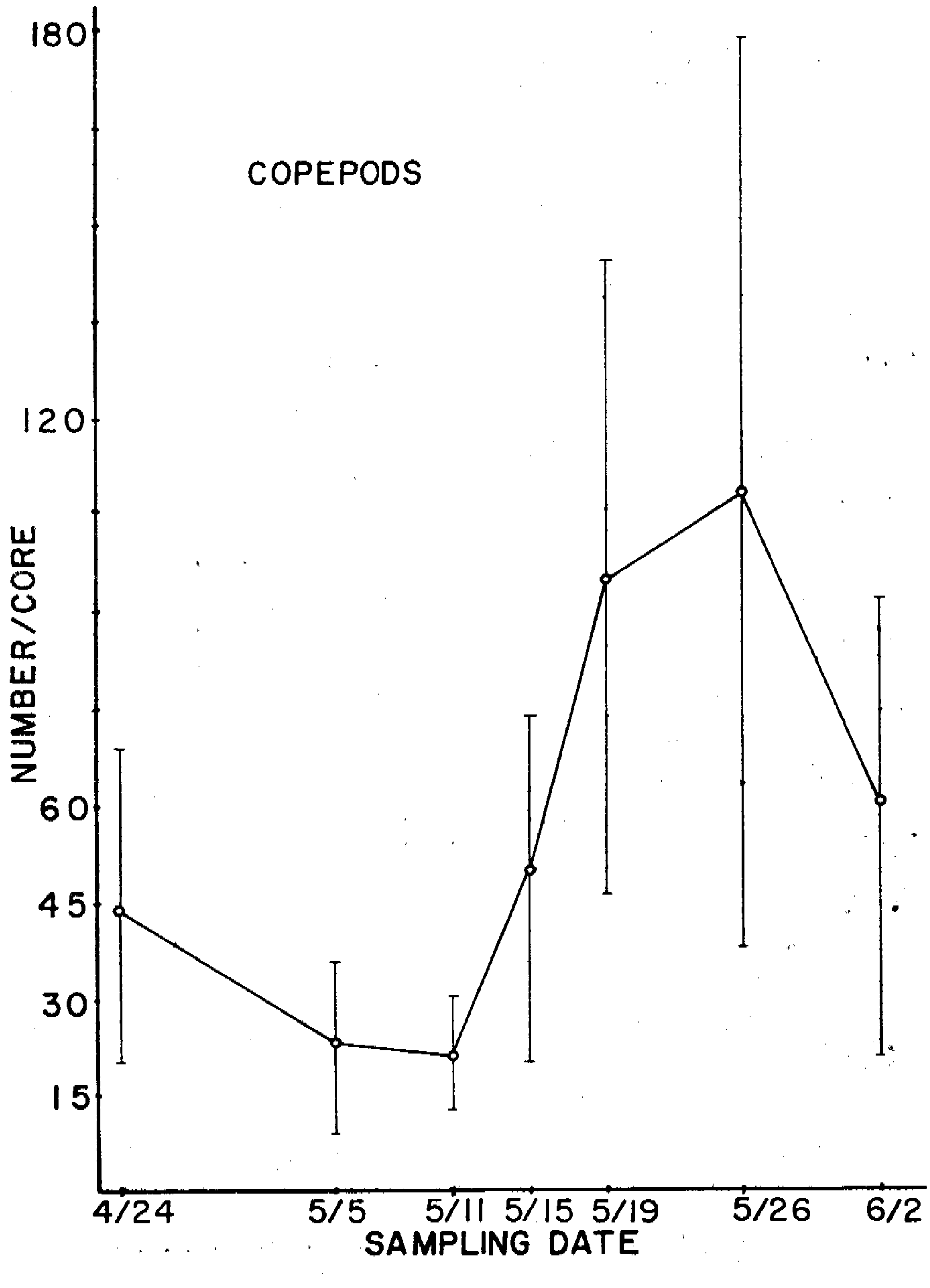

Figure 34. Mean abundance of cyclopoid and harpacticoid copepods in cores taken from the ice vertical bars represent ± 1 standard deviation.

The results obtained in the grazer-exclusion experiment may indicate that the ice fauna are not utilized by animals in the water column during the ice season. It was expected that amphipods would be significantly reduced since the cages were designed to exclude them from the ice. If significant amounts of grazing was occurring on other ice fauna, increased densities within the cages would be expected. This did not occur. There were no significant differences, or, in the case of copepods, a lower density.

It may be possible that the lower density of copepods in caged ice is due to air damage of the ice. The diver who took the samples may have been able to choose "good looking" ice in uncaged areas. In caged samples the cores had to be taken within a limited area whether the ice appeared to be damaged by air or not. Without samples from the cage-effect controls, it is not possible to prove this hypothesis, or to see if other cage effects are occurring.

Although no trophic connection of the ice to organisms in the water column was found, this may not be generally true. Arctic cod were not observed in the study area this year. The high density of organisms in the sea ice would also be expected to be a source of organic matter to the benthos when the ice melts in the late spring. The epontic community must still be considered to be potentially of great significance to the arctic marine ecosystem.

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3. Beaufort Sea ice macrofauna: Gammarid Amphipoda - Narwhal Island, 1980. (D. Cronin).

INTRODUCTION

For most of the period from September through May, the inshore area of the Beaufort Sea is covered by sea ice (Barnes and Reimnitz, 1975). Organisms that live in the lower layers of this sea ice have been known and studied for more than 100 years (Horner, 1976). Most of the earlier studies were taxonomic in nature, with simple reports of occurrences of diatoms. The first reference to organisms other than pennate diatoms was by Nansen (1906). He reported finding ciliates and flagellates associated with the under ice community. In more recent studies in the Arctic, the major trend has been to describe the fauna that seems to be associated with this underice floral community. This fauna includes nematodes, harpacticoid and cyclopoid copepods, turbellarians, and amphipods (Carey, 1975 data; Horner 1976).

While the fauna in the sea ice community is known to some extent, there are no good quantitative estimates of the densities of invertebrates. The purpose of this paper is to give seasonal variance data for the amphipod population associated with the underice community of the inner southwestern Beaufort Sea. This time series study includes the period from early May, before the ice has begun to melt to any considerable extent, to June when a great percentage of the ice has already melted.

MATERIALS AND METHODS

Underice animals were collected in about 7.5 meters of water in the Beaufort Sea off Alaska. The study site was located on a large ice pan approximately 0.4 km north of Narwhal Island (latitude 70°19.25'N; longitude 147°35.1'W) (Figure 3). The site was chosen on the basis of abundant algal growth on the undersurface of the ice and on the ice clarity. However, in 1980 abundant algal growth on the undersurface of the ice was not typical of the nearshore enviornment around Narwhal Island. The majority of the sea ice contained incorporated sediment particles that markedly reduced light transmission through the ice.

The animals were collected from the undersurface of the ice using SCUBA diver-operated, hand-held, open mouth nets. The mesh size was 0.5 mm, and the net width 10 cm. The net was scraped along the undersurface of the ice in a straight transect, 10 meters in length. The area sampled was 1.0 m^2. Five replicates, using the above sampling procedure, were taken during three separate dates, May 5, 17 and June 9, 1980.

The samples were washed into jars in a heated tent and brought back to the laboratory, at Prudhoe Bay, Alaska. Here, they were washed through a 500 micron sieve and 10% formalin buffered with sodium borate was added. Amphipods were later identified using the following references: Barnard, 1969; Sars, 1895, Vol. I, II; Stephensen, 1923 and 1938; and Gurjanova, 1951.

Salinity and temperature measurements were taken during the fieldwork at the water-ice interface using a KAHLSICO induction salinometer. The temperature remained consistently below zero °C during the sampling period, May to early June. Salinity decreased markedly during the interval from 35.3°/°° in May to 2.8°/°° in June (Table 37).

Table 37. Temperature and salinity of ice water interface.

	T(°C)	S(°/₀₀)
May 5	-0.78	33.7
May 17	<-2.00	35.3
June 9	-0.44	2.8

RESULTS

Gammarid amphipods from underice net trawls (INB) have been identified from three replicates during three different sampling periods: May 5 - INB 11, 12, 13; May 17 - INB 16, 17, 18; and June 9 - INB 28, 29, 30. Representatives of all species of amphipods, associated with the underice fauna during May 5 and 17, occurred within three ice net hauls. No new species of amphipods were collected with increasing number of underice net samples (Figure 35). Thus it is assumed that three trawls adequately sampled the species present.

The diversity of amphipod species associated with the underice community of the Beaufort Sea remains very low during the three sampling periods from May through June. A total of eight different species, representing three families were identified from the three sampling dates (Table 38). However, all eight species never occurred in a single ice net trawl. The diversity ranges from three species occurring during the first sampling period (May 5), to seven different species during the second sampling period (May 17). Six species occurred in the third sampling period (June 9). Juvenile life stages were poorly represented in the first sampling period; however, juveniles increased substantially during late May and early June (Table 39).

The density of the underice amphipods varied more drastically between sampling periods than the diversity (Table 40). The early season sampling period contained the lowest number of amphipods. An average of 29 were captured in each ice net trawl. The number of amphipods increased to an average of 93 per ice net haul during the May 17 sampling period. During the final sampling period the number of amphipods increased to an average of 1136 amphipods per ice net trawl. The underice community of amphipods shows a definite seasonal trend (Kruskal-Wallace Test, F=5.60, P=0.05). The great majority of this seasonal change is caused by the juvenile population (Figure 36). The densities of the adult assemblage remains relatively low throughout the sampling period, with the variance showing no significant changes over time (Kruskal-Wallace test, F=5.6, P=0.05). The density ranged from an average of twelve adults during the first sampling period to an average of only 27 during the final sampling period, while the density of the juvenile population increased significantly between the first and last sampling period. The densities ranged from an average of 17 juveniles during the May 5 sampling period to an average of 1109 juveniles during the June 9 sampling period, showing a significant change in variance (F=5.60, P=0.05).

Onisimus litoralis was the numerically dominant adult and the only species that occurred in every ice net haul. These adults represent 83.3% of all the adult specimens in the first sampling period; 63.3% during the second sampling period; and 81% during the last sampling period. This species had a temporal density pattern similar to the total ice amphipod population (Figure 37). The variance of the total number of *Onisimus* shows a singificant change between sampling periods (F=5.60, P=0.08). *Onisimus litoralis* increased from an average of 27 per net haul during the May 5 sampling period to an average of 395 during the June 9 sampling period. The juveniles increased the most in density (F=5.60, P=0.08) from an average of 17 per net sample during the May 5 sampling period to an average of 373 during the last sampling period. However, the variance of the adult population of *O. litoralis* showed no significant change (F=5.60, P=0.08). The adults increased in density from an average of 10 per net sample during the first sampling period to an average of 22 during the last sampling period (Table 40).

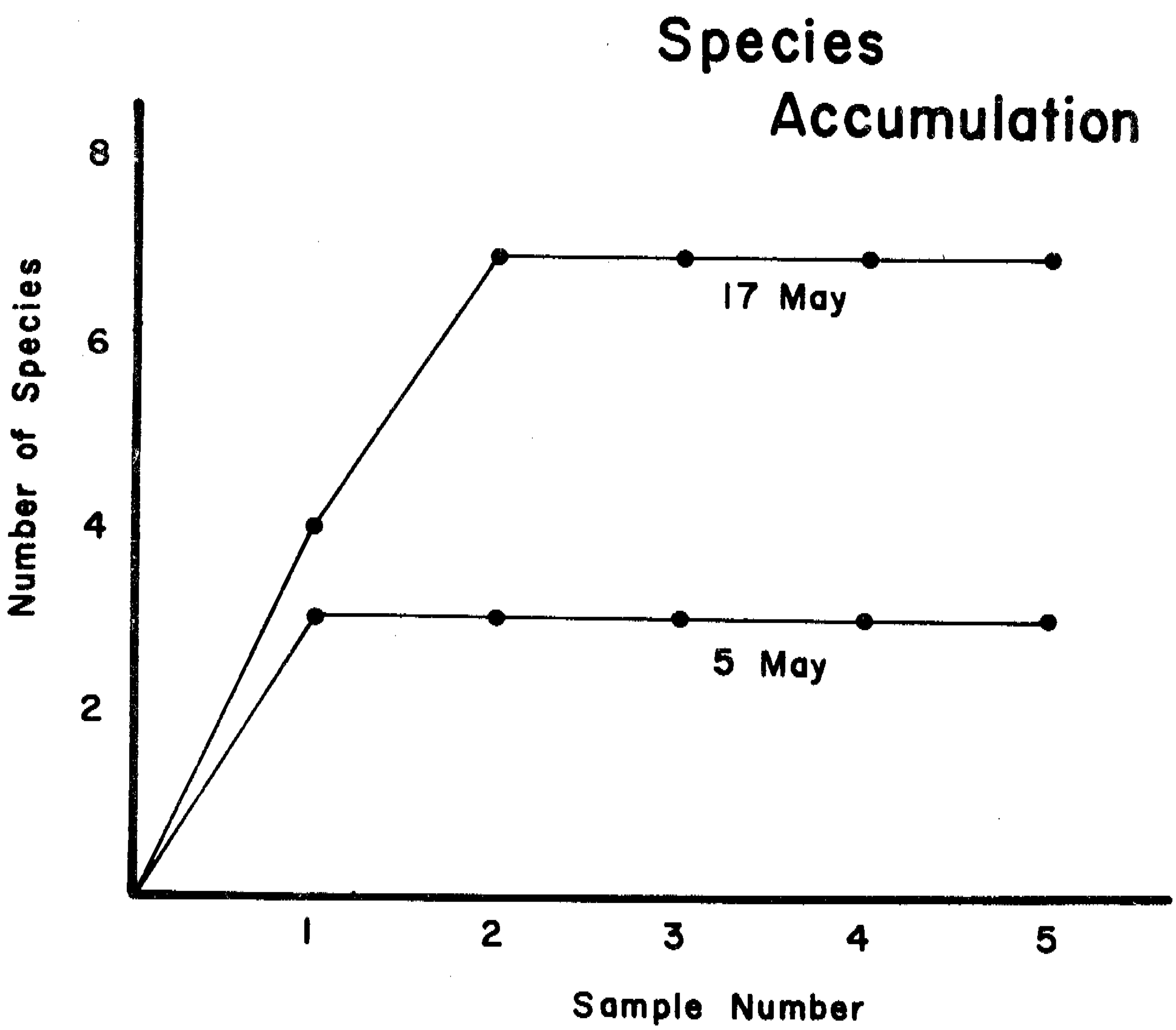


Figure 35. Amphipod species accumulation with increasing numbers of underice net samples.

Table 38. List of species identified from under ice.

Calliopiidae	*Apherusa glacialis*
	Halirages mixtus
	Sp. A
	Sp. B
Gammaridae	*Laguno-gammarus setosa*
	Weyprechtia pinguis
	Sp. A
Lysianassidae	*Onisimus litoralis*

Table 39. Species Diversity.

	Total Population	Adult	Juvenile
May 5	3	3	1
May 17	7	6	4
June 9	6	5	5

Table 40 . Species Density

	Amphipod Population		
	Total Population	Adult	Juvenile
May 5	29	12	17
May 17	93	19	74
June 9	1136	27	1109
	Onisimus litoralis		
May 5	27	10	17
May 17	31	12	19
June 9	395	22	373
	Calliopiidae sp. A		
May 5	0	0	0
May 17	40	0	40
June 9	727	1	726

Figure 36. Change in the total abundance of amphipods through time.

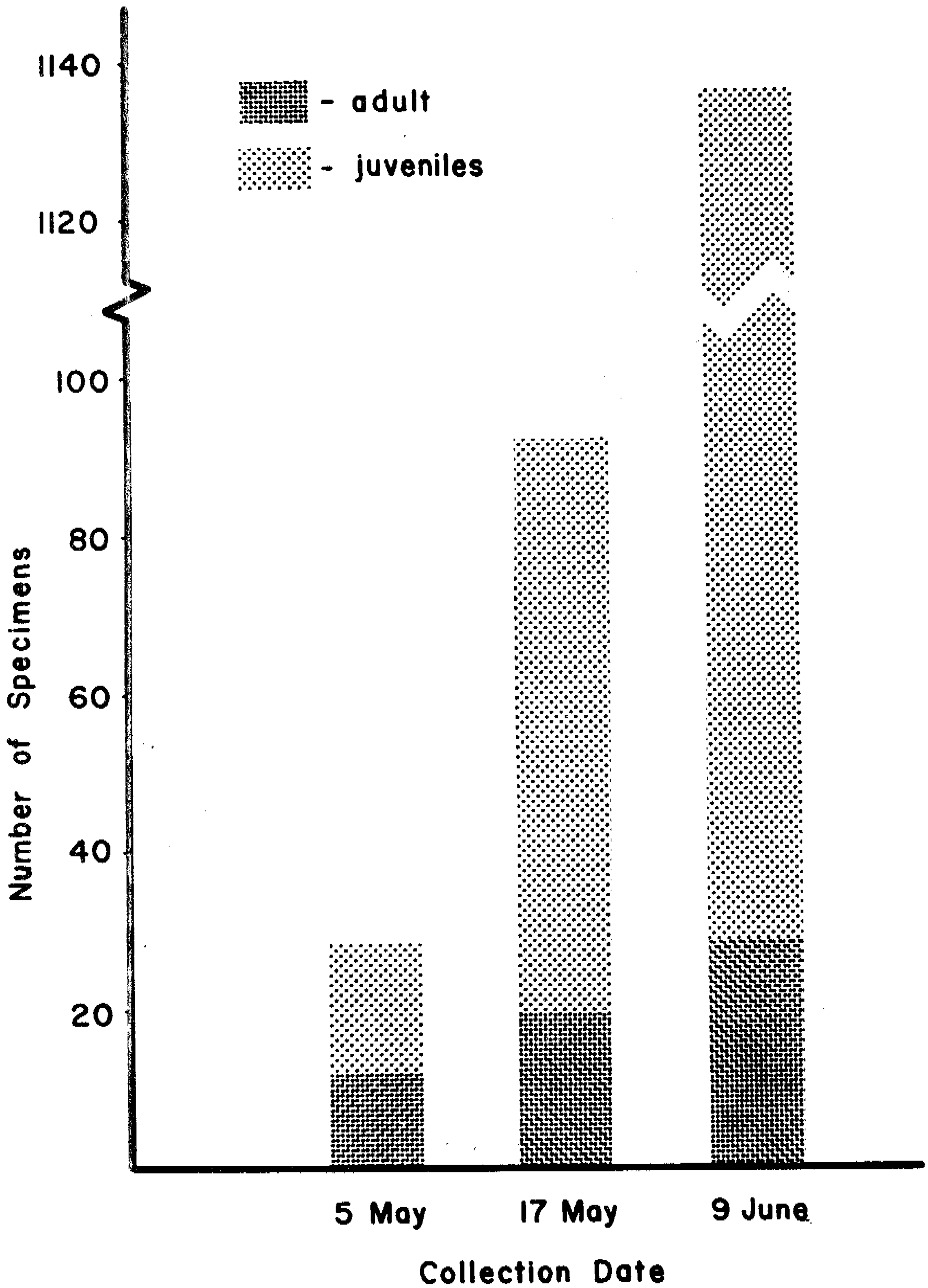
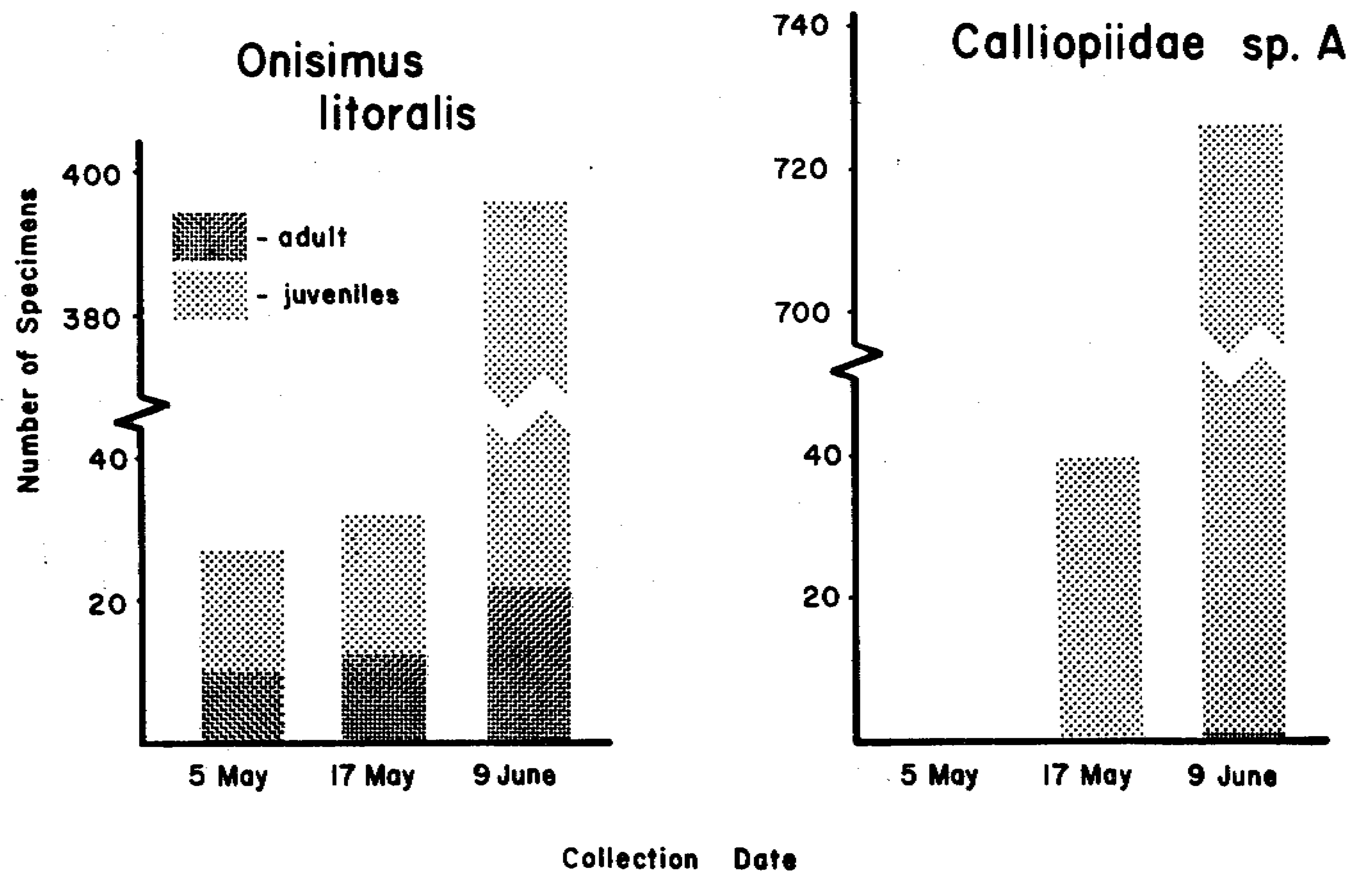


Figure 37. Changes in the abundance of two amphipod species through time.



Calliopiidae sp. A also increased significantly in density through time (F=5.60, P=0.05). However, this species was found almost entirely restricted to the last sampling period. The vast majority of all specimens of Calliopiidae sp. A are juveniles. A total of only four adults were captured, and of these, three were females which possessed brood plates (Figure 37). This influx of juvenile Calliopiidae sp. A during the last sampling period represents over 63.3% of the total number of all amphipods (both adult and juvenile) that occur during the last sampling period.

DISCUSSION

Alexander (1980) has stated that the underice community probably does serve as a source of relatively concentrated food for grazing animals. Amphipods have been observed grazing on this underice algal community (English, 1961; Appolonio, 1965; Horner, 1976). Fecal pellets from amphipods grazing on underice surface contain the remains of ice diatoms (Horner, 1976; George, 1977). Specimens of Onisimus litoralis, collected during the three sampling periods, were dissected and found to contain yellowish-green amorphous masses and oil droplets. This material may be the remains of diatoms, although no frustules have been found. Andriashev (1968) reported that the guts of amphipods collected beneath the fast ice in Antarctica contain similar material. He suggested that these amphipods may be eating out organic material from dead or living ice diatoms. Since the densities of O. litoralis remain constant, if not increasing, it would seem reasonable to state that O. litoralis is at least temporally in direct trophic connection with the underice community of the Beaufort Sea. This agrees with Andriashev (1968) conclusions on the fast ice environment of Antarctica. He concluded that the genus Orchomenopsis sp. A was, to some degree, in trophic connection with the underice community in Antarctica.

The temporal seasonal distribution pattern for Onisimus litoralis is different than the pattern observed by Percy (1975) for Onisimus affinis in Canadian Beaufort waters. Both species are euyhaline, thus adapted to live in brackish environments, characteristic of the shallow, nearshore Beaufort Sea in the late spring and early summer. However, experiments by Percy have shown that O. affinis is unable to survive in waters where salinity is very low when compounded with decreased temperatures. In the Eskimo Lakes (Canada) O. affinis congregates in large numbers at the ice water interface during late February and early March, but by late May, when the ice begins to melt and the salinity of the water column below the ice greatly decreases, the underice population of O. affinis vanishes completely (Percy, 1975). In contrast, the adult population of O. litoralis remained the numerically dominant species (compared to the other adult amphipods) throughout the sampling periods off Narwhal Island, even during June, when the salinity of the water column at the water ice interface reached 2.8°/₀₀. Salinities this low, compounded with decreased temperatures, (Table 37) was determined by Percy to be fatal to O. affinis. Thus it seems that O. litoralis has a higher tolerance for a low salinity environment at decreased temperatures.

The total amphipod assemblage was not evenly distributed between juveniles and adults. The amphipod assemblage seems to have a higher percentage of juvenile specimens, especially towards the latter sampling periods (Figure 37). During the first sampling period the juveniles represent 59.3% of the total amphipod numbers, while during the last period the juveniles represent 98.8% of all the amphipods sampled. This trend is similar to that found in the ice community in Stefansson Sound (Carey and Montagna, unpublished manuscript). They reported that the ice community also had higher juvenile densities than adult densities. Thus it might be that the underice community offers a temporary substrate for juveniles.

The relative importance of the underice environment to benthic gammarid amphipods can be better evaluated when comparative data are available on the concurrent densities and species composition of the benthic populations. Because of the numbers of amphipods associated with the ice during the spring months, it is possible that the ice diatoms do provide a sizeable portion of the energy source of these species populations at this season of the year.

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4. Faunal and environmental data - 1980 Narwhal Island ice fauna study.

INTRODUCTION

The following data have been accumulated over the past year in the field at the Narwhal Island sea ice station seaward of the island and in the laboratory at Oregon State University. The macrofauna samples - ice net (INB), sediment nets (SNB) and midwater zooplankton net (ZNB) samples have all been sorted to major taxa and quantified (counted and weighed). Only a portion of the standard meifaunal samples, ie the ice dredge (IDB) and sediment core (SCB) samples, could be processed to even the major taxon level with the limited manpower available. The glass fiber filter collections of particles falling into the eight weekly particle trap deployments have not been analyzed nor studied in any way because of the lack of personnel and sample analysis funding. Further laboratory sample processing, faunal identification and data analysis will be necessary before conclusions can be drawn about the faunal densities on the ice, the faunal composition, the relationship of the ice fauna to the fauna in the water column and sediments beneath the ice food web, the organic particle flux to the sea floor and the significance of the ice algal community to the benthos.

The *in situ* hydrographic data were obtained in the field at station NIO with a KAHLSICO electrodeless salinometer. Though the instrument reads to -2.0°C, the accurate minima could not be ascertained, however, the lowest temperatures are probably close to those values recorded in the field.

The following data reports are included in this section of the Annual Report for RU #006:

A. The major meio- and macrofauna and their numerical densities from the station NIO sea ice, water column and sediments-to date (Tables 41 through 52).

B. Hydrographic data from station NIO, 17 April-11 June, 1980 (Table 53).

A. The major meio- and macrofauna and their numerical densities from station NIO sea ice, water column and sediments.

Table 41. Ice dredge animal densities from OCS-11 (Spring 1980) collected on April 19 at Narwhal Island ice station. The total area sampled per dredge equals 100 cm^2.

IDB #	64 μ - 500 μ Harpacticoid/ Cyclopoid Copepods	Calanoid Copepods	Nauplius	Nematoda	Turbellaria	Polychaeta	Foraminifera	Total	>500 μ Amphipoda
17A	79	70	58	14	68	195		484	2
17B	100	64	75	17	134	265		655	3
17C	126	77	76	32	77	240	1	628	3
17D	116	57	47	21	69	187		497	6
Total	421	268	256	84	348	887	1	2264	14
18A	76	47	39	14	21	177		374	3
18B	82	38	3	15	26	255		419	2
18C	65	42	41	8	21	224		401	2
18D	67	34	53	16	26	189		385	3
Total	290	161	136	53	94	845	0	1579	10
19A	78	55	79	10	39	251		512	2
19B	100	87	72	15	71	424		769	0
19C	119	109	74	12	78	431		823	2
19D	140	119	74	15	77	548		973	3
Total	437	370	299	52	265	1654	0	3077	7

Table 42. Ice dredge animal densities from OCS-11 (Spring 1980) collected on May 17 at Narwhal Island ice station. Total area sample per dredge equals 50 cm^2.

	64 µ - 500 µ							>500 µ			
IDB #	Harpacticoid/ Cyclopoid Copepods	Calanoid Copepods	Nauplius	Nematoda	Turbellaria	Polychaeta	TOTAL	Amphipoda	Harpacticoid/ Cyclopoid Copepods	Turbellaria	TOTAL
57A	213	149	32	91	134	85	704	16	10		26
57B	173	114	25	91	101	91	595	11	11		22
57C	193	145	41	103	165	109	756	12	14	4	30
57D	203	134	68	117	195	82	799	12	14	4	30
TOTAL	782	542	166	402	595	367	2854	51	49	8	108
58A	199	87	13	165	40	37	541	3	17		20
58B	147	52	9	120	22	30	380	4	20		24
58C	120	85	32	119	35	23	414	3	11		14
58D	173	70	26	129	24	34	456	2	20		22
TOTAL	639	294	80	533	121	124	1791	12	68		80
59A	139	129	48	160	157	61	694	10	8	3	21
59B	183	142	44	142	156	55	722	6	6		12
59C	156	125	45	173	148	68	715	6	17		23
59D	152	147	60	173	140	57	729	8	4		12
TOTAL	630	543	197	648	601	241	2860	30	35	3	68

Table 43. Ice dredge animal densities from OCS-11 (Spring 1980) collected on June 5 at Narwhal Island ice station. The total area sampled per dredge equals 50 cm^2.

IDB #	Harpacticoid/ Cyclopoid Copepods (64 μ - 500 μ)	Calanoid Copepod (64 μ - 500 μ)	Nauplius (64 μ - 500 μ)	Nematoda (64 μ - 500 μ)	Turbellaria (64 μ - 500 μ)	Polychaeta (64 μ - 500 μ)	Total (64 μ - 500 μ)	Amphipoda (>500 μ)	Harpacticoid/ Cyclopoid Copepods (>500 μ)	Turbellaria (>500 μ)	Total (>500 μ)
97A	255	108		106	11	7	487	1	9	2	12
97B	248	145	22	54	23	18	510	2	7		9
97C	293	195	64	77	30	12	671	1	16		17
97D	255	228	88	79	25	21	696	3	12		15
TOTAL	1051	676	174	316	89	58	2364	7	44	2	53
98A	214	219	79	221	51	12	796	7	2		9
98B	183	177	65	200	43	11	679	9	14		23
98C	213	170	51	204	62	10	710	3	9		12
98D	204	163	41	217	48	14	687	3	5		8
TOTAL	814	729	236	842	204	47	2872	22	30	0	52
99A	285	243	85	131	49	17	810	4	15		19
99B	260	248	84	176	52	7	827	7	22	7	36
99C	297	232	68	155	75	11	838	3	16		19
99D	253	210	68	154	69	14	768	6	2	3	11
TOTAL	1095	933	305	616	245	49	3243	20	55	10	85

Table 44. Animal densities from sediment nets (SNB) collected at Narwhal Island ice station (NIO) on April 17, 1980 (OCS-11).

			Net Number					
Phylum	Class	Order	SNB1	SNB2	SNB3	SNB4	SNB5	TOTAL
Protozoa	Rhizopodea	Foraminifera		4	5		2	11
Annelida	Polychaeta				1			1
	Hirudinea				1	1		2
Arthropoda	Crustacea	Amphipoda	252	6	17	5	20	300
		Harpacticoida	1	1				2
		Ostracoda	2	2	8	1	1	14
		Cumacea	2		5			7
		Mysidacea	26	2	23	24	2	77
		TOTAL	283	15	60	31	25	414

Table 45. Animal densities from sediment nets (SNB) collected at Narwhal Island ice station (NIO) on May 2, 1980 (OCS-11).

			Net Number					
Phylum	Class	Order	SNB6	SNB7	SNB8	SNB9	SNB10	TOTAL
Arthropoda	Crustacea	Amphipoda	16	12	13	11	23	75
		Ostracoda		2		4	1	7
		Cumacea	1	3	1	2	1	8
		Mysidacea	11	4	6	10	16	47
		TOTAL	28	21	20	27	41	137

Table 46. Animal densities from sediment nets (SNB) collected at Narwhal Island ice station (NIO) on May 29, 1980 (OCS-11).

			Net Number					
Phylum	Class	Order	SNB11	SNB12	SNB13	SNB14	SNB15	TOTAL
Protozoa	Rhizopodea	Foraminifera	9	8	6	11	6	40
Annelida	Polychaeta			1				1
Arthropoda	Crustacea	Amphipoda	17	34	17	44	32	144
		Ostracoda	1	6	6	10	12	35
		Cumacea	4	12	6	9	3	34
		Mysidacea	5	2	5	5	7	24
Mollusca	Pelecypoda					1	3	4
	Gastropoda						2	2
		TOTAL	36	63	40	80	65	284

Table 47. Animal densities from sediment nets (SNB) collected at Narwhal Island ice station (NIO) on June 7, 1980 (OCS-11).

Phylum	Class	Order	SNB16	SNB17	SNB18	SNB19	SNB20	SNB21	SNB22	SNB23	SNB24	SNB25	TOTAL
Protozoa	Rhizopodea	Foraminifera	5	6	8	14	21	13	27	34	28	12	168
Nemertinea									1				1
Annelida	Polychaeta				1	3	6						10
Arthropoda	Crustacea	Amphipoda	49	69	72	71	167	70	74	48	102	135	857
		Harpacticoida						1		1			2
		Ostracoda	2	7	11	9	30	9	14	4	7	9	102
		Cumacea	32	35	36	60	91	42	128	89	107	76	696
		Mysidacea	14	17	11	11	10	7	8	5	14	14	111
Mollusca	Pelecypoda				1		2	1		2			6
	Gastropoda		1			1					1		3
		TOTAL	103	134	140	169	327	143	252	183	259	246	1956

Table 48. Animal densities from ice nets (INB) from Narwhal Island ice station (NIO) collected on April 13 through June 9, 1980.

Net Number	Date	Animal Group						
		Amphipoda	Cyclopoida	Harpacticoida	Calanoida	Cnidaria	Polychaeta	Total
INB 1	April 13	252						252
INB 2	"	195						195
INB 3	"	69						69
INB 4	"	11						11
INB 5	"	113	1					114
Total		640	1	-	-	-	-	641
INB 6	April 19	50						50
INB 7	"	70						70
INB 8	"	117			3	2	1	123
INB 9	"	45						45
INB 10	"	121						121
Total		403	-	-	3	2	1	409
INB 11	May 5	37						37
INB 12	"	38						38
INB 13	"	32						32
INB 14	"	21					1	22
INB 15	"	51						51
Total		179	-	-	-	-	1	180
INB 16	May 17	30			1	1		32
INB 17	"	172			13			185
INB 18	"	72						72
INB 19	"	50			1			51
INB 20	"	135						135
Total		459	-	-	15	1	-	475
INB 21	May 31	36			3			39
INB 22	"	105				2		107
INB 23	"	55						55
INB 24	"	136						136
INB 25	"	98						98
Total		430	-	-	3	2	-	435
INB 26	June 9	805		2	7	1		815
INB 27	"	905		4	1			910
INB 28	"	2082		10	1			2093
INB 29	"	1144				1		1145
INB 30	"	464		2				466
INB 31	"	1564		2	1			1567
INB 32	"	1462		15				1477
INB 33	"	630		1				631
INB 34	"	512		6	1			519
INB 35	"	718		6		1		725
Total		10286	-	48	11	3	-	10348

Table 49. Animal densities from midwater zooplankton net tows (ZNB) collected during OCS-11 (Spring 1980) at Narwhal Island ice station.

ZNB #	Date	Amphipoda	Harpacticoid/ Cyclopoid Copepods	Scyphozoa	Polychaeta	Cumacea	Chaetognatha	Calanoid Copepods
1	April 13	11		3				+
2	April 13	3		7	1			+
3	April 14	22						+
6	April 17	3	1	15				+
7	April 19	9		9				+
8	April 19	2	1	6	1			+
9	April 19	4		16				+
10	April 24	2		12				+
11	April 24	3	2	2				+
12	April 28	–		4				+
13	April 28	1		15				+
14	April 28	1		9		1		+
15	April 28	1		30				+
40	May 2	4		22	3			+
41	May 2	2	1	34	2			+
62	May 17	5	4	20	3			+
63	May 17	2	2	17	1		1	+
86	May 22	–	11	49	12			+
87	May 22	1	17	39	13			+
88	May 26	8	10	12	2			+
89	May 26	2	26	19	3			+

Table 50. Animal densities from midwater zooplankton tows (ZNB) collected on April 30-May 1, 1980 at Narwhal Island ice station.

ZNB #	Time	Amphipoda	Harpacticoid/ Cyclopoid Copepods	Scyphozoa	Polychaeta	Cumacea	Mysidacea	Ostracoda	Chaetognatha	Calanoid Copepods
16	0830	9		19				1	2	+
17	0835	1		23					1	+
18	1024	-		35						+
19	1028	2		38						+
20	1225	1		20						+
21	1230	1		30	1					+
22	1424	1		22						+
23	1428	-		29	1					+
24	1626	2		25	1				2	+
25	1631	2		13	1					+
26	1825	-		16						
27	1829	-		11					1	+
28	2021	-		34						+
29	2027	-		17						+
30	2222	3		23						+
31	2227	1		39						+
32	0025	20	2	23						+
33	0029	14	3	13	1					+
34	0229	263	5	19	1		1			+
35	0234	23	2	8					+	+
36	0436	23		21	1					+
37	0442	48	3	24		1				+
38	0637	52	2	55						+
39	0643	3	1	18					1	+

Table 51. Animal densities from midwater zooplankton tows (ZNB) collected on May 7-8, 1980 at Narshal Island ice station.

ZNB #	Time	Amphipoda	Harpacticoid/ Cyclopoid Copepods	Scyphozoa	Polychaeta	Chaetognatha	Calanoid Copepods
42	0925	7	1	17	4		+
43	0930	6		10	2		+
44	1125	3		18	3		+
45	1130	1		12			+
46	1324	1		9			+
47	1327	-		7			+
48	1527	1	2	23	1	1	+
49	1533	-	1	29			+
50	1727	-		40	3		+
51	1730	-	1	38	5		+
52	1925	2		25	3		+
53	1930	3		22		1	+
54	2127	4	1	41	2		+
55	2133	2		23	3		+
56	2324	3		15	1		+
58	0133	22	1	46	6		+
59	0135	32	1	40			+
60	0320	4	1	20			+
61	0325	6	1	26	1		+

Table 52. Animal densities from midwater zooplankton net tows (ZNB) collected on May 19-20, 1980 at Narwhal Island ice station.

ZNB #	Time	Amphipoda	Harpacticoid/ Cyclopoid Copepods	Scyphozoa	Polychaeta	Cumacea	Mysidacea	Chaetognatha	Calanoid Copepods
64	0935	1	9	26					+
65	0940	3	6	21	1			1	+
66	1130	-	6	34				1	+
67	1135	-	3	34	1				+
68	1330	1	15	20	1				+
69	1335	-	4	33	2				+
70	1730	1	6	34	3				+
71	1735	5	2	12					+
72	1930	1	8	34	2				+
73	1935	1	14	34	1				+
74	2130	2	6	31	3				+
75	2135	9	9	26	1	1			+
76	2330	2	10	33			1		+
77	2335	1	10	38					+
78	0130	3	4	24			1		+
79	0135	1	7	25					+
80	0330	1	9	36					+
81	0335	-	2	41	2				+
82	0530	1		5	1				+
83	0535	2	4	19			1		+
84	0730	1	3	15	1				+
85	0735	-	6	30	1				+

B. Hydrographic data from station NIO, 17 April-11 June, 1930 (OCS-11).

Table 53.

Date/Time		Depth(m)	Conductivity	Salinity($^{\circ}/_{\circ\circ}$)	Temperature (°C)
17 Apr 80		0	27.41	35.82	-1.82
		1	27.24	35.93	-2.00
		2	27.08	35.64	-2.00
		3	27.08	35.09	-2.00
		4	27.07	35.28	<-2.00
		5	27.14	35.57	<-2.00
		6	27.13	35.45	<-2.00
		7	27.15	35.82	<-2.00
		8	27.24	36.02	<-2.00
19 Apr 80	1315	0	27.37	34.90	-1.40
		1	27.14	34.95	<-1.50
		2	27.10	35.50	<-2.00
		3	27.10	35.50	<-2.00
		4	27.17	35.73	<-2.00
		5	27.23	36.17	<-2.00
		6	27.34	36.30	<-2.00
	1625	0	27.16	35.50	-1.70
		6	27.33	36.03	<-2.00
24 Apr 80	1201	0	26.80	34.10	-1.70
		1	26.74	34.83	<-2.00
		2	26.75	34.96	-2.00
		3	26.78	34.94	<-2.00
		4	26.76	35.19	<-2.00
		5	26.75	35.17	<-2.00
		6	27.15	35.85	<-2.00
	1500	0	26.78	34.67	<-2.00
		6	27.82	36.78	<-2.00
28 Apr 80	1909	0	26.88	34.70	-2.00
		1	26.89	35.32	<-2.00
		2	26.86	35.28	<-2.00
		3	26.86	35.39	<-2.00
		4	26.91	35.45	<-2.00
		5	27.00	35.68	<-2.00
		6	27.24	35.76	<-2.00
30 Apr 80	0845	0	26.74	35.70	<-2.00
		1	26.80	35.84	<-2.00
		2	26.82	35.67	<-2.00
		3	26.82	35.72	<-2.00
		4	26.98	35.88	<-2.00
		5	27.06	35.92	<-2.00
		6	27.39	36.48	<-2.00
	1035	0	26.77	35.46	<-2.00
		6	27.30	36.29	<-2.00

Table 53. (cont'd)

Date/Time		Depth(m)	Conductivity	Salinity(‰)	Temperature (°C)
30 Apr	1235	0	26.84	34.86	<-2.00
		1	26.82	34.37	-1.78
		2	26.85	34.70	-1.73
		3	26.85	35.01	<-2.00
		4	26.86	35.26	<-2.00
		5	26.90	35.42	<-2.00
		6	27.35	36.23	<-2.00
	1436	0	26.76	35.05	<-2.0
		6	27.14	35.69	<-2.0
	1638	0	26.79	33.74	-1.69
		1	26.75	34.70	-2.00
		3	26.78	34.88	<-2.00
		4	26.98	35.33	<-2.00
		5	27.19	35.51	<-2.00
		6	27.30	35.90	<-2.00
	1834	0	26.76	35.14	<-2.00
		6	27.29	35.91	<-2.00
	2032	0	26.92	35.05	<-2.00
		1	26.84	35.23	<-2.00
		2	26.84	35.20	<-2.00
		3	26.84	35.27	<-2.00
		4	26.94	35.51	<-2.00
		5	27.33	35.98	<-2.00
		6	27.40	35.98	<-2.00
	2230	0	26.86	35.21	<-2.00
		6	27.49	36.52	<-2.00
1 May 80	0034	0	26.81	35.08	<-2.00
		1	26.85	35.16	<-2.00
		2	26.85	35.34	<-2.00
		3	26.91	35.41	<-2.00
		4	27.12	35.80	<-2.00
		5	27.15	35.92	<-2.00
		6	27.38	36.21	<-2.00
	0240	0	26.83	35.08	<-2.00
		6	27.42	36.06	<-2.00
	0447	0	26.83	34.45	-1.65
		1	26.82	34.84	<-2.00
		2	26.82	34.95	<-2.00
		3	26.83	35.18	<-2.00
		4	26.89	35.38	<-2.00
		5	27.29	36.03	<-2.00
		6	27.37	36.14	<-2.00
	0650	0	26.77	34.93	<-2.00
		6	27.16	35.58	<-2.00

Table 53. (cont'd)

Date/Time		Depth(m)	Conductivity	Salinity(°/oo)	Temperature (°C)
	0930	0	27.08	33.40	-1.30
		1	26.86	34.92	<-2.00
		2	26.87	35.05	<-2.00
		3	26.87	35.23	<-2.00
		4	27.03	35.41	<-2.00
		5	27.13	35.50	<-2.00
		6	27.55	36.39	<-2.00
	1533	0	26.91	35.23	<-2.00
		6	27.25	36.00	<-2.00
5 May 80	0920	0	27.10	33.68	-0.78
		1	26.88	33.93	-0.91
		2	26.86	34.08	-0.97
		3	26.93	34.99	<-2.00
		4	27.28	35.62	<-2.00
		5	27.45	36.31	<-2.00
		6	27.59	36.50	<-2.00
7 May 80	0935	0	27.03	34.80	-2.00
		1	26.91	35.28	<-2.00
		2	26.93	35.00	<-2.00
		3	26.93	35.21	<-2.00
		4	27.31	35.95	<-2.00
		5	27.49	36.32	<-2.00
		6	27.54	36.40	<-2.00
	1135	0	26.94	35.50	<-2.00
		6	27.55	36.79	<-2.00
	1330	0	26.71	35.56	<-2.00
		1	26.96	35.87	<-2.00
		2	27.00	35.84	<-2.00
		3	7.00	35.93	<-2.00
		4	27.25	36.27	<-2.00
		5	27.55	36.62	<-2.00
		6	27.69	36.81	<-2.00
	1535	0	26.91	35.77	<-2.00
		6	27.55	36.80	<-2.00
	1758	0	26.81	35.87	<-2.00
		1	26.93	35.89	<-2.00
		2	26.93	35.89	<-2.00
		3	26.92	35.75	<-2.00
		4	26.96	35.74	<-2.00
		5	27.18	36.21	<-2.00
		6	27.52	36.67	<-2.00
	1934	0	26.93	35.74	<-2.00
		6	26.99	36.19	<-2.00

Table 53. (cont'd)

Date/Time		Depth(m)	Conductivity	Salinity(°/₀₀)	Temperature (°C)
7 May 80	2135	0	26.62	36.15	<-2.00
		1	26.92	36.52	<-2.00
		2	26.93	36.39	<-2.00
		3	26.95	36.34	<-2.00
		4	26.99	36.40	<-2.00
		5	27.42	36.98	<-2.00
		6	27.55	36.80	<-2.00
	2330	0	26.88	36.33	<-2.00
		6	27.45	37.69	<-2.00
8 May 80	0145	0	26.46	38.53	<<-2.00
		1	26.84	39.17	<<-2.00
		2	26.80	39.17	<<-2.00
		3	26.80	38.63	<<-2.00
		4	27.02	38.90	<<-2.00
		5	27.44	39.58	<<-2.00
		6	27.53	39.83	<<-2.00
	0330	0	26.57	39.31	<<-2.00
		6	26.92	40.00	<<-2.00
11 May 80	1605	0	26.90	34.70	-1.90
		1	26.79	34.92	<-2.00
		2	26.80	35.10	<-2.00
		3	26.80	35.20	<-2.00
		4	26.90	34.60	-1.99
		5	27.19	36.00	<-2.00
		6	27.39	36.30	<-2.0
15 May 80	1430	0	26.94	35.36	<-2.00
		1	26.96	35.30	<-2.00
		2	26.98	35.60	<-2.00
		3	26.90	35.42	<-2.00
		4	26.96	35.54	<-2.00
		5	27.02	35.78	<-2.00
		6	27.10	35.78	<-2.00
17 May 80	1149	0	26.88	35.30	<-2.00
		1	26.88	35.88	<-2.00
		2	26.98	35.70	<-2.00
		3	26.96	35.70	<-2.00
		4	27.06	35.72	<-2.00
		5	27.08	35.82	<-2.00
		6	27.13	36.00	<-2.00
19 May 80	0947	0	26.62	36.22	<-2.00
		1	26.72	35.44	<-2.00
		2	26.74	35.46	<-2.00
		3	26.76	35.60	<-2.00
		4	26.76	35.60	<-2.00
		5	27.06	36.20	<-2.00
		6	27.15	36.14	<-2.00

Table 53. (cont'd)

Date/Time		Depth(m)	Conductivity	Salinity(°/₀₀)	Temperature (°C)
29 May 80	0900	0	26.55	34.94	<-2.00
		1	26.55	34.98	<-2.00
		2	26.54	34.93	<-2.00
		3	26.56	34.94	<-2.00
		4	26.61	34.96	<-2.00
		5	26.65	35.06	<-2.00
		6	26.70	35.08	<-2.00
31 May 80	0945	0	26.50	35.04	<-2.00
		1	26.58	34.96	<-2.00
		2	26.58	35.12	<-2.00
		3	26.61	35.22	<-2.00
		4	26.68	35.22	<-2.00
		5	26.75	35.22	<-2.00
		6	26.85	35.22	<-2.00
2 June 80	0900	0	26.59	34.84	<-2.00
		1	26.62	34.84	<-2.00
		2	26.65	34.90	<-2.00
		3	26.69	34.98	<-2.00
		4	26.66	35.05	<-2.00
		5	26.70	35.11	<-2.00
		6	26.75	35.11	<-2.00
	1100	0	26.65	35.05	-1.75
		6	26.96	35.53	<-2.00
	1300	0	26.64	31.90	+0.57
		1	26.76	34.89	<-2.00
		2	26.76	34.99	<-2.00
		3	26.76	35.09	<-2.00
		4	26.78	34.79	<-2.00
		5	26.85	35.26	<-2.00
		6	26.82	35.23	<-2.00
	1500	0	26.76	33.04	+0.59
		6	26.69	34.59	<-2.00
	1700	0	27.04	32.49	+0.09
		1	26.81	34.61	<-2.00
		2	26.83	34.26	-1.85
		3	26.81	34.80	<-2.00
		4	26.81	34.76	<-2.00
		5	26.82	35.09	<-2.00
		6	26.85	35.18	<-2.00
	1900	0	27.01	32.88	-0.51
		6	26.90	34.95	-1.65
	2100	0	27.01	33.27	-1.03
		1	26.83	34.95	<-2.00
		2	26.83	34.94	<-2.00
		3	26.83	34.90	<-2.00
		4	26.82	34.88	<-2.00
		5	26.85	34.82	<-2.00
		6	26.85	34.94	<-2.00

Table 53. (cont'd)

Date/Time		Depth(m)	Conductivity	Salinity(°/₀₀)	Temperature (°C)
2 June 80	2300	0	26.97	31.26	+0.64
		6	26.94	33.82	-0.70
3 June 80	0100	0	27.00	31.39	+1.14
		1	26.72	32.94	-1.32
		2	26.70	33.74	-1.45
		3	26.74	34.58	-2.00
		4	26.75	34.72	<-2.00
		5	26.79	35.06	<-2.00
		6	26.77	35.04	<-2.00
	0300	0	27.08	29.89	+0.82
		6	26.96	34.88	<-2.00
	0500	0	26.92	32.96	+0.23
		1	26.81	31.50	-0.32
		2	26.97	32.62	-0.42
		3	26.94	34.69	-1.90
		4	26.90	34.85	<-2.00
		5	26.93	35.17	<-2.00
		6	26.92	35.11	<-2.00
	0700	0	26.96	30.79	+1.22
		6	27.06	33.67	+0.06
5 June 80	0840	0	26.06	33.68	<-2.00
		1	26.75	34.47	-1.90
		2	26.84	35.03	<-2.00
		3	26.86	35.26	<-2.00
		4	26.93	35.26	<-2.00
		5	26.98	35.39	<-2.00
		6	27.01	35.54	<-2.00
7 June 80	0840	0	25.63	32.30	-1.46
		1	26.62	34.51	<-2.00
		2	26.75	34.94	<-2.00
		3	26.77	34.89	<-2.00
		4	26.89	35.23	<-2.00
		5	27.05	35.46	<-2.00
		6	27.10	35.60	<-2.00
9 June 80	0840	0	2.73	2.81	-0.44
		1	26.22	34.06	<-2.00
		2	26.30	33.86	-1.84
		3	26.54	34.71	<-2.00
		4	26.74	35.10	<-2.00
		5	26.87	35.11	<-2.00
		6	26.89	35.28	<-2.00
11 June 80	0833	0	1.56	1.56	-0.31
		1	19.58	23.48	-1.17
		2	26.06	33.82	<-2.00
		3	26.65	34.84	<-2.00
		4	26.76	35.21	<-2.00
		5	26.80	35.03	<-2.00
		6	26.90	35.38	<-2.00

G. Food web.

A continuing effort has been placed on the benthic food web - the trophic relationships among the benthic invertebrate assemblages and the food habits of the major large predators on the benthos. To this end, the polychaetes and the bivalve molluscs in the coastal environment (5-25 m depth) have been classified into feeding types (see the partial final reports in Section VI-A).

The food web of the ice faunal community has been under investigation over the past year. The amphipods graze on the ice algae, but documentation of ingestion of meiofauna by them is yet to come.

1. Food habits of offshore arctic cod.

INTRODUCTION

Arctic cod (Boreogadus saida) is an abundant fish in the Chukchi and Beaufort seas of the Arctic Ocean (Andriyashev, 1954). They have been described as being pelagic (Andriyashev, 1954; Dunbar and Hilderbrand, 1952) or demersal (Quast, 1974) in habit. While this species has been found at depths ranging from the surface down to 1000 m (Dunbar and Hilderbrand, 1952), it is most commonly found associated with ice or benthic substrates (Quast, 1974).

Arctic cod mature when four years old (Quast, 1974). Adult fish up to 257 mm in length have been collected in the Beaufort Sea, but they are more commonly 60-180 mm in size (Craig and Haldorson, 1981). This species may be found in high densities in the nearshore Beaufort Sea during certain times of the year. For example, approximately 12 million cod were estimated to be in Simpson Lagoon during an eight day period in mid-August 1978 (Craig and Haldorson, 1981).

Arctic cod are thought to be a very important component in the Arctic marine ecosystem. Andriyashev (1954) said, "Arctic cod occupies an extremely important place in the food chain of Arctic seas being the main or only...consumer of plankton of the Arctic seas." Quast (1974) similarly called B. saida a "key species" in the ecology of this region. The food habits of this species have been examined in the nearshore waters of the Beaufort Sea (Craig and Haldorson, 1981), but not farther offshore. This paper reports on the food habits of Arctic cod caught in trawls in deeper water in the Beaufort Sea.

MATERIALS AND METHODS

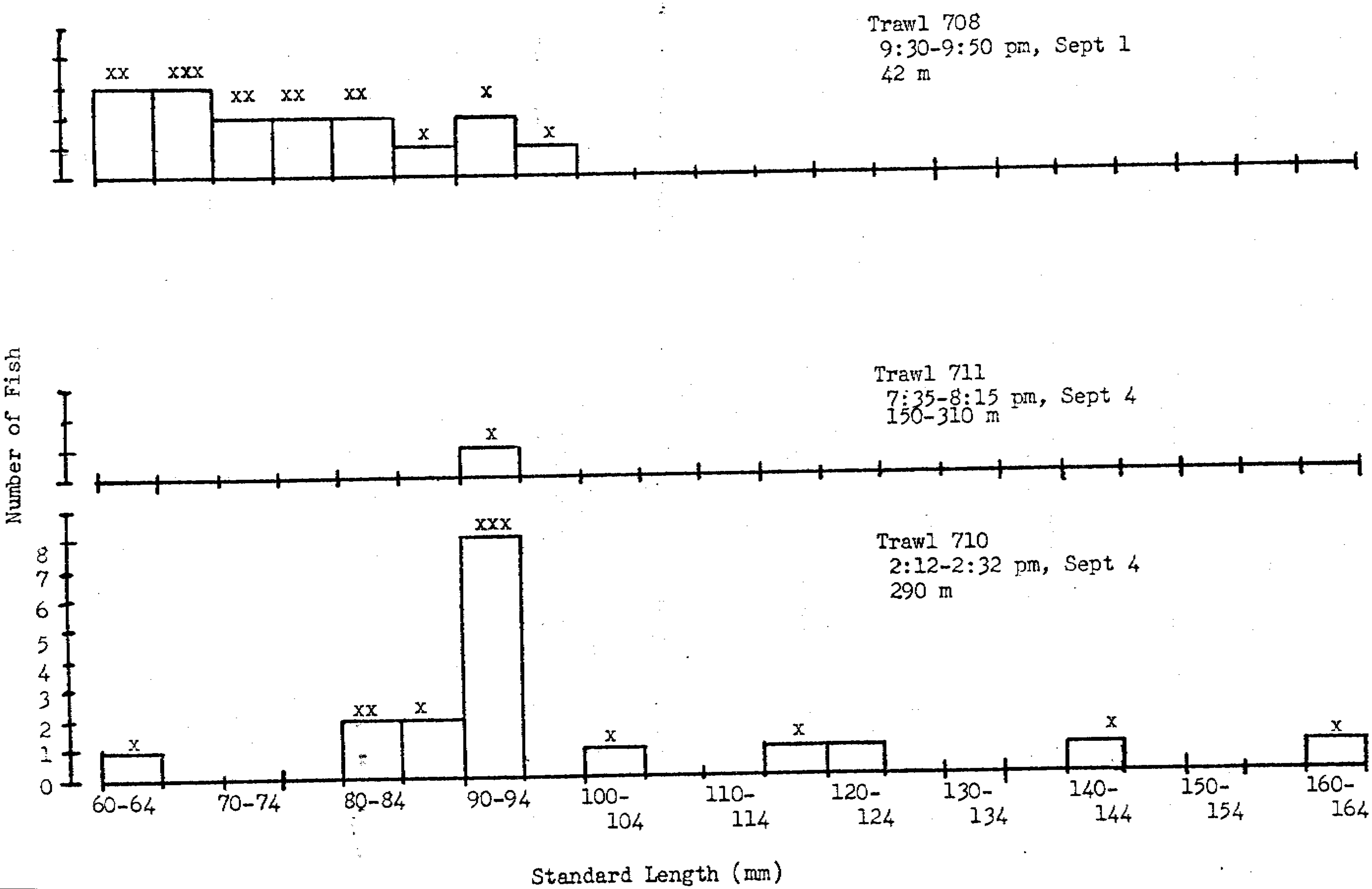
Arctic cod were collected using a ten-foot otter trawl towed at one to two kts by an icebreaker. Tows were made in early September 1978 in the Beaufort Sea near the U.S.-Canadian border. Three trawls at various depths off Demarcation Point were examined. A total of 34 Arctic cod were collected. The size-frequency distributions of fish collected in each trawl, as well as the towing time and station depth are given in Figure 38. Trawl positions are as follows: Trawl 708 - 70°06.5'N, 142°04.1'W; Trawl 710 - 70°25.9'N, 141°28.1'W; Trawl 711 - 70°25.5'N, 141°44.5'W.

Onboard ship the fish were placed in containers filled with 10 percent formalin neutralized in sodium borate. In the laboratory, standard lengths and weights of all fish were recorded. The stomachs were removed and stomach fullness was estimated on a relative scale ranging from 0 (empty) to 3 (very full, distended). The contents of the stomachs were placed in vials containing 70% ethanol for later examination.

The contents of the stomachs were washed on a 63 micron sieve to remove the ethanol and examined under a dissecting microscope. All fragments identiable to a basic taxonomic level were enumerated. The groups were weighed, as was the unidentifiable material, and the percentage volume of these categories was estimated.

Due to the small sample size, no statistical methods were applied in analyzing the data.

Figure 38. Size-frequency of Boreogadus saida captured in otter trawls 708, 710 and 711 in September 1978. The x's indicate samples for which stomach contents were available.



RESULTS

A total of 25 stomachs was examined. Table 54 summarizes the data on number of items within a prey category, the number of fish that these occurred in, the percent by number of the total made up by each category, and the frequency of occurrence of the items in cod stomachs for Trawls 708, 710, and all three trawls combined.

Calanoid copepods were the most abundant prey item and were found in more stomachs than any other prey. Overall they represented over 95% of the prey items identified, and were found in 88% of the fish. Ostracods were next in both percent of total (1.8%) and frequency of occurrence (28%). This group is numerically important only in Trawl 708. Mysids occur as frequently as ostracods in stomachs, but are only half as numerous. Gammarid amphipods, hyperiid amphipods, and cyclopoid copepods were other groups found in stomachs. These were of minor importance numerically, each less than one percent of the total number of recognizable items. Hyperiids did occur in 27% of the fish in Trawl 710, but were absent in Trawl 708.

There are no obvious differences shown in the diets of different sized cods obtained in the trawls (Table 55). Most prey items occurred in the stomachs of cod from a range of sizes. There seems to be some segregation of different-sized cods at different depths. Larger cods were only taken in Trawl 710 (290 m).

There is a trend shown in fullness of stomachs (Table 56) for more stomachs to be full near the end of the day. Over 60% of the fish taken in Trawl 708 (begun at 9:30 pm) were full. Only 11.1% of the fish caught in Trawl 710 (begun at 2:12 pm) had full stomachs. Light conditions during Trawl 708 were approximately those of twilight in temperate regions (Gene Ruff, pers. comm.).

The weights of stomach contents are not listed because of the small mass concerned. The largest weight contained in any one stomach was 0.14 g. Most of the prey categories in a stomach weighed less than 0.01 g.

DISCUSSION

The fish examined appear to be feeding almost exclusively on crustaceans in the water column rather than benthic organisms. Calanoid copepods are typically found in the plankton and were the numerically most abundant item present in the guts of these fish. Of the other prey items found, hyperiids, ostracods, and mysids, are often found in the water column. Only gammarid amphipods are usually benthic, but are capable of swimming. Common benthic crustaceans such as isopods and harpacticoid copepods were not present in the stomachs. It appears that these cods are not feeding on the bottom even though they were caught in bottom trawls, instead they feed on organisms living in the water column above them. However, the net was on bottom only minutes; many of the fish could have been captured in the water column during deployment and retrieval.

The results obtained in this feeding study agree very closely with those by Hognestad (1968) who looked at the guts of 200 _B. saida_ collected largely in bottom trawls from the Barents Sea. These stomachs were filled with _Calanus finmarchicus_ although a few fish contained larvaceans and hyperiids in addition. Tyler (1978) reported that arctic cod from Dease Strait, Victoria Island in Canadian Northwest Terretories fed on amphipods, mysids, calanoids and larval fish, indicating a pelagic food source. The results of a study by Craig and Haldorson (1981) do not agree as well with the present study. Arctic cod in the summer in Simpson Lagoon

Table 54. Summary of Gut Contents of *Boreogadus saida* collected in Trawls 708, 710, and 711. Trawl 711 is not listed separately since only one fish was taken.

TRAWL 708 — 13 FISH

Prey Item	# recognized	Occur in # fish	% Total	Frequency of Occurence
Calanoids	700	13	96.7	100%
Ostracods	13	6	1.8	46.2%
Mysids	5	5	0.7	38.5%
Gammarid amphipods	4	3	0.6	23.1%
Hyperiid amphipods	0	0	0	0
Cyclopoid copepods	2	1	0.3	7.7%
	724			

TRAWL 710 — 11 FISH

Calanoids	14	8	63.6	72.7%
Ostracods	1	1	4.5	9.1%
Mysids	2	2	9.1	18.2%
Gammarid amphipods	2	1	9.1	9.1%
Hyperiid amphipods	3	3	13.6	27.3%
Cyclopoid copepods	0	0	0	0
	22			

TOTAL: TRAWLS 708, 710, 711 — 25 FISH

Calanoids	723	22	95.5	88%
Ostracods	14	7	1.8	28%
Mysids	7	7	0.9	28%
Gammarid amphipods	6	4	0.8	16%
Hyperiid amphipods	5	4	0.7	16%
Cyclopoid copepods	2	1	0.3	4%
	757			

Table 55. Number of Recognizable Items in the Guts of Arctic cod captured in Trawls 708, 710, and 711. The fish are arranged by increasing length.

SL (mm)	Trawl	Calanoids	Ostracods	Mysids	Gammarid amphipods	Hyperiid amphipods	Cyclopoid copepods	Est. Vol. Unrecogniza
60	708	23	4					60%
63	708	15	2	1				60%
63	710	4				1		95%
66	708	23		1				40%
69	708	33						75%
69	708	196			2			45%
72	708	71						60%
74	708	5					2	87%
77	708	15	1		1			80%
77	708	8						90%
84	708	54	1	1				75%
84	708	74	2					45%
84	710	1						100%
84	710	2				1		95%
88	708	171	3	1				15%
88	710					1		98%
90	710	3		1				50%
90	710	1						100%
92	710	1						95%
94	708	12		1	1			65%
94	711	9				2		75%
104	710	1	1					95%
119	710			1				95%
143	710	1			2			95%
160	710							100%

Table 56. Degree of Fullness of Gut for Arctic cod collected in Trawls 708 and 710

		Relative Fullness of Gut (0-3)			
		0	1	2	3
Trawl 710 2:12-2:32 pm 290 m	# Fish	1	10	5	2
Trawl 708 9:30-9:50 42 m	# Fish	0	3	3	10

fed on a larger variety of prey items, including euphausids. Copepods (no details as to which Order are given) would appear to represent a smaller portion of the diets of the fish they collected, compared to the fish in this study. However, their data is based on weight and not number, making direct comparisons difficult. Copepods represented from less than one percent to 44% of the total diet in different years. Mysids and amphipods were the most important prey items overall. Simpson Lagoon is much shallower and is more protected than the stations sampled in this study and this may partially explain the differences observed.

It would have perhaps been wiser to pool groups of prey items for all fish and weigh these, instead of weighing the groups for each individual fish. If this had been done, instead of comparing numerical abundance, mysids would undoubtedly make up more than 0.9% of the total; however, the mysids found were small (the largest being approximately 15 mm in length). Some of the calanoids were nearly as large. I believe that even if composition by weight was used, calanoid copepods would still represent the major component of the diets of the fish examined.

In summary, Arctic cod collected in this study fed on crustaceans in the water column. Feeding occurred late in the day. The question of whether feeding occurs in the night and early morning, in addition, cannot be answered with these data. Calanoid copepods were the most important food item in cod stomachs with mysids and gammarid and hyperiid amphipods of lesser importance. Cyclopoid copepods and ostracods were prey items of lesser importance due to their small numbers and size in the guts of Arctic cod.

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H. Benthos recolonization - Harrison Bay.

INTRODUCTION

During a three day period in mid-August, 1980, benthic grab and core samples were taken in and around selected ice gouges off Thetis Island in Harrison Bay. The objective of this field effort was to obtain infaunal samples from gouges of known age in order to assess the natural repopulation sequence. This data would allow more accurate estimates of the rate of return of arctic communities to the normal ranges of species composition and interactions after a major environment disturbance.

The keels of pressure ridges impinge upon the ocean bottom in shallow areas, plowing through the sediments and creating linear gouges. These disrupted strips have been mapped and monitored in Harrison Bay since 1975 by the USGS, and the creation dates of numerous gouges are known fairly accurately. Three of these gouges, aged <1 yr, 3 yrs, and >5 yrs, were located and marked with pingers during the summer of 1980 for subsequent benthic sampling (Table 57).

The grab sampling was carried out between 17-19 August, 1980 from the R/V D.W. HOOD, a 35' fiberglass fishing boat operated through Kinetics Laboratories and supplied with a crew of two. A field camp was established on Thetis Island where a good (ice-free) anchorage existed and salt water was available for sieving operations. Grab samples were obtained from the axis of the gouge, and from control sites on either side of the gouge. Divers were employed to visually confirm the position of the grab samples, and to take additional small cores for meiofauna and sediment analyses. One gouge was occupied each day, and the samples were transported back to the field camp in the evening where they were washed, preserved, and packaged for shipment to the laboratory.

The following is a summary of the cruise report excerpted from the notes maintained by the OSU personnel aboard:

CRUISE REPORT

CRUISE:	OCS-12
DATES:	12-21 August 1980
VESSEL:	R/V D.W. HOOD
OSU PERSONNEL:	R. Eugene Ruff
	Paul Scott

REPORT:

12 August 1980 - Depart OSU for Mukluk Camp, Deadhorse, AK

13 August 1980 - Locate all necessary cruise gear and supplies. Begin preparing equipment for transport to Helmericks on the Colville River. Find that the cruise days have been shifted to the 17th-19th August which will result in a tight cleanup schedule at the end of the cruise.

14 August 1980 -

Morning - Continue with cruise prep - mount camera, light and trip - switch on grab.

Afternoon - Fly over to Helmericks to examine the facilities. Discover that:

1. The R/V HOOD cannot get in to the Helmericks each night as planned to offload the samples at the existing siever location.

Table 57. Station location data provided by the USGS for aged ice gouges in Harrison Bay marked by pingers.

		Gouge 1	Gouge 2	Gouge 3
UTM zone 6 coord	X	372,086	379,337	373,669
"	Y	7,838,579	7,833,345	7,837,367
Range (measured)	Thetis	13379	4436	11387
"	Spy	21766	13390	19874
Range (calculated)	Oliktok	25222	16279	23229
"	Tolaktovuk	24132	27357	24553
Geographic coord.	Latitude	70°37.1591'	70°34.5639'	70°36.5569'
	Longitude	150°27.3328'	150°15.1414'	150°24.6528'
Water depth		13.5m	9-1/4m	12.2m

Gouge 1 - Ridge was 30-50 cm in 1975. Orientation about N/S

Gouge 2 - Formed after the fall of 1979 (during winter '79-'80)

Gouge 3 - Formed during winter 1977-78

Trisponder locations:

	UTM Zone 6 X	UTM Zone 6 Y
Thetis	382,962	7,830,787
Spy	392,548	7,831,158
Oliktok	392,516	7,823,789
Tolaktovuk	354,343	7,822,222

2. The water at the siever location is nearly fresh, which will tend to disrupt the tissues in the marine organisms.

Decide to move the base of operations to Thetis Island off the mouth of the Colville River. The vessel will be able to anchor at the island at night, salt water will be available for the siever, and a cabin is available for shelter and sleeping. Plan to fly the gear to Thetis the afternoon of the 16th, and to bring the siever and pump over and set it up at that time.

15 August 1980 - Complete cruise preps. Talk with Peter Barnes of the USGS and obtain a list of the gouge locations and descriptions of the individual gouges. Arrange for helo transport of gear and personnel to Thetis on the afternoon of the 16th, and off the island the morning of the 20th.

16 August 1980 - Afternoon - Fly all necessary equipment to Thetis Island. Go out with Chris Mungel from Kinetics Labs to get a feeling for the vessel, and begin moving the sampling gear aboard. Meet with the divers from WWSU, and go over sampling strategy.

17 August 1980 -

Morning - Load the balance of the gear aboard the vessel with the Zodiac, and depart for gouge #2. Arrive in an area of many drifting ice floes and deploy the underwater directional antenna.

The antenna is picking up more than one signal, making resolution of the correct site difficult.

Afternoon - Continue tracking ping signals with the directional antenna. It is evident that the antenna will only provide an approximate pinger location, and it will take a diver to pin-point the site.

The Captain informs us that we must depart the area by 1900 hours to allow him enough daylight to navigate through the ice floes back to the island. Decision is made to locate the site as closely as possible using the underwater antenna, visual bearings, and the trisponder range from Thetis, and then to locate the gouge with the recording fathometer. This is accomplished, and the gouge axis is marked with a Norwegian float.

Since the ship cannot anchor, the divers operate from the Zodiac. One diver is sent down to examine the ice gouge and general terrain. The ship is moved ∿100 meters to the SE where 5 quantitative grab samples are obtained as controls.

The diver reports a new-looking, W-shaped gouge which is characterized by sharp relief and little or no silting (Figure 39). The ship is positioned over the gouge, and 5 grab samples are taken in the axis. The sediments appear more clayey than those at the site to the SE.

The ship is moved to a site ∿100 meters NW of the gouge to take an additional series of control samples. At the same time, a diver re-occupies the gouge to confirm that the grabs were taken from the right location, and to obtain meiofauna core samples.

Figure 39. Field sketch and notes made from diver description of ice gouge #2.

Diver Observations:

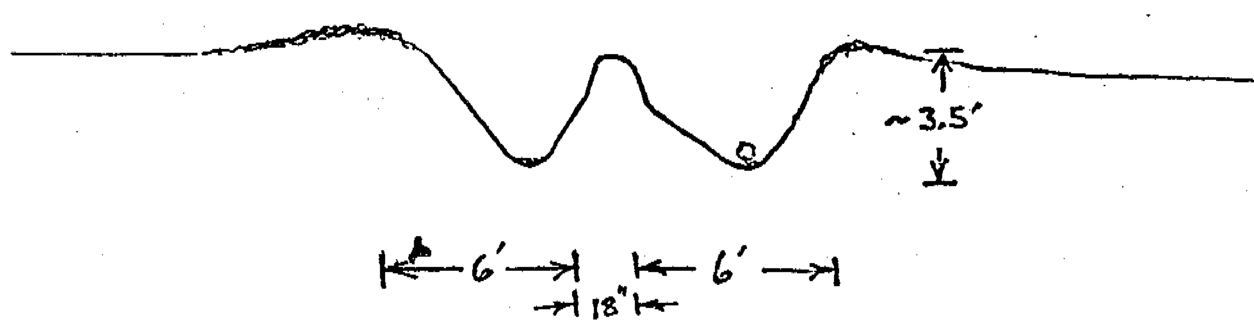
Gouge #2
9.2 m
17 Aug 80

3 grab marks total were located, all in the gouge

All of bottom very gouged up

Visibility ~ 2-3 feet

Double-keeled gouge -



Gouge depth variable - 2-4 feet

When undisturbed, seds all looked the same. When disturbed, however, covering in gouge looked thinner.

Gouge was acting as detritus trap - Laminaria noted, along w/ balls of detritus + wood chips.

Night - The ship is moved back to Thetis Island and anchored in a lagoon on the south side. The siever and pump are set up for operation, and the samples are washed by 0230 the next morning.

18 August 1980 -

Morning - Depart for gouge site #3 after breakfast. Follow the same procedure as the day before - gain general area, look for pinger with directional antenna, locate the gouge with the recoring fathometer and mark with floats. This gouge appears to be much older and broader, with smooth relief and filled with silts (Figure 40).

Afternoon - Obtain grab samples from either side of gouge, and from within the gouge. The within-gouge sediments appear to be a loose silt on top of a dense clay. Have a diver confirm the within-gouge grab locations, and take meiofaunal cores.

Night - Spend the evening and early morning hours washing samples. The within-gouge clays are very difficult to break down, and only 2/3 of the samples are washed by 0300. Preserve the samples, and knock off for some sleep.

19 August 1980 -

Morning - Finish washing the grab samples before breakfast. Depart for gouge site #1 late in the morning.

Afternoon - As before, mark the appropriate gouge with floats. This gouge also appears to be older and silted in. The ice is quiet enough to permit anchor stations, and therefore the diver can follow the grab down and make sure it is sampling where desired. As a test, 5 of the within-gouge meiofauna cores are taken via diver, while the other five are taken from a grab sample.

Night - Spend early evening washing all samples. Preserve the samples with buffered formaldehyde, tape the lids, and box the samples for shipment. Spend the rest of the evening off-loading the ship, tearing down the gear and getting it ready for shipment back to Mukluk Camp.

20 August 1980 - Call OCS-Mukluk for scheduled helo support. The helo is not available, so the personnel and a limited amount of gear is flown out in the afternoon via float plane. The balance of the gear is loaded back aboard the D.W. HOOD for delivery to West Dock in Prudhoe Bay in the evening. After arrival, off-load the equipment, rinse, inventory and store in the dive trailer.

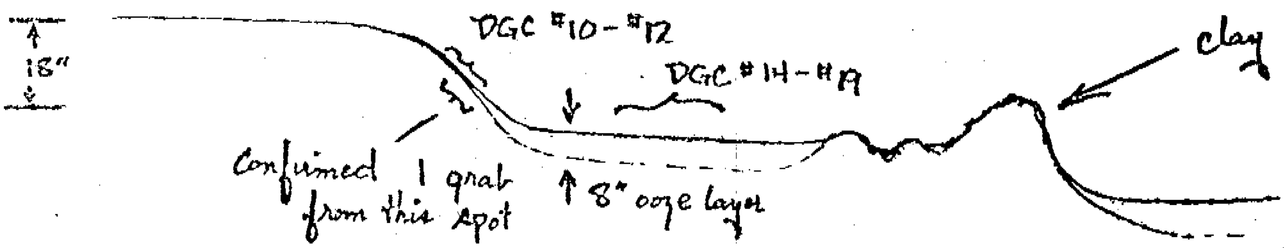
21 August 1980 - Depart Mukluk Camp, Deadhorse, AK for OSU.

COMMENTS AND RECOMMENDATIONS:

Overall, the OCS-12 cruise can be rated as generally successful in that benthic samples and diver observations were obtained from areas in and around ice gouges. Much of the credit should be directed toward the crew aboard the D.W. HOOD. They were a pleasure to work with, and they greatly facilitated a safe and productive sampling program.

Figure 40. Field sketch and notes made from diver description of ice gouge #3.

Visibility - 2½'-3' at start -
0' when silt kicked up



DGC #13 from this spot

Looked older - smooth relief

Noted very little animal life
1- amphipod
1- narrow trail (gastropod?)

Gastropods confirmed
Saduria sabini
Mysis
No detrital drift

Numerous problems were encountered throughout the cruise, the most serious of which was our inability to precisely locate the pingers emplaced by the USGS. A possible solution to this difficulty might be to mark the gouges with a subsurface float tethered to an acoustic release. Although more expensive initially, this equipment would free any future ice-gouge work from dependence upon outside programs and/or borrowed gear. Cumbersome underwater directional antennas would not be required, and problems with signals from other pingers in the area could be avoided. Valuable diver time would not need to be expended in search patterns. This system would permit immediate occupation of the exact gouge site if local ice conditions were favorable and a signal were sent. The release and float could then be re-set by the divers at the conclusion of the day's work.

Other problems were of a less serious nature, and many of the solutions worked out in the field can be routinely adopted in future work. Thetis Island is an excellent base of operations, providing a good anchorage, a convenient source of sea water for sieving, and heated shelter with sleeping accomodations. Having divers with a biological background is invaluable for this sort of benthic work, and a hearty "Thanks" is extended to the divers from WWSU for their support both above and below the surface of the Beaufort Sea.

RESULTS:

Gouge #2 (sampled 17 Aug 1980):

∿100 m SE of gouge, Z = 8.5 m

5 - 0.1 m^2 quantitative grabs (SMG 1781-1785)
5 - quantitative meiofauna cores (SMG 1786)
12 - subsamples for sediment analysis

gouge axis, Z = 9 m

5 - 0.1 m^2 quantitative grabs (SMG 1787-1791)
5 - quantitative meiofauna cores (Diver)
10 - subsamples for sediment analysis

∿100 m NW of gouge, Z = 8.5 m

5 - 0.1 m^2 quantitative grabs (SMG 1792-1796)
5 - quantitative meiofauna cores (SMG 1797)
12 - subsamples for sediment analysis
Bottom water - T°C = -0.55 S°/₀₀ = 30.99 Cond. = 25.69

Gouge #3 (sampled 18 Aug 1980):

∿50 m E of gouge, Z = 12 m

5 - 0.1 m^2 quantitative grabs (SMG 1798-1802)
5 - quantitative meiofauna cores (SMG 1803)
12 - subsamples for sediment analysis
Bottom water - T°C = -1.02 S°/₀₀ = 31.19 Cond. = 25.53
Surface water - T°C = -0.55 S°/₀₀ = 23.39 Cond. = 20.07

gouge axis, Z = 13 m

5 - 0.1 m^2 quantitative grabs (SMG 1804-1808)
5 - quantitative meiofauna cores (Diver)
10 - subsamples for sediment analysis
Bottom water - T°C = -1.07 S°/₀₀ = 31.58 Cond. = 25.61

∿100 m NW of gouge, Z = 12 m

5 - 0.1 m^2 quantitative grabs (SMG 1809-1813)
5 - quantitative meiofauna cores (SMG 1814)
12 - subsamples for sediment analysis
Bottom water - T°C = -0.94 S°/₀₀ = 31.35 Cond. = 25.69

Gouge #1 (sampled 19 Aug 1980):

∿100 m NNE of gouge, Z = 13 m

5 - 0.1 m^2 quantitative grabs (SMG 1815-1819)
5 - quantitative meiofauna cores (SMG 1820)
12 - subsamples for sediment analysis

gouge axis, Z = 14 m

5 - 0.1 m^2 quantitative grabs (SMG 1821-1825)
10 - quantitative meiofauna cores (5-SMG 1826, 5-Diver)
12 - subsamples for sediment analysis

∿90 m S of gouge, Z = 13 m

5 - 0.1 m^2 quantitative grabs (SMG 1827-1830, 1832)
5 - quantitative meiofauna cores (SMG 1831)
12 - subsamples for sediment analysis
Bottom water - T°C = -0.20 S°/₀₀ = 30.18 Cond. = 25.56
Surface water - T°C = +0.41 S°/₀₀ = 23.04 Cond. = 20.28

VII. Discussion

There appears to be a characteristic group of species associated with the coastal environment (5-20 meters depth). Generally within this zone the infaunal species are distributed throughout with depth and longitude. This is a relatively speciose fauna, eg 105 species of polychaetes are present from 5 to 25 meters depth along the Alaskan North Slope coastline.

Temporal variability of total abundance or species numbers by season or depth is not significant statistically across the continental shelf along the OCS Standard Station Transect. Benthic communities in warmer climates, however, exhibit marked seasonal changes in numerical densities and species (Frankenberg and Leiper, 1977). In contrast to epibenthic crustaceans, eg gammarid amphipods and mysids (Griffiths and Dillinger, 1980), the bivalves and polychaetes reproduce slowly over an extended period.

Though no definite conclusions can be drawn at this time concerning recruitment timing and amplitude, the data for the three species of pelecypod mollusc and four species of polychaetous annelid suggest that recruitment levels are low and extended over long periods of time. These conclusions, if warranted, would correspond well with previous reports on the reproductive modes of arctic benthic invertebrate fauna (Mileikovsky, 1971; Thorson, 1950). Most arctic benthic species produce relatively few numbers of lecitrophic eggs, and the larvae can have a relatively short existence in surface or bottom water layers before they metaphorphose into benthic juveniles. Such a reproductive cycle generally extends over a long period of time; recruitment would also be extended over a long season.

The analysis of variability of species composition, species richness and abundances indicate that there are no significant overall changes in community structure over a three year period. These preliminary results suggest that lumping of data from separate cruises and separate years is justified for synthesis summaries of southwestern Beaufort Sea benthic ecology.

It is apparent that the fauna associated with the ice undersurface is drawn from both the pelagic and benthic environments in shallow Beaufort Sea waters. There are some striking differences between the Stefansson Sound and the Beaufort Sea coastal ice faunal assemblage. First, the offshore site (NIO) supported larger concentrations of meiofauna on the ice, and some of these showed more marked increases in population density through the spring season. The meiofauna population growth is presumably in response to the increased food supply of the growing ice algal community. The macrofauna, particularly gammarid amphipods, associated with the Narwhal Island ice were in much larger concentrations than those from the 1979 Stefansson Sound ice. Though only a few net samples of macrofauna were attempted in 1979, SCUBA diver observations made it clear that amphipod densities were very low in both March and May. In 1980 amphipods associated with the ice offshore of Narshal Island were abundant, and their diversity increased with the season. Again, the gammarid concentration was probably due to the ice algal bloom. In the case of Calliopiidae sp. A, its appearance and sudden increase during June was caused almost entirely by juveniles. The ice substrate appears to attract some fauna because of the associated ice algae, though some of the larval and juvenile forms may be attracted by the hard substrate.

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VIII. Conclusions

A. There is a coastal fauna living on the inner continental shelf from about 5 to 20 meters depth.

B. There is a widespread continental shelf fauna as well as an outer shelf complex of species.

C. There does not appear to be significant overall changes in the benthic communities across the continental shelf (25-100 meters) either seasonally or yearly.

D. Macro-infaunal benthos generally reproduces over an extended period of time and at a slow rate.

E. There is an extensive fauna associated with the sea ice undersurface that probably feeds on the ice algae. The oceanic environment seems to support a larger ice community than the protected lagoonal region.

F. Offshore arctic cod feed on pelagic crustaceans rather than on the benthos.

IX. Needs for further study.

Though general and some specific patterns of distribution and abundance of the benthic invertebrate fauna have been determined from the inner continental shelf to the upper slope, much remains to be accomplished in three main areas of research: (1) food web, (2) ice fauna and (3) biological rates.

A. Food web.

Offshore of the barrier islands the continental shelf benthic food web is not well known. The food habits of large predators such as demersal fishes, seabirds and marine mammals that feed on the benthos are not well known. Offshore populations of arctic cod have not been well-studied, and their food sources are not known.

The role of the sea ice algal blooms in the benthic (and pelagic) food web is not understood. The carbon input to the ecosystem by this community is not known, nor are the vertical fluxes through which the ice community and the benthic community would interact. Data from other studies (RU #537 and 467) indicate that ice algal blooms are present on the undersurface of the sea ice out to at least 100 n mi from shore; so this carbon source may be important over large areas.

B. Ice fauna.

Though initial description of the invertebrate sea ice assemblage has been achieved in nearshore waters beyond the barrier islands, there is a basic lack of knowledge about the ice fauna and its relationship to the benthos and pelagic fauna beneath. Nor do we know the areal extent and patchiness of the ice fauna and its relationship to ice as a substrate - with or without a food source at the ice-water interface. The ice may act as a concentrating interface for advanced and metamorphosing larval stages of benthic invertebrate fauna because it is a solid substrate - albeit upsidedown. Further offshore in the polar pack where the bottom drops away in deeper water, are there macrofaunal grazers primarily from the water column associated with the ice? Are there benthic meiofauna that exist as permanent members of the ice assemblage? And what is the food web associated with the sea ice in this environment?

C. Biological rates.

Much basic information is needed on biological rates - reproductive, growth, mortality, recolonization and metabolic for the purpose of determining the biological activity of the arctic fauna. What are the turnover rates of the benthos (production/biomass) beyond the barrier islands; are the secondary production rates lower than in more temperate environments? Knowledge of the recolonization rates pertain directly to the ability of the fauna to recover after a natural or pollution disturbance event. This information would be most useful in modelling food web recovery rates of a region of the inner shelf of the Beaufort Sea after a major oil spill.

Appendix 1. Polychaete species data for stations between 5 and 2400 meters deep on the Pitt Point Transect taken during WEBSEC-71 and on cruises OCS-1 through OCS-8.

X. Appendices

1. Polychaete species data for stations between 5 and 2400 meters deep on the Pitt Point Transect taken during WEBSEC-71 and on cruises OCS-1 through OCS-8.

2. Bivalve species data for stations between 25 and 100 meters deep on the Pitt Point Transect taken on cruises OCS-1 through OCS-4, and OCS-6 through OCS-8.

3. Amphipod species data for stations between 25 and 100 meters deep on the Pitt Point Transect taken on cruises OCS-1 through OCS-4, and OCS-6.

4. Arctic bibliography - Publications based on the research accomplished through RU #006.

Appendix 1. Polychaete species data for stations between 5 and 2400 meters deep on the Pitt Point Transect taken during WEBSEC-71 and on cruises OCS-1 through OCS-8.

		#/0.5m²
Lumbriclymene minor		
Lumbrineris fragilis		
Lumbrineris impatiens		
Lumbrineris latreilli		
Lumbrineris minuta		2
Lumbrineris sp. A		
Lumbrineris sp. B		
Lumbrineris sp. X		
Lysilla loveni		
Lysippe labiata		
Magelona longicornis		
Maldane sarsi		
Marenzelleria wireni		
Melaenis loveni		
Melinna elisabethae		
Microclymene sp.		
Micronephthys minuta		88
Minuspio cirrifera		1
Myriochele heeri		
Myriochele oculata		
Mystides borealis		
Nemidia torelli		
Neosabellides sp.		
Nephtys caeca		
Nephtys ciliata		2
Nephtys discors		
Nephtys incisa		
Nephtys longosetosa		
Nephtys paradoxa		
Nereimyra aphroditoides		
Nereis zonata		
Nicolea zostericola		
Nicomache lumbricalis		
Nicon sp. A		
Nothria conchylega		
Notomastus latericeus		
Notoproctus oculatus		
Onuphis quadricuspis		
Ophelina acuminata		1
Ophelina cylindricaudatus		1
Ophelina groenlandica		
Ophelina sp. A		
Ophryotrocha sp.		
Orbinia sp.		
Owenia collaris		
Owenia fusiformis		
Paramphitrite tetrabranchia		
Paranaitides wahlbergi		
Paraonis sp. A		3
Parheteromastus sp. A		
Petaloproctus tenuis		
Pherusa plumosa		
Pholoe minuta		

		#/0.5m²
Pionosyllis compacta		
Pista cristata		
Polycirrus medusa		
Polydora caulleryi		
Polydora quadrilobata		
Polydora socialis		
Polyphysia crassa		
Praxillella gracilis		
Praxillella praetermissa		
Prionospio steenstrupi		
Proclea graffii		
Pygospio elegans		
Rhodine gracilior		
Sabella sp.		
Sabellastarte sp.		
Sabellides borealis		
Scalibregma inflatum		
Schistomeringos caeca	1	
Schistomeringos sp. A		
Scoloplos acutus	4	
Scoloplos armiger		
Sigambra tentaculata		
Sphaerodoridium claparedii		
Sphaerodoridium sp. A		
Sphaerodoropsis biserialis	1	
Sphaerodoropsis minuta		
Sphaerodoropsis sp. A		
Sphaerodoropsis sp. B		
Sphaerodorum gracilis		
Sphaerosyllis erinaceus		
Spinther sp.		
Spio filicornis		
Spio theeli		
Spiochaetopterus typicus		
Spiophanes bombyx		
Spirorbis granulatus		
Sternaspis scutata	56	
Syllides longocirrata		
Syllides sp.		
Tachytrypane abranchiata		
Tachytrypane sp. A		
Tauberia gracilis	5	
Terebellides stroemi		
Tharyx ?acutus	72	
Travisia sp.		
Trichobranchus glacialis		
Trochochaeta carica		
Trochochaeta multisetosa		
Typosyllis cornuta		
Typosyllis fasciata		
unidentified	3	
TOTAL 24 spp.	296	

Appendix I: Polychaete species data for Station PPB-25 (25m), Cruise OCS-1; accumulated from Smith McIntyre Grab samples 1082, 1083, 1084, 1085, and 1087. The numbers represent totals per $0.5m^2$ of sea floor for the polychaetes retained on a 1.0 mm sieve.

		$\#/0.5m^2$
Aglaophamus malmgreni		
Allia abranchiata		
Allia nr *suecica*		16
Allia sp. B		1
Allia sp. C		
Amage auricula		
Ampharete acutifrons		
Ampharete arctica		
Ampharete goësi		
Ampharete lindstromi		
Ampharete vega		
Ampharetidae - Genus A		
Ampharetidae - Genus B		
Amphicteis sundevalli		
Anaitides citrina		
Anaitides groenlandica		1
Antinoella badia		
Antinoella sarsi		2
Apistobranchus tullbergi		2
Apomatus globifer		
Arcteobia anticostiensis		
Arenicola glacialis		
Aricidea quadrilobata		
Aricidea tetrabranchiata		
Artacama proboscidea		
Autolytus alexandri		
Autolytus fallax		
Axionice flexuosa		
Axionice maculata		
Barantolla sp.		
Brada incrustata		
Brada inhabilis		
Brada nuda		
Brada villosa		
Branchiomma infarcta		
Capitella capitata		3
Chaetozone setosa		4
Chone duneri		
Chone infundibuliformis		
Chone nr *murmanica*		
Cirratulus cirratus		
Cistenides hyperborea		
Clymenura polaris		
Cossura longocirrata		19
Cossura sp. A		

		$\#/0.5m^2$
Dexiospira spirillum		
Diplocirrus glaucus		
Diplocirrus hirsutus		
Diplocirrus longisetosus		
Dorvillea sp.		
Dysponetus sp. N		
Eclysippe sp. A		
Enipo gracilis		
Enipo canadensis		
Ephesiella macrocirrus		
Eteone flava		
Eteone longa		1
Eteone spetsbergensis		
Eteone (Mysta) barbata		
Euchone analis		
Euchone elegans		
Euchone incolor		
Euchone papillosa		
Euchone sp.		
Eucranta villosa		
Eunoe oerstedi		
Eusyllis blomstrandi		
Exogone dispar		
Exogone naidina		
Exogone sp.		
Fabricinae - sp. O		5
Fabricinae - sp. R		
Fabrisabella schaudinni		
Flabelligera affinis		
Gattyana cirrosa		
Glycera capitata		
Glycinde wireni		
Glyphanostomum pallescens		
Harmothoe imbricata		
Hesionidae gen et sp. nov.		
Heteromastus filiformis		2
Jasmineira sp.		
Lagisca extenuata		
Lanassa nordenskjoldi		
Lanassa venusta		
Laonice cirrata		
Laonome kroyeri		
Laphania boecki		

		$\#/0.5m^2$
Lumbriclymene minor		
Lumbrineris fragilis		
Lumbrineris impatiens		
Lumbrineris latreilli		
Lumbrineris minuta		2
Lumbrineris sp. A		
Lumbrineris sp. B		
Lumbrineris sp. X		
Lysilla loveni		
Lysippe labiata		
Magelona longicornis		
Maldane sarsi		
Marenzelleria wireni		
Melaenis loveni		
Melinna elisabethae		
Microclymene sp.		
Micronephthys minuta		88
Minuspio cirrifera		1
Myriochele heeri		
Myriochele oculata		
Mystides borealis		
Nemidia torelli		
Neosabellides sp.		
Nephtys caeca		
Nephtys ciliata		2
Nephtys discors		
Nephtys incisa		
Nephtys longosetosa		
Nephtys paradoxa		
Nereimyra aphroditoides		
Nereis zonata		
Nicolea zostericola		
Nicomache lumbricalis		
Nicon sp. A		
Nothria conchylega		
Notomastus latericeus		
Notoproctus oculatus		
Onuphis quadricuspis		
Ophelina acuminata		1
Ophelina cylindricaudatus		1
Ophelina groenlandica		
Ophelina sp. A		
Ophryotrocha sp.		
Orbinia sp.		
Owenia collaris		
Owenia fusiformis		
Paramphitrite tetrabranchia		
Paranaitides wahlbergi		
Paraonis sp. A		3
Parheteromastus sp. A		
Petaloproctus tenuis		
Pherusa plumosa		
Pholoe minuta		

		$\#/0.5m^2$
Pionosyllis compacta		
Pista cristata		
Polycirrus medusa		
Polydora caulleryi		
Polydora quadrilobata		
Polydora socialis		
Polyphysia crassa		
Praxillella gracilis		
Praxillella praetermissa		
Prionospio steenstrupi		
Proclea graffii		
Pygospio elegans		
Rhodine gracilior		
Sabella sp.		
Sabellastarte sp.		
Sabellides borealis		
Scalibregma inflatum		
Schistomeringos caeca	1	
Schistomeringos sp. A		
Scoloplos acutus	4	
Scoloplos armiger		
Sigambra tentaculata		
Sphaerodoridium claparedii		
Sphaerodoridium sp. A		
Sphaerodoropsis biserialis	1	
Sphaerodoropsis minuta		
Sphaerodoropsis sp. A		
Sphaerodoropsis sp. B		
Sphaerodorum gracilis		
Sphaerosyllis erinaceus		
Spinther sp.		
Spio filicornis		
Spio theeli		
Spiochaetopterus typicus		
Spiophanes bombyx		
Spirorbis granulatus		
Sternaspis scutata	56	
Syllides longocirrata		
Syllides sp.		
Tachytrypane abranchiata		
Tachytrypane sp. A		
Tauberia gracilis	5	
Terebellides stroemi		
Tharyx ?acutus	72	
Travisia sp.		
Trichobranchus glacialis		
Trochochaeta carica		
Trochochaeta multisetosa		
Typosyllis cornuta		
Typosyllis fasciata		
unidentified	3	
TOTAL 24 spp.	296	

Appendix I (cont'd): Polychaete species data for Station PPB-55 (55m), Cruise OCS-1; accumulated from Smith-McIntyre Grab samples 1088, 1089, 1090, 1091 and 1092. The numbers represent totals per $0.5m^2$ of sea floor for the polychaetes retained on a 1.0 mm sieve.

		$\#/0.5m^2$
Aglaophamus malmgreni		
Allia abranchiata		
Allia nr *suecica*		15
Allia sp. B		
Allia sp. C		
Amage auricula		
Ampharete acutifrons		1
Ampharete arctica		
Ampharete goësi		
Ampharete lindstromi		13
Ampharete vega		
Ampharetidae - Genus A		
Ampharetidae - Genus B		
Amphicteis sundevalli		
Anaitides citrina		
Anaitides groenlandica		5
Antinoella badia		
Antinoella sarsi		6
Apistobranchus tullbergi		2
Apomatus globifer		
Arcteobia anticostiensis		
Arenicola glacialis		
Aricidea quadrilobata		
Aricidea tetrabranchiata		
Artacama proboscidea		
Autolytus alexandri		
Autolytus fallax		
Axionice flexuosa		
Axionice maculata		
Barantolla sp.		15
Brada incrustata		
Brada inhabilis		
Brada nuda		
Brada villosa		
Branchiomma infarcta		
Capitella capitata		
Chaetozone setosa		65
Chone duneri		5
Chone infundibuliformis		
Chone nr *murmanica*		39
Cirratulus cirratus		
Cistenides hyperborea		1
Clymenura polaris		7
Cossura longocirrata		1
Cossura sp. A		

		$\#/0.5m^2$
Dexiospira spirillum		
Diplocirrus glaucus		
Diplocirrus hirsutus		
Diplocirrus longisetosus		2
Dorvillea sp.		
Dysponetus sp. N		
Eunde sp. 1		1
Eclysippe sp. A		
Enipo gracilis		
Enipo canadensis		
Ephesiella macrocirrus		
Eteone flava		
Eteone longa		7
Eteone spetsbergensis		
Eteone (Mysta) barbata		1
Euchone analis		1
Euchone elegans		9
Euchone incolor		2
Euchone papillosa		
Euchone sp.		
Eucranta villosa		1
Eunoe oerstedi		
Eusyllis blomstrandi		
Exogone dispar		
Exogone naidina		3
Exogone sp.		
Fabricinae - sp. O		18
Fabricinae - sp. R		3
Fabrisabella schaudinni		
Flabelligera affinis		
Gattyana cirrosa		2
Glycera capitata		
Glycinde wireni		1
Glyphanostomum pallescens		
Harmothoe imbricata		
Hesionidae gen et sp. nov.		1
Heteromastus filiformis		4
Jasmineira sp.		
Lagisca extenuata		
Lanassa nordenskjoldi		
Lanassa venusta		
Laonice cirrata		
Laonome kroyeri		
Laphania boecki		1

		$\#/0.5m^2$
Lumbriclymene minor		
Lumbrineris fragilis		
Lumbrineris impatiens		26
Lumbrineris latreilli		8
Lumbrineris minuta		2
Lumbrineris sp. A		
Lumbrineris sp. B		3
Lumbrineris sp. X		11
Lysilla loveni		7
Lysippe labiata		35
Magelona longicornis		
Maldane sarsi		8
Marenzelleria wireni		
Melaenis loveni		
Melinna elisabethae		8
Microclymene sp.		
Micronephthys minuta		57
Minuspio cirrifera		1
Myriochele heeri		30
Myriochele oculata		2
Mystides borealis		
Nemidia torelli		
Neosabellides sp.		
Nephtys caeca		
Nephtys ciliata		8
Nephtys discors		
Nephtys incisa		
Nephtys longosetosa		
Nephtys paradoxa		1
Nereimyra aphroditoides		7
Nereis zonata		
Nicolea zostericola		
Nicomache lumbricalis		
Nicon sp. A		
Nothria conchylega		1
Notomastus latericeus		
Notoproctus oculatus		
Onuphis quadricuspis		14
Ophelina acuminata		
Ophelina cylindricaudatus		2
Ophelina groenlandica		9
Ophelina sp. A		
Ophryotrocha sp.		
Orbinia sp.		
Owenia collaris		
Owenia fusiformis		
Paramphitrite tetrabranchia		
Paranaitides wahlbergi		
Paraonis sp. A		
Parheteromastus sp. A		2
Petaloproctus tenuis		1
Pherusa plumosa		
Pholoe minuta		124
Pionosyllis compacta		
Pista cristata		
Polycirrus medusa		1
Polydora caulleryi		5
Polydora quadrilobata		
Polydora socialis		
Polyphysia crassa		
Praxillella gracilis		1
Praxillella praetermissa		2
Prionospio steenstrupi		5
Proclea graffii		1
Pygospio elegans		
Rhodine gracilior		1
Sabella sp.		
Sabellastarte sp.		
Sabellides borealis		
Scalibregma inflatum		6
Schistomeringos caeca		
Schistomeringos sp. A		
Scoloplos acutus		14
Scoloplos armiger		
Sigambra tentaculata		
Sphaerodoridium claparedii		
Sphaerodoridium sp. A		1
Sphaerodoropsis biserialis		
Sphaerodoropsis minuta		
Sphaerodoropsis sp. A		
Sphaerodoropsis sp. B		
Sphaerodorum gracilis		2
Sphaerosyllis erinaceus		2
Spinther sp.		
Spio filicornis		
Spio theeli		
Spiochaetopterus typicus		
Spiophanes bombyx		
Spirorbis granulatus		
Sternaspis scutata		
Syllides longocirrata		2
Syllides sp.		3
Tachytrypane abranchiata		
Tachytrypane sp. A		
Tauberia gracilis		
Terebellides stroemi		71
Tharyx ?acutus		33
Travisia sp.		1
Trichobranchus glacialis		
Trochochaeta carica		2
Trochochaeta multisetosa		
Typosyllis cornuta		6
Typosyllis fasciata		
unidentified		14
TOTAL 71 spp.		772

		$\#/0.5m^2$
Lumbriclymene minor		
Lumbrineris fragilis		
Lumbrineris impatiens		26
Lumbrineris latreilli		8
Lumbrineris minuta		2
Lumbrineris sp. A		
Lumbrineris sp. B		3
Lumbrineris sp. X		11
Lysilla loveni		7
Lysippe labiata		35
Magelona longicornis		
Maldane sarsi		8
Marenzelleria wireni		
Melaenis loveni		
Melinna elisabethae		8
Microclymene sp.		
Micronephthys minuta		57
Minuspio cirrifera		1
Myriochele heeri		30
Myriochele oculata		2
Mystides borealis		
Nemidia torelli		
Neosabellides sp.		
Nephtys caeca		
Nephtys ciliata		8
Nephtys discors		
Nephtys incisa		
Nephtys longosetosa		
Nephtys paradoxa		1
Nereimyra aphroditoides		7
Nereis zonata		
Nicolea zostericola		
Nicomache lumbricalis		
Nicon sp. A		
Nothria conchylega		1
Notomastus latericeus		
Notoproctus oculatus		
Onuphis quadricuspis		14
Ophelina acuminata		
Ophelina cylindricaudatus		2
Ophelina groenlandica		9
Ophelina sp. A		
Ophryotrocha sp.		
Orbinia sp.		
Owenia collaris		
Owenia fusiformis		
Paramphitrite tetrabranchia		
Paranaitides wahlbergi		
Paraonis sp. A		
Parheteromastus sp. A		2
Petaloproctus tenuis		1
Pherusa plumosa		
Pholoe minuta		124

		$\#/0.5m^2$
Pionosyllis compacta		
Pista cristata		
Polycirrus medusa		1
Polydora caulleryi		5
Polydora quadrilobata		
Polydora socialis		
Polyphysia crassa		
Praxillella gracilis		1
Praxillella praetermissa		2
Prionospio steenstrupi		5
Proclea graffii		1
Pygospio elegans		
Rhodine gracilior		1
Sabella sp.		
Sabellastarte sp.		
Sabellides borealis		
Scalibregma inflatum		6
Schistomeringos caeca		
Schistomeringos sp. A		
Scoloplos acutus		14
Scoloplos armiger		
Sigambra tentaculata		
Sphaerodoridium claparedii		
Sphaerodoridium sp. A		1
Sphaerodoropsis biserialis		
Sphaerodoropsis minuta		
Sphaerodoropsis sp. A		
Sphaerodoropsis sp. B		
Sphaerodorum gracilis		2
Sphaerosyllis erinaceus		2
Spinther sp.		
Spio filicornis		
Spio theeli		
Spiochaetopterus typicus		
Spiophanes bombyx		
Spirorbis granulatus		
Sternaspis scutata		
Syllides longocirrata		2
Syllides sp.		3
Tachytrypane abranchiata		
Tachytrypane sp. A		
Tauberia gracilis		
Terebellides stroemi		71
Tharyx ?acutus		33
Travisia sp.		1
Trichobranchus glacialis		
Trochochaeta carica		2
Trochochaeta multisetosa		
Typosyllis cornuta		6
Typosyllis fasciata		
unidentified		14
TOTAL 71 spp.		772

Appendix I (cont'd): Polychaete species data for Station PPB-100 (100m), Cruise OCS-1; accumulated from Smith-McIntyre Grab samples 1093 1094, 1095, 1096 and 1097. The numbers represent totals per $0.5m^2$ of sea floor for the polychaetes retained on a 1.0 mm sieve.

		$\#/0.5m^2$
Aglaophamus malmgreni		
Allia abranchiata		
Allia nr *suecica*		30
Allia sp. B		
Allia sp. C		
Amage auricula		
Ampharete acutifrons		
Ampharete arctica		
Ampharete goësi		1
Ampharete lindstromi		4
Ampharete vega		
Ampharetidae - Genus A		
Ampharetidae - Genus B		
Amphicteis sundevalli		
Anaitides citrina		
Anaitides groenlandica		10
Antinoella badia		
Antinoella sarsi		4
Apistobranchus tullbergi		22
Apomatus globifer		
Arcteobia anticostiensis		
Arenicola glacialis		
Aricidea quadrilobata		
Aricidea tetrabranchiata		
Artacama proboscidea		
Autolytus alexandri		
Autolytus fallax		
Axionice flexuosa		
Axionice maculata		
Barantolla sp.		51
Brada incrustata		
Brada inhabilis		
Brada nuda		
Brada villosa		
Branchiomma infarcta		
Capitella capitata		5
Chaetozone setosa		12
Chone duneri		
Chone infundibuliformis		1
Chone nr *murmanica*		14
Cirratulus cirratus		
Cistenides hyperborea		
Clymenura polaris		
Cossura longocirrata		25
Cossura sp. A		

		$\#/0.5m^2$
Dexiospira spirillum		
Diplocirrus glaucus		
Diplocirrus hirsutus		
Diplocirrus longisetosus		2
Dorvillea sp.		
Dysponetus sp. N		
Eclysippe sp. A		
Enipo gracilis		
Enipo canadensis		
Ephesiella macrocirrus		
Eteone flava		1
Eteone longa		14
Eteone spetsbergensis		2
Eteone (Mysta) barbata		
Euchone analis		
Euchone elegans		
Euchone incolor		1
Euchone papillosa		
Euchone sp.		
Eucranta villosa		
Eunoe oerstedi		
Eusyllis blomstrandi		
Exogone dispar		
Exogone naidina		
Exogone sp.		
Fabricinae - sp. O		1
Fabricinae - sp. R		
Fabrisabella schaudinni		
Flabelligera affinis		
Gattyana cirrosa		2
Glycera capitata		
Glycinde wireni		1
Glyphanostomum pallescens		
Harmothoe imbricata		
Hesionidae gen et sp. nov.		1
Heteromastus filiformis		30
Jasmineira sp.		
Lagisca extenuata		3
Lanassa nordenskjoldi		
Lanassa venusta		
Laonice cirrata		2
Laonome kroyeri		
Laphania boecki		1

		#/0.5m^2
Lumbriclymene minor		
Lumbrineris fragilis		1
Lumbrineris impatiens		31
Lumbrineris latreilli		3
Lumbrineris minuta		6
Lumbrineris sp. A		
Lumbrineris sp. B		
Lumbrineris sp. X		49
Lysilla loveni		
Lysippe labiata		22
Magelona longicornis		
Maldane sarsi		2
Marenzelleria wireni		
Melaenis loveni		
Melinna elisabethae		
Microclymene sp.		9
Micronephthys minuta		129
Minuspio cirrifera		
Myriochele heeri		7
Myriochele oculata		1
Mystides borealis		
Nemidia torelli		
Neosabellides sp.		
Nephtys caeca		
Nephtys ciliata		4
Nephtys discors		
Nephtys incisa		
Nephtys longosetosa		
Nephtys paradoxa		3
Nereimyra aphroditoides		2
Nereis zonata		2
Nicolea zostericola		
Nicomache lumbricalis		
Nicon sp. A		
Nothria conchylega		
Notomastus latericeus		
Notoproctus oculatus		
Onuphis quadricuspis		29
Ophelina acuminata		
Ophelina cylindricaudatus		
Ophelina groenlandica		2
Ophelina sp. A		
Ophryotrocha sp.		2
Orbinia sp.		
Owenia collaris		
Owenia fusiformis		
Paramphitrite tetrabranchia		
Paranaitides wahlbergi		
Paraonis sp. A		
Parheteromastus sp. A		6
Petaloproctus tenuis		
Pherusa plumosa		1
Pholoe minuta		69

		#/0.5m^2
Pionosyllis compacta		
Pista cristata		
Polycirrus medusa		3
Polydora caulleryi		
Polydora quadrilobata		
Polydora socialis		2
Polyphysia crassa		
Praxillella gracilis		
Praxillella praetermissa		
Prionospio steenstrupi		5
Proclea graffii		
Pygospio elegans		
		4
Rhodine gracilior		
Sabella sp.		
Sabellastarte sp.		1
Sabellides borealis		
Scalibregma inflatum		1
Schistomeringos caeca		2
Schistomeringos sp. A		
Scoloplos acutus		48
Scoloplos armiger		
Sigambra tentaculata		
Sphaerodoridium claparedii		
Sphaerodoridium sp. A		
Sphaerodoropsis biserialis		2
Sphaerodoropsis minuta		
Sphaerodoropsis sp. A		
Sphaerodoropsis sp. B		
Sphaerodorum gracilis		9
Sphaerosyllis erinaceus		
Spinther sp.		
Spio filicornis		
Spio theeli		
Spiochaetopterus typicus		7
Spiophanes bombyx		
Spirorbis granulatus		
Sternaspis scutata		1
Syllides longocirrata		
Syllides sp.		
Tachytrypane abranchiata		
Tachytrypane sp. A		
Tauberia gracilis		40
Terebellides stroemi		37
Tharyx ?acutus		90
Travisia sp.		6
Trichobranchus glacialis		3
Trochochaeta carica		3
Trochochaeta multisetosa		1
Typosyllis cornuta		1
Typosyllis fasciata		
unidentified		4
TOTAL 66 spp.		890

		#/0.5m²
Lumbriclymene minor		
Lumbrineris fragilis		1
Lumbrineris impatiens		31
Lumbrineris latreilli		3
Lumbrineris minuta		6
Lumbrineris sp. A		
Lumbrineris sp. B		
Lumbrineris sp. X		49
Lysilla loveni		
Lysippe labiata		22
Magelona longicornis		
Maldane sarsi		2
Marenzelleria wireni		
Melaenis loveni		
Melinna elisabethae		
Microclymene sp.		9
Micronephthys minuta		129
Minuspio cirrifera		
Myriochele heeri		7
Myriochele oculata		1
Mystides borealis		
Nemidia torelli		
Neosabellides sp.		
Nephtys caeca		
Nephtys ciliata		4
Nephtys discors		
Nephtys incisa		
Nephtys longosetosa		
Nephtys paradoxa		3
Nereimyra aphroditoides		2
Nereis zonata		2
Nicolea zostericola		
Nicomache lumbricalis		
Nicon sp. A		
Nothria conchylega		
Notomastus latericeus		
Notoproctus oculatus		
Onuphis quadricuspis		29
Ophelina acuminata		
Ophelina cylindricaudatus		
Ophelina groenlandica		2
Ophelina sp. A		
Ophryotrocha sp.		2
Orbinia sp.		
Owenia collaris		
Owenia fusiformis		
Paramphitrite tetrabranchia		
Paranaitides wahlbergi		
Paraonis sp. A		
Parheteromastus sp. A		6
Petaloproctus tenuis		
Pherusa plumosa		1
Pholoe minuta		69

		#/0.5m²
Pionosyllis compacta		
Pista cristata		
Polycirrus medusa		3
Polydora caulleryi		
Polydora quadrilobata		
Polydora socialis		2
Polyphysia crassa		
Praxillella gracilis		
Praxillella praetermissa		
Prionospio steenstrupi		5
Proclea graffii		
Pygospio elegans		
		4
Rhodine gracilior		
Sabella sp.		
Sabellastarte sp.		1
Sabellides borealis		
Scalibregma inflatum		1
Schistomeringos caeca		2
Schistomeringos sp. A		
Scoloplos acutus		48
Scoloplos armiger		
Sigambra tentaculata		
Sphaerodoridium claparedii		
Sphaerodoridium sp. A		
Sphaerodoropsis biserialis		2
Sphaerodoropsis minuta		
Sphaerodoropsis sp. A		
Sphaerodoropsis sp. B		
Sphaerodorum gracilis		9
Sphaerosyllis erinaceus		
Spinther sp.		
Spio filicornis		
Spio theeli		
Spiochaetopterus typicus		7
Spiophanes bombyx		
Spirorbis granulatus		
Sternaspis scutata		1
Syllides longocirrata		
Syllides sp.		
Tachytrypane abranchiata		
Tachytrypane sp. A		
Tauberia gracilis		40
Terebellides stroemi		37
Tharyx ?acutus		90
Travisia sp.		6
Trichobranchus glacialis		3
Trochochaeta carica		3
Trochochaeta multisetosa		1
Typosyllis cornuta		1
Typosyllis fasciata		
unidentified		4
TOTAL 66 spp.		890

Appendix I (cont'd): Polychaete species data for Station PPB-25 (25m), Cruise OCS-2; accumulated from Smith-McIntyre Grab samples 1098, 1100, 1103, 1104, and 1105. The numbers represent totals per $0.5m^2$ of sea floor for the polychaetes retained on a 1.0 mm sieve.

		$\#/0.5m^2$
Aglaophamus malmgreni		
Allia abranchiata		
Allia nr *suecica*		91
Allia sp. B		15
Allia sp. C		
Amage auricula		
Ampharete acutifrons		
Ampharete arctica		
Ampharete goësi		
Ampharete lindstromi		
Ampharete vega		
Ampharetidae - Genus A		
Ampharetidae - Genus B		
Amphicteis sundevalli		
Anaitides citrina		
Anaitides groenlandica		
Antinoella badia		
Antinoella sarsi		
Apistobranchus tullbergi		8
Apomatus globifer		
Arcteobia anticostiensis		
Arenicola glacialis		
Aricidea quadrilobata		
Aricidea tetrabranchiata		
Artacama proboscidea		3
Autolytus alexandri		
Autolytus fallax		
Axionice flexuosa		
Axionice maculata		
Barantolla sp.		
Brada incrustata		
Brada inhabilis		
Brada nuda		
Brada villosa		2
Branchiomma infarcta		
Capitella capitata		3
Chaetozone setosa		34
Chone duneri		
Chone infundibuliformis		
Chone nr *murmanica*		
Cirratulus cirratus		
Cistenides hyperborea		
Clymenura polaris		
Cossura longocirrata		33
Cossura sp. A		

		$\#/0.5m^2$
Dexiospira spirillum		
Diplocirrus glaucus		
Diplocirrus hirsutus		
Diplocirrus longisetosus		
Dorvillea sp.		
Dysponetus sp. N		
Eclysippe sp. A		
Enipo gracilis		
Enipo canadensis		
Ephesiella macrocirrus		
Eteone flava		
Eteone longa		2
Eteone spetsbergensis		
Eteone (Mysta) barbata		
Euchone analis		
Euchone elegans		
Euchone incolor		
Euchone papillosa		
Euchone sp.		
Eucranta villosa		
Eunoe oerstedi		
Eusyllis blomstrandi		
Exogone dispar		
Exogone naidina		
Exogone sp.		
Fabricinae - sp. O		
Fabricinae - sp. R		
Fabrisabella schaudinni		
Flabelligera affinis		
Gattyana cirrosa		
Glycera capitata		
Glycinde wireni		
Glyphanostomum pallescens		
Harmothoe imbricata		
Hesionidae gen et sp. nov.		
Heteromastus filiformis		
Jasmineira sp.		
Lagisca extenuata		
Lanassa nordenskjoldi		
Lanassa venusta		
Laonice cirrata		
Laonome kroyeri		
Laphania boecki		

		#/0.5m²
Lumbriclymene minor		
Lumbrineris fragilis		
Lumbrineris impatiens		
Lumbrineris latreilli		
Lumbrineris minuta		
Lumbrineris sp. A		
Lumbrineris sp. B		
Lumbrineris sp. X		1
Lysilla loveni		
Lysippe labiata		
Magelona longicornis		
Maldane sarsi		
Marenzelleria wireni		
Melaenis loveni		
Melinna elisabethae		
Microclymene sp.		
Micronephthys minuta		58
Minuspio cirrifera		1
Myriochele heeri		
Myriochele oculata		
Mystides borealis		
Nemidia torelli		1
Neosabellides sp.		
Nephtys caeca		
Nephtys ciliata		9
Nephtys discors		
Nephtys incisa		
Nephtys longosetosa		
Nephtys paradoxa		
Nereimyra aphroditoides		
Nereis zonata		
Nicolea zostericola		
Nicomache lumbricalis		
Nicon sp. A		
Nothria conchylega		
Notomastus latericeus		
Notoproctus oculatus		
Onuphis quadricuspis		
Ophelina acuminata		
Ophelina cylindricaudatus		1
Ophelina groenlandica		
Ophelina sp. A		
Ophryotrocha sp.		1
Orbinia sp.		
Owenia collaris		
Owenia fusiformis		
Paramphitrite tetrabranchia		
Paranaitides wahlbergi		
Paraonis sp. A		2
Parheteromastus sp. A		
Petaloproctus tenuis		
Pherusa plumosa		
Pholoe minuta		

		#/0.5m²
Pionosyllis compacta		
Pista cristata		
Polycirrus medusa		
Polydora caulleryi		
Polydora quadrilobata		
Polydora socialis		
Polyphysia crassa		
Praxillella gracilis		
Praxillella praetermissa		
Prionospio steenstrupi		11
Proclea graffii		
Pygospio elegans		
Rhodine gracilior		
Sabella sp.		
Sabellastarte sp.		
Sabellides borealis		
Scalibregma inflatum		1
Schistomeringos caeca		
Schistomeringos sp. A		
Scoloplos acutus		4
Scoloplos armiger		
Sigambra tentaculata		
Sphaerodoridium claparedii		
Sphaerodoridium sp. A		
Sphaerodoropsis biserialis		
Sphaerodoropsis minuta		
Sphaerodoropsis sp. A		
Sphaerodoropsis sp. B		
Sphaerodorum gracilis		
Sphaerosyllis erinaceus		
Spinther sp.		
Spio filicornis		
Spio theeli		
Spiochaetopterus typicus		
Spiophanes bombyx		
Spirorbis granulatus		
Sternaspis scutata		7
Syllides longocirrata		
Syllides sp.		
Tachytrypane abranchiata		
Tachytrypane sp. A		
Tauberia gracilis		5
Terebellides stroemi		
Tharyx ?acutus		126
Travisia sp.		
Trichobranchus glacialis		
Trochochaeta carica		
Trochochaeta multisetosa		
Typosyllis cornuta		
Typosyllis fasciata		
unidentified		2
TOTAL 23 spp.		421

		#/0.5m²
Lumbriclymene minor		
Lumbrineris fragilis		
Lumbrineris impatiens		
Lumbrineris latreilli		
Lumbrineris minuta		
Lumbrineris sp. A		
Lumbrineris sp. B		
Lumbrineris sp. X		1
Lysilla loveni		
Lysippe labiata		
Magelona longicornis		
Maldane sarsi		
Marenzelleria wireni		
Melaenis loveni		
Melinna elisabethae		
Microclymene sp.		
Micronephthys minuta		58
Minuspio cirrifera		1
Myriochele heeri		
Myriochele oculata		
Mystides borealis		
Nemidia torelli		1
Neosabellides sp.		
Nephtys caeca		
Nephtys ciliata		9
Nephtys discors		
Nephtys incisa		
Nephtys longosetosa		
Nephtys paradoxa		
Nereimyra aphroditoides		
Nereis zonata		
Nicolea zostericola		
Nicomache lumbricalis		
Nicon sp. A		
Nothria conchylega		
Notomastus latericeus		
Notoproctus oculatus		
Onuphis quadricuspis		
Ophelina acuminata		
Ophelina cylindricaudatus		1
Ophelina groenlandica		
Ophelina sp. A		
Ophryotrocha sp.		1
Orbinia sp.		
Owenia collaris		
Owenia fusiformis		
Paramphitrite tetrabranchia		
Paranaitides wahlbergi		
Paraonis sp. A		2
Parheteromastus sp. A		
Petaloproctus tenuis		
Pherusa plumosa		
Pholoe minuta		

		#/0.5m²
Pionosyllis compacta		
Pista cristata		
Polycirrus medusa		
Polydora caulleryi		
Polydora quadrilobata		
Polydora socialis		
Polyphysia crassa		
Praxillella gracilis		
Praxillella praetermissa		
Prionospio steenstrupi		11
Proclea graffii		
Pygospio elegans		
Rhodine gracilior		
Sabella sp.		
Sabellastarte sp.		
Sabellides borealis		
Scalibregma inflatum		1
Schistomeringos caeca		
Schistomeringos sp. A		
Scoloplos acutus		4
Scoloplos armiger		
Sigambra tentaculata		
Sphaerodoridium claparedii		
Sphaerodoridium sp. A		
Sphaerodoropsis biserialis		
Sphaerodoropsis minuta		
Sphaerodoropsis sp. A		
Sphaerodoropsis sp. B		
Sphaerodorum gracilis		
Sphaerosyllis erinaceus		
Spinther sp.		
Spio filicornis		
Spio theeli		
Spiochaetopterus typicus		
Spiophanes bombyx		
Spirorbis granulatus		
Sternaspis scutata		7
Syllides longocirrata		
Syllides sp.		
Tachytrypane abranchiata		
Tachytrypane sp. A		
Tauberia gracilis		5
Terebellides stroemi		
Tharyx ?acutus		126
Travisia sp.		
Trichobranchus glacialis		
Trochochaeta carica		
Trochochaeta multisetosa		
Typosyllis cornuta		
Typosyllis fasciata		
unidentified		2
TOTAL	23 spp.	421

Appendix I (cont'd): Polychaete species data for Station PPB-55 (55m), Cruise OCS-2; accumulated from Smith-McIntyre Grab samples 1121, 1122, 1123, 1126, and 1128. The numbers represent totals per $0.5m^2$ of sea floor for the polychaetes retained on a 1.0 mm sieve.

		$\#/0.5m^2$
Aglaophamus malmgreni		
Allia abranchiata		
Allia nr *suecica*		28
Allia sp. B		
Allia sp. C		
Amage auricula		
Ampharete acutifrons		
Ampharete arctica		1
Ampharete goësi		
Ampharete lindstromi		11
Ampharete vega		
Ampharetidae - Genus A		
Ampharetidae - Genus B		
Amphicteis sundevalli		
Anaitides citrina		
Anaitides groenlandica		1
Antinoella badia		
Antinoella sarsi		5
Apistobranchus tullbergi		5
Apomatus globifer		
Arcteobia anticostiensis		
Arenicola glacialis		
Aricidea quadrilobata		
Aricidea tetrabranchiata		
Artacama proboscidea		
Autolytus alexandri		
Autolytus fallax		
Axionice flexuosa		
Axionice maculata		1
Barantolla sp.		21
Brada incrustata		
Brada inhabilis		
Brada nuda		
Brada villosa		
Branchiomma infarcta		
Capitella capitata		
Chaetozone setosa		26
Chone duneri		12
Chone infundibuliformis		
Chone nr *murmanica*		21
Cirratulus cirratus		
Cistenides hyperborea		
Clymenura polaris		12
Cossura longocirrata		
Cossura sp. A		

		$\#/0.5m^2$
Dexiospira spirillum		
Diplocirrus glaucus		
Diplocirrus hirsutus		3
Diplocirrus longisetosus		8
Dorvillea sp.		
Dysponetus sp. N		
Eclysippe sp. A		
Enipo gracilis		
Enipo canadensis		
Ephesiella macrocirrus		
Eteone flava		
Eteone longa		6
Eteone spetsbergensis		
Eteone (Mysta) barbata		
Euchone analis		
Euchone elegans		3
Euchone incolor		2
Euchone papillosa		
Euchone sp.		
Eucranta villosa		
Eunoe oerstedi		
Eusyllis blomstrandi		
Exogone dispar		
Exogone naidina		
Exogone sp.		
Fabricinae - sp. O		7
Fabricinae - sp. R		
Fabrisabella schaudinni		
Flabelligera affinis		
Gattyana cirrosa		2
Glycera capitata		
Glycinde wireni		1
Glyphanostomum pallescens		
Harmothoe imbricata		
Hesionidae gen et sp. nov.		
Heteromastus filiformis		1
Jasmineira sp.		
Lagisca extenuata		
Lanassa nordenskjoldi		
Lanassa venusta		
Laonice cirrata		
Laonome kroyeri		
Laphania boecki		6

		$\#/0.5m^2$
Lumbriclymene minor		
Lumbrineris fragilis		4
Lumbrineris impatiens		13
Lumbrineris latreilli		2
Lumbrineris minuta		
Lumbrineris sp. A		
Lumbrineris sp. B		
Lumbrineris sp. X		3
Lysilla loveni		6
Lysippe labiata		31
Magelona longicornis		1
Maldane sarsi		14
Marenzelleria wireni		
Melaenis loveni		
Melinna elisabethae		5
Microclymene sp.		
Micronephthys minuta		43
Minuspio cirrifera		
Myriochele heeri		20
Myriochele oculata		4
Mystides borealis		
Nemidia torelli		
Neosabellides sp.		
Nephtys caeca		
Nephtys ciliata		1
Nephtys discors		
Nephtys incisa		
Nephtys longosetosa		
Nephtys paradoxa		3
Nereimyra aphroditoides		10
Nereis zonata		
Nicolea zostericola		
Nicomache lumbricalis		
Nicon sp. A		
Nothria conchylega		3
Notomastus latericeus		
Notoproctus oculatus		
Onuphis quadricuspis		5
Ophelina acuminata		
Ophelina cylindricaudatus		
Ophelina groenlandica		4
Ophelina sp. A		
Ophryotrocha sp.		
Orbinia sp.		
Owenia collaris		
Owenia fusiformis		
Paramphitrite tetrabranchia		
Paranaitides wahlbergi		
Paraonis sp. A		1
Parheteromastus sp. A		2
Petaloproctus tenuis		
Pherusa plumosa		1
Pholoe minuta		48

		$\#/0.5m^2$
Pionosyllis compacta		
Pista cristata		
Polycirrus medusa		7
Polydora caulleryi		22
Polydora quadrilobata		
Polydora socialis		
Polyphysia crassa		
Praxillella gracilis		
Praxillella praetermissa		5
Prionospio steenstrupi		7
Proclea graffii		2
Pygospio elegans		
Rhodine gracilior		1
Sabella sp.		
Sabellastarte sp.		
Sabellides borealis		
Scalibregma inflatum		7
Schistomeringos caeca		
Schistomeringos sp. A		
Scoloplos acutus		2
Scoloplos armiger		
Sigambra tentaculata		
Sphaerodoridium claparedii		
Sphaerodoridium sp. A		2
Sphaerodoropsis biserialis		
Sphaerodoropsis minuta		
Sphaerodoropsis sp. A		
Sphaerodoropsis sp. B		
Sphaerodorum gracilis		4
Sphaerosyllis erinaceus		6
Spinther sp.		
Spio filicornis		
Spio theeli		
Spiochaetopterus typicus		1
Spiophanes bombyx		
Spirorbis granulatus		
Sternaspis scutata		
Syllides longocirrata		
Syllides sp.		
Tachytrypane abranchiata		
Tachytrypane sp. A		
Tauberia gracilis		
Terebellides stroemi		84
Tharyx ?acutus		7
Travisia sp.		2
Trichobranchus glacialis		
Trochochaeta carica		3
Trochochaeta multisetosa		
Typosyllis cornuta		8
Typosyllis fasciata		1
unidentified		10
TOTAL 62 spp.		588

		$\#/0.5m^2$
Lumbriclymene minor		
Lumbrineris fragilis		4
Lumbrineris impatiens		13
Lumbrineris latreilli		2
Lumbrineris minuta		
Lumbrineris sp. A		
Lumbrineris sp. B		
Lumbrineris sp. X		3
Lysilla loveni		6
Lysippe labiata		31
Magelona longicornis		1
Maldane sarsi		14
Marenzelleria wireni		
Melaenis loveni		
Melinna elisabethae		5
Microclymene sp.		
Micronephthys minuta		43
Minuspio cirrifera		
Myriochele heeri		20
Myriochele oculata		4
Mystides borealis		
Nemidia torelli		
Neosabellides sp.		
Nephtys caeca		
Nephtys ciliata		1
Nephtys discors		
Nephtys incisa		
Nephtys longosetosa		
Nephtys paradoxa		3
Nereimyra aphroditoides		10
Nereis zonata		
Nicolea zostericola		
Nicomache lumbricalis		
Nicon sp. A		
Nothria conchylega		3
Notomastus latericeus		
Notoproctus oculatus		
Onuphis quadricuspis		5
Ophelina acuminata		
Ophelina cylindricaudatus		
Ophelina groenlandica		4
Ophelina sp. A		
Ophryotrocha sp.		
Orbinia sp.		
Owenia collaris		
Owenia fusiformis		
Paramphitrite tetrabranchia		
Paranaitides wahlbergi		
Paraonis sp. A		1
Parheteromastus sp. A		2
Petaloproctus tenuis		
Pherusa plumosa		1
Pholoe minuta		48

		$\#/0.5m^2$
Pionosyllis compacta		
Pista cristata		
Polycirrus medusa		7
Polydora caulleryi		22
Polydora quadrilobata		
Polydora socialis		
Polyphysia crassa		
Praxillella gracilis		
Praxillella praetermissa		5
Prionospio steenstrupi		7
Proclea graffii		2
Pygospio elegans		
Rhodine gracilior		1
Sabella sp.		
Sabellastarte sp.		
Sabellides borealis		
Scalibregma inflatum		7
Schistomeringos caeca		
Schistomeringos sp. A		
Scoloplos acutus		2
Scoloplos armiger		
Sigambra tentaculata		
Sphaerodoridium claparedii		
Sphaerodoridium sp. A		2
Sphaerodoropsis biserialis		
Sphaerodoropsis minuta		
Sphaerodoropsis sp. A		
Sphaerodoropsis sp. B		
Sphaerodorum gracilis		4
Sphaerosyllis erinaceus		6
Spinther sp.		
Spio filicornis		
Spio theeli		
Spiochaetopterus typicus		1
Spiophanes bombyx		
Spirorbis granulatus		
Sternaspis scutata		
Syllides longocirrata		
Syllides sp.		
Tachytrypane abranchiata		
Tachytrypane sp. A		
Tauberia gracilis		
Terebellides stroemi		84
Tharyx ?acutus		7
Travisia sp.		2
Trichobranchus glacialis		
Trochochaeta carica		3
Trochochaeta multisetosa		
Typosyllis cornuta		8
Typosyllis fasciata		1
unidentified		10
TOTAL 62 spp.		588

Appendix I (cont'd): Polychaete species data for Station PPB-100 (100m), Cruise OCS-2; accumulated from Smith-McIntyre Grab samples 1131, 1132, 1133, 1139 and 1140. The numbers represent totals per $0.5m^2$ of sea floor for the polychaetes retained on a 1.0 mm sieve.

		$\#/0.5m^2$
Aglaophamus malmgreni		
Allia abranchiata		
Allia nr *suecica*		11
Allia sp. B		
Allia sp. C		
Amage auricula		
Ampharete acutifrons		
Ampharete arctica		
Ampharete goësi		3
Ampharete lindstromi		6
Ampharete vega		
Ampharetidae - Genus A		
Ampharetidae - Genus B		
Amphicteis sundevalli		
Anaitides citrina		
Anaitides groenlandica		6
Antinoella badia		
Antinoella sarsi		7
Apistobranchus tullbergi		1
Apomatus globifer		
Arcteobia anticostiensis		
Arenicola glacialis		
Aricidea quadrilobata		
Aricidea tetrabranchiata		
Artacama proboscidea		
Autolytus alexandri		
Autolytus fallax		
Axionice flexuosa		
Axionice maculata		
Barantolla sp.		20
Brada incrustata		
Brada inhabilis		
Brada nuda		
Brada villosa		
Branchiomma infarcta		
Capitella capitata		
Chaetozone setosa		
Chone duneri		17
Chone infundibuliformis		
Chone nr *murmanica*		30
Cirratulus cirratus		
Cistenides hyperborea		
Clymenura polaris		
Cossura longocirrata		2
Cossura sp. A		

		$\#/0.5m^2$
Dexiospira spirillum		
Diplocirrus glaucus		
Diplocirrus hirsutus		1
Diplocirrus longisetosus		1
Dorvillea sp.		
Dysponetus sp. N		
Eclysippe sp. A		
Enipo gracilis		
Enipo canadensis		
Ephesiella macrocirrus		
Eteone flava		
Eteone longa		6
Eteone spetsbergensis		
Eteone (Mysta) barbata		1
Euchone analis		
Euchone elegans		
Euchone incolor		1
Euchone papillosa		
Euchone sp.		
Eucranta villosa		
Eunoe oerstedi		
Eusyllis blomstrandi		1
Exogone dispar		
Exogone naidina		
Exogone sp.		
Fabricinae - sp. O		3
Fabricinae - sp. R		
Fabrisabella schaudinni		
Flabelligera affinis		
Gattyana cirrosa		
Glycera capitata		
Glycinde wireni		
Glyphanostomum pallescens		
Harmothoe imbricata		
Hesionidae gen et sp. nov.		
Heteromastus filiformis		20
Jasmineira sp.		
Lagisca extenuata		
Lanassa nordenskjoldi		
Lanassa venusta		
Laonice cirrata		
Laonome kroyeri		
Laphania boecki		3

		#/0.5m^2
Lumbriclymene minor		
Lumbrineris fragilis		
Lumbrineris impatiens		56
Lumbrineris latreilli		5
Lumbrineris minuta		4
Lumbrineris sp. A		
Lumbrineris sp. B		1
Lumbrineris sp. X		35
Lysilla loveni		2
Lysippe labiata		46
Magelona longicornis		1
Maldane sarsi		12
Marenzelleria wireni		
Melaenis loveni		
Melinna elisabethae		
Microclymene sp.		7
Micronephthys minuta		86
Minuspio cirrifera		
Myriochele heeri		28
Myriochele oculata		6
Mystides borealis		
Nemidia torelli		
Neosabellides sp.		
Nephtys caeca		
Nephtys ciliata		4
Nephtys discors		
Nephtys incisa		
Nephtys longosetosa		
Nephtys paradoxa		1
Nereimyra aphroditoides		2
Nereis zonata		4
Nicolea zostericola		
Nicomache lumbricalis		2
Nicon sp. A		
Nothria conchylega		
Notomastus latericeus		
Notoproctus oculatus		
Onuphis quadricuspis		25
Ophelina acuminata		
Ophelina cylindricaudatus		
Ophelina groenlandica		
Ophelina sp. A		
Ophryotrocha sp.		
Orbinia sp.		
Owenia collaris		4
Owenia fusiformis		
Paramphitrite tetrabranchia		
Paranaitides wahlbergi		
Paraonis sp. A		3
Parheteromastus sp. A		3
Petaloproctus tenuis		6
Pherusa plumosa		
Pholoe minuta		71

		#/0.5m^2
Pionosyllis compacta		
Pista cristata		
Polycirrus medusa		1
Polydora caulleryi		85
Polydora quadrilobata		
Polydora socialis		
Polyphysia crassa		
Praxillella gracilis		2
Praxillella praetermissa		4
Prionospio steenstrupi		20
Proclea graffii		1
Pygospio elegans		
Pista maculata		1
Rhodine gracilior		
Sabella sp.		
Sabellastarte sp.		
Sabellides borealis		
Scalibregma inflatum		9
Schistomeringos caeca		13
Schistomeringos sp. A		
Scoloplos acutus		32
Scoloplos armiger		
Sigambra tentaculata		
Sphaerodoridium claparedii		
Sphaerodoridium sp. A		
Sphaerodoropsis biserialis		
Sphaerodoropsis minuta		
Sphaerodoropsis sp. A		
Sphaerodoropsis sp. B		
Sphaerodorum gracilis		8
Sphaerosyllis erinaceus		6
Spinther sp.		
Spio filicornis		
Spio theeli		
Spiochaetopterus typicus		6
Spiophanes bombyx		
Spirorbis granulatus		
Sternaspis scutata		
Syllides longocirrata		
Syllides sp.		
Tachytrypane abranchiata		
Tachytrypane sp. A		
Tauberia gracilis		1
Terebellides stroemi		40
Tharyx ?acutus		65
Travisia sp.		6
Trichobranchus glacialis		1
Trochochaeta carica		8
Trochochaeta multisetosa		
Typosyllis cornuta		8
Typosyllis fasciata		4
unidentified		6
TOTAL 64 spp.		871

		#/0.5m^2
Lumbriclymene minor		
Lumbrineris fragilis		
Lumbrineris impatiens		56
Lumbrineris latreilli		5
Lumbrineris minuta		4
Lumbrineris sp. A		
Lumbrineris sp. B		1
Lumbrineris sp. X		35
Lysilla loveni		2
Lysippe labiata		46
Magelona longicornis		1
Maldane sarsi		12
Marenzelleria wireni		
Melaenis loveni		
Melinna elisabethae		
Microclymene sp.		7
Micronephthys minuta		86
Minuspio cirrifera		
Myriochele heeri		28
Myriochele oculata		6
Mystides borealis		
Nemidia torelli		
Neosabellides sp.		
Nephtys caeca		
Nephtys ciliata		4
Nephtys discors		
Nephtys incisa		
Nephtys longosetosa		
Nephtys paradoxa		1
Nereimyra aphroditoides		2
Nereis zonata		4
Nicolea zostericola		
Nicomache lumbricalis		2
Nicon sp. A		
Nothria conchylega		
Notomastus latericeus		
Notoproctus oculatus		
Onuphis quadricuspis		25
Ophelina acuminata		
Ophelina cylindricaudatus		
Ophelina groenlandica		
Ophelina sp. A		
Ophryotrocha sp.		
Orbinia sp.		
Owenia collaris		4
Owenia fusiformis		
Paramphitrite tetrabranchia		
Paranaitides wahlbergi		
Paraonis sp. A		3
Parheteromastus sp. A		3
Petaloproctus tenuis		6
Pherusa plumosa		
Pholoe minuta		71

		#/0.5m^2
Pionosyllis compacta		
Pista cristata		
Polycirrus medusa		1
Polydora caulleryi		85
Polydora quadrilobata		
Polydora socialis		
Polyphysia crassa		
Praxillella gracilis		2
Praxillella praetermissa		4
Prionospio steenstrupi		20
Proclea graffii		1
Pygospio elegans		
Pista maculata		1
Rhodine gracilior		
Sabella sp.		
Sabellastarte sp.		
Sabellides borealis		
Scalibregma inflatum		9
Schistomeringos caeca		13
Schistomeringos sp. A		
Scoloplos acutus		32
Scoloplos armiger		
Sigambra tentaculata		
Sphaerodoridium claparedii		
Sphaerodoridium sp. A		
Sphaerodoropsis biserialis		
Sphaerodoropsis minuta		
Sphaerodoropsis sp. A		
Sphaerodoropsis sp. B		
Sphaerodorum gracilis		8
Sphaerosyllis erinaceus		6
Spinther sp.		
Spio filicornis		
Spio theeli		
Spiochaetopterus typicus		6
Spiophanes bombyx		
Spirorbis granulatus		
Sternaspis scutata		
Syllides longocirrata		
Syllides sp.		
Tachytrypane abranchiata		
Tachytrypane sp. A		
Tauberia gracilis		1
Terebellides stroemi		40
Tharyx ?acutus		65
Travisia sp.		6
Trichobranchus glacialis		1
Trochochaeta carica		8
Trochochaeta multisetosa		
Typosyllis cornuta		8
Typosyllis fasciata		4
unidentified		6
TOTAL 64 spp.		871

Appendix I (cont'd): Polychaete species data for Station PPB-25 (25m), Cruise OCS-3; accumulated from Smith-McIntyre Grab samples 1141, 1142, 1143, 1144, 1145, 1146, 1147, 1149 and 1150. The numbers represent totals per $0.9m^2$ of sea floor for the polychaete retained on a 1.0 mm sieve.

		$\#/0.9m^2$			$\#/0.9m^2$
Aglaophamus malmgreni			*Dexiospira spirillum*		
Allia abranchiata			*Diplocirrus glaucus*		
Allia nr *suecica*		61	*Diplocirrus hirsutus*		
Allia sp. B			*Diplocirrus longisetosus*		
Allia sp. C			*Dorvillea sp.*		1
Amage auricula			*Dysponetus sp. N*		
Ampharete acutifrons					
Ampharete arctica			*Eclysippe sp. A*		
Ampharete goësi			*Enipo gracilis*		
Ampharete lindstromi			*Enipo canadensis*		
Ampharete vega			*Ephesiella macrocirrus*		
Ampharetidae - Genus A			*Eteone flava*		
Ampharetidae - Genus B			*Eteone longa*		1
Amphicteis sundevalli			*Eteone spetsbergensis*		
Anaitides citrina			*Eteone (Mysta) barbata*		
Anaitides groenlandica		1	*Euchone analis*		
Antinoella badia			*Euchone elegans*		
Antinoella sarsi		2	*Euchone incolor*		
Apistobranchus tullbergi		1	*Euchone papillosa*		
Apomatus globifer			*Euchone sp.*		
Arcteobia anticostiensis			*Eucranta villosa*		
Arenicola glacialis			*Eunoe oerstedi*		
Aricidea quadrilobata			*Eusyllis blomstrandi*		
Aricidea tetrabranchiata			*Exogone dispar*		
Artacama proboscidea			*Exogone naidina*		
Autolytus alexandri			*Exogone sp.*		
Autolytus fallax			*Fabricinae - sp. O*		1
Axionice flexuosa			*Fabricinae - sp. R*		
Axionice maculata			*Fabrisabella schaudinni*		
			Flabelligera affinis		
Barantolla sp.					
Brada incrustata			*Gattyana cirrosa*		
Brada inhabilis			*Glycera capitata*		
Brada nuda			*Glycinde wireni*		
Brada villosa		2	*Glyphanostomum pallescens*		
Branchiomma infarcta			*Harmothoe imbricata*		
Capitella capitata		2	*Hesionidae gen et sp. nov.*		
Chaetozone setosa		6	*Heteromastus filiformis*		4
Chone duneri			*Jasmineira sp.*		
Chone infundibuliformis					
Chone nr *murmanica*			*Lagisca extenuata*		
Cirratulus cirratus			*Lanassa nordenskjoldi*		
Cistenides hyperborea		2	*Lanassa venusta*		
Clymenura polaris			*Laonice cirrata*		
Cossura longocirrata		13	*Laonome kroyeri*		
Cossura sp. A			*Laphania boecki*		

		#/0.9m²
Lumbriclymene minor		
Lumbrineris fragilis		2
Lumbrineris impatiens		
Lumbrineris latreilli		
Lumbrineris minuta		9
Lumbrineris sp. A		
Lumbrineris sp. B		
Lumbrineris sp. X		1
Lysilla loveni		
Lysippe labiata		
Magelona longicornis		
Maldane sarsi		
Marenzelleria wireni		
Melaenis loveni		
Melinna elisabethae		
Microclymene sp.		
Micronephthys minuta		
Minuspio cirrifera		44
Myriochele heeri		6
Myriochele oculata		
Mystides borealis		
Nemidia torelli		
Neosabellides sp.		
Nephtys caeca		
Nephtys ciliata		17
Nephtys discors		
Nephtys incisa		
Nephtys longosetosa		
Nephtys paradoxa		
Nereimyra aphroditoides		
Nereis zonata		
Nicolea zostericola		
Nicomache lumbricalis		
Nicon sp. A		
Nothria conchylega		
Notomastus latericeus		
Notoproctus oculatus		
Onuphis quadricuspis		
Ophelina acuminata		
Ophelina cylindricaudatus		7
Ophelina groenlandica		
Ophelina sp. A		
Ophryotrocha sp.		
Orbinia sp.		
Owenia collaris		
Owenia fusiformis		
Paramphitrite tetrabranchia		
Paranaitides wahlbergi		
Paraonis sp. A		9
Parheteromastus sp. A		
Petaloproctus tenuis		
Pherusa plumosa		
Pholoe minuta		4

		#/0.9m²
Pionosyllis compacta		
Pista cristata		
Polycirrus medusa		1
Polydora caulleryi		
Polydora quadrilobata		
Polydora socialis		
Polyphysia crassa		
Praxillella gracilis		
Praxillella praetermissa		
Prionospio steenstrupi		11
Proclea graffii		1
Pygospio elegans		
Rhodine gracilior		
Sabella sp.		
Sabellastarte sp.		
Sabellides borealis		
Scalibregma inflatum		
Schistomeringos caeca		6
Schistomeringos sp. A		
Scoloplos acutus		8
Scoloplos armiger		
Sigambra tentaculata		
Sphaerodoridium claparedii		
Sphaerodoridium sp. A		
Sphaerodoropsis biserialis		
Sphaerodoropsis minuta		
Sphaerodoropsis sp. A		
Sphaerodoropsis sp. B		
Sphaerodorum gracilis		
Sphaerosyllis erinaceus		
Spinther sp.		
Spio filicornis		
Spio theeli		
Spiochaetopterus typicus		
Spiophanes bombyx		
Spirorbis granulatus		3
Sternaspis scutata		44
Syllides longocirrata		
Syllides sp.		
Tachytrypane abranchiata		
Tachytrypane sp. A		
Tauberia gracilis		2
Terebellides stroemi		8
Tharyx ?acutus		120
Travisia sp.		
Trichobranchus glacialis		
Trochochaeta carica		
Trochochaeta multisetosa		
Typosyllis cornuta		
Typosyllis fasciata		
unidentified		4
TOTAL 32 spp.		404

		#/0.9m²
Lumbriclymene minor		
Lumbrineris fragilis		2
Lumbrineris impatiens		
Lumbrineris latreilli		
Lumbrineris minuta		9
Lumbrineris sp. A		
Lumbrineris sp. B		
Lumbrineris sp. X		1
Lysilla loveni		
Lysippe labiata		
Magelona longicornis		
Maldane sarsi		
Marenzelleria wireni		
Melaenis loveni		
Melinna elisabethae		
Microclymene sp.		
Micronephthys minuta		
Minuspio cirrifera		44
Myriochele heeri		6
Myriochele oculata		
Mystides borealis		
Nemidia torelli		
Neosabellides sp.		
Nephtys caeca		
Nephtys ciliata		17
Nephtys discors		
Nephtys incisa		
Nephtys longosetosa		
Nephtys paradoxa		
Nereimyra aphroditoides		
Nereis zonata		
Nicolea zostericola		
Nicomache lumbricalis		
Nicon sp. A		
Nothria conchylega		
Notomastus latericeus		
Notoproctus oculatus		
Onuphis quadricuspis		
Ophelina acuminata		
Ophelina cylindricaudatus		7
Ophelina groenlandica		
Ophelina sp. A		
Ophryotrocha sp.		
Orbinia sp.		
Owenia collaris		
Owenia fusiformis		
Paramphitrite tetrabranchia		
Paranaitides wahlbergi		
Paraonis sp. A		9
Parheteromastus sp. A		
Petaloproctus tenuis		
Pherusa plumosa		
Pholoe minuta		4

		#/0.9m²
Pionosyllis compacta		
Pista cristata		
Polycirrus medusa		1
Polydora caulleryi		
Polydora quadrilobata		
Polydora socialis		
Polyphysia crassa		
Praxillella gracilis		
Praxillella praetermissa		
Prionospio steenstrupi		11
Proclea graffii		1
Pygospio elegans		
Rhodine gracilior		
Sabella sp.		
Sabellastarte sp.		
Sabellides borealis		
Scalibregma inflatum		
Schistomeringos caeca		6
Schistomeringos sp. A		
Scoloplos acutus		8
Scoloplos armiger		
Sigambra tentaculata		
Sphaerodoridium claparedii		
Sphaerodoridium sp. A		
Sphaerodoropsis biserialis		
Sphaerodoropsis minuta		
Sphaerodoropsis sp. A		
Sphaerodoropsis sp. B		
Sphaerodorum gracilis		
Sphaerosyllis erinaceus		
Spinther sp.		
Spio filicornis		
Spio theeli		
Spiochaetopterus typicus		
Spiophanes bombyx		
Spirorbis granulatus		3
Sternaspis scutata		44
Syllides longocirrata		
Syllides sp.		
Tachytrypane abranchiata		
Tachytrypane sp. A		
Tauberia gracilis		2
Terebellides stroemi		8
Tharyx ?acutus		120
Travisia sp.		
Trichobranchus glacialis		
Trochochaeta carica		
Trochochaeta multisetosa		
Typosyllis cornuta		
Typosyllis fasciata		
unidentified		4
TOTAL 32 spp.		404

Appendix I (cont'd): Polychaete species data for Station PPB-55 (55m), Cruise OCS-3; accumulated from Smith-McIntyre Grab samples 1151, 1155, 1156, 1158, 1159 and 1160. The numbers represent totals per $0.6m^2$ of sea floor for the polychaete retained on a 1.0 mm sieve.

		$\#/0.6m^2$			$\#/0.6m^2$
Aglaophamus malmgreni			*Dexiospira spirillum*		
Allia abranchiata			*Diplocirrus glaucus*		1
Allia nr *suecica*		25	*Diplocirrus hirsutus*		6
Allia sp. B			*Diplocirrus longisetosus*		8
Allia sp. C			*Dorvillea sp.*		
Amage auricula			*Dysponetus sp. N*		
Ampharete acutifrons					
Ampharete arctica		1	*Eclysippe sp. A*		
Ampharete goësi		1	*Enipo gracilis*		
Ampharete lindstromi		40	*Enipo canadensis*		
Ampharete vega			*Ephesiella macrocirrus*		
Ampharetidae - Genus A			*Eteone flava*		
Ampharetidae - Genus B			*Eteone longa*		11
Amphicteis sundevalli			*Eteone spetsbergensis*		
Anaitides citrina			*Eteone (Mysta) barbata*		
Anaitides groenlandica		2	*Euchone analis*		
Antinoella badia			*Euchone elegans*		6
Antinoella sarsi		3	*Euchone incolor*		9
Apistobranchus tullbergi		3	*Euchone papillosa*		
Apomatus globifer			*Euchone sp.*		
Arcteobia anticostiensis		1	*Eucranta villosa*		
Arenicola glacialis			*Eunoe oerstedi*		
Aricidea quadrilobata			*Eusyllis blomstrandi*		
Aricidea tetrabranchiata			*Exogone dispar*		
Artacama proboscidea			*Exogone naidina*		2
Autolytus alexandri			*Exogone sp.*		
Autolytus fallax			*Fabricinae - sp. O*		16
Axionice flexuosa			*Fabricinae - sp. R*		
Axionice maculata			*Fabrisabella schaudinni*		
			Flabelligera affinis		
Barantolla sp.		14			
Brada incrustata			*Gattyana cirrosa*		4
Brada inhabilis			*Glycera capitata*		1
Brada nuda			*Glycinde wireni*		
Brada villosa			*Glyphanostomum pallescens*		
Branchiomma infarcta			*Harmothoe imbricata*		
Capitella capitata			*Hesionidae gen et sp. nov.*		
Chaetozone setosa		70	*Heteromastus filiformis*		38
Chone duneri		24	*Jasmineira sp.*		
Chone infundibuliformis					
Chone nr *murmanica*		59	*Lagisca extenuata*		
Cirratulus cirratus			*Lanassa nordenskjoldi*		
Cistenides hyperborea			*Lanassa venusta*		1
Clymenura polaris		6	*Laonice cirrata*		
Cossura longocirrata		1	*Laonome kroyeri*		
Cossura sp. A			*Laphania boecki*		6

		#/0.6m²
Lumbriclymene minor		
Lumbrineris fragilis		1
Lumbrineris impatiens		42
Lumbrineris latreilli		5
Lumbrineris minuta		1
Lumbrineris sp. A		
Lumbrineris sp. B		5
Lumbrineris sp. X		5
Lysilla loveni		4
Lysippe labiata		53
Magelona longicornis		
Maldane sarsi		21
Marenzelleria wireni		
Melaenis loveni		
Melinna elisabethae		11
Microclymene sp.		
Micronephthys minuta		110
Minuspio cirrifera		2
Myriochele heeri		35
Myriochele oculata		4
Mystides borealis		
Nemidia torelli		
Neosabellides sp.		
Nephtys caeca		
Nephtys ciliata		2
Nephtys discors		
Nephtys incisa		
Nephtys longosetosa		
Nephtys paradoxa		10
Nereimyra aphroditoides		23
Nereis zonata		
Nicolea zostericola		
Nicomache lumbricalis		2
Nicon sp. A		
Nothria conchylega		1
Notomastus latericeus		
Notoproctus oculatus		
Onuphis quadricuspis		9
Ophelina acuminata		
Ophelina cylindricaudatus		1
Ophelina groenlandica		15
Ophelina sp. A		
Ophryotrocha sp.		
Orbinia sp.		
Owenia collaris		1
Owenia fusiformis		
Paramphitrite tetrabranchia		
Paranaitides wahlbergi		
Paraonis sp. A		1
Parheteromastus sp. A		16
Petaloproctus tenuis		
Pherusa plumosa		
Pholoe minuta		166

		#/0.6m²
Pionosyllis compacta		
Pista cristata		
Polycirrus medusa		1
Polydora caulleryi		53
Polydora quadrilobata		
Polydora socialis		
Polyphysia crassa		
Praxillella gracilis		
Praxillella praetermissa		10
Prionospio steenstrupi		15
Proclea graffii		7
Pygospio elegans		
Rhodine gracilior		6
Sabella sp.		
Sabellastarte sp.		
Sabellides borealis		
Scalibregma inflatum		17
Schistomeringos caeca		13
Schistomeringos sp. A		
Scoloplos acutus		17
Scoloplos armiger		
Sigambra tentaculata		
Sphaerodoridium claparedii		
Sphaerodoridium sp. A		10
Sphaerodoropsis biserialis		
Sphaerodoropsis minuta		
Sphaerodoropsis sp. A		
Sphaerodoropsis sp. B		
Sphaerodorum gracilis		1
Sphaerosyllis erinaceus		12
Spinther sp.		
Spio filicornis		
Spio theeli		
Spiochaetopterus typicus		
Spiophanes bombyx		
Spirorbis granulatus		
Sternaspis scutata		
Syllides longocirrata		2
Syllides sp.		1
Tachytrypane abranchiata		
Tachytrypane sp. A		
Tauberia gracilis		
Terebellides stroemi		150
Tharyx ?acutus		92
Travisia sp.		4
Trichobranchus glacialis		
Trochochaeta carica		5
Trochochaeta multisetosa		
Typosyllis cornuta		9
Typosyllis fasciata		
unidentified		13
TOTAL 72 spp.		1343

		#/0.6m²
Lumbriclymene minor		
Lumbrineris fragilis		1
Lumbrineris impatiens		42
Lumbrineris latreilli		5
Lumbrineris minuta		1
Lumbrineris sp. A		
Lumbrineris sp. B		5
Lumbrineris sp. X		5
Lysilla loveni		4
Lysippe labiata		53
Magelona longicornis		
Maldane sarsi		21
Marenzelleria wireni		
Melaenis loveni		
Melinna elisabethae		11
Microclymene sp.		
Micronephthys minuta		110
Minuspio cirrifera		2
Myriochele heeri		35
Myriochele oculata		4
Mystides borealis		
Nemidia torelli		
Neosabellides sp.		
Nephtys caeca		
Nephtys ciliata		2
Nephtys discors		
Nephtys incisa		
Nephtys longosetosa		
Nephtys paradoxa		10
Nereimyra aphroditoides		23
Nereis zonata		
Nicolea zostericola		
Nicomache lumbricalis		2
Nicon sp. A		
Nothria conchylega		1
Notomastus latericeus		
Notoproctus oculatus		
Onuphis quadricuspis		9
Ophelina acuminata		
Ophelina cylindricaudatus		1
Ophelina groenlandica		15
Ophelina sp. A		
Ophryotrocha sp.		
Orbinia sp.		
Owenia collaris		1
Owenia fusiformis		
Paramphitrite tetrabranchia		
Paranaitides wahlbergi		
Paraonis sp. A		1
Parheteromastus sp. A		16
Petaloproctus tenuis		
Pherusa plumosa		
Pholoe minuta		166

		#/0.6m²
Pionosyllis compacta		
Pista cristata		
Polycirrus medusa		1
Polydora caulleryi		53
Polydora quadrilobata		
Polydora socialis		
Polyphysia crassa		
Praxillella gracilis		
Praxillella praetermissa		10
Prionospio steenstrupi		15
Proclea graffii		7
Pygospio elegans		
Rhodine gracilior		6
Sabella sp.		
Sabellastarte sp.		
Sabellides borealis		
Scalibregma inflatum		17
Schistomeringos caeca		13
Schistomeringos sp. A		
Scoloplos acutus		17
Scoloplos armiger		
Sigambra tentaculata		
Sphaerodoridium claparedii		
Sphaerodoridium sp. A		10
Sphaerodoropsis biserialis		
Sphaerodoropsis minuta		
Sphaerodoropsis sp. A		
Sphaerodoropsis sp. B		
Sphaerodorum gracilis		1
Sphaerosyllis erinaceus		12
Spinther sp.		
Spio filicornis		
Spio theeli		
Spiochaetopterus typicus		
Spiophanes bombyx		
Spirorbis granulatus		
Sternaspis scutata		
Syllides longocirrata		2
Syllides sp.		1
Tachytrypane abranchiata		
Tachytrypane sp. A		
Tauberia gracilis		
Terebellides stroemi		150
Tharyx ?acutus		92
Travisia sp.		4
Trichobranchus glacialis		
Trochochaeta carica		5
Trochochaeta multisetosa		
Typosyllis cornuta		9
Typosyllis fasciata		
unidentified		13
TOTAL 72 spp.		1343

Appendix I (cont'd): Polychaete species data for Station PPB-100 (100m), Cruise OCS-3; accumulated from Smith-McIntyre Grab samples 1161, 1162, 1166, 1168 and 1169. The numbers represent totals per $0.5m^2$ of sea floor for the polychaete retained on a 1.0 mm sieve.

		$\#/0.5m^2$
Aglaophamus malmgreni		
Allia abranchiata		
Allia nr *suecica*		54
Allia sp. B		
Allia sp. C		
Amage auricula		
Ampharete acutifrons		
Ampharete arctica		1
Ampharete goësi		2
Ampharete lindstromi		13
Ampharete vega		
Ampharetidae - Genus A		
Ampharetidae - Genus B		
Amphicteis sundevalli		
Anaitides citrina		
Anaitides groenlandica		5
Antinoella badia		
Antinoella sarsi		10
Apistobranchus tullbergi		6
Apomatus globifer		
Arcteobia anticostiensis		
Arenicola glacialis		
Aricidea quadrilobata		
Aricidea tetrabranchiata		
Artacama proboscidea		
Autolytus alexandri		
Autolytus fallax		1
Axionice flexuosa		
Axionice maculata		1
Amphicteis gunneri		1
Barantolla sp.		17
Brada incrustata		
Brada inhabilis		
Brada nuda		
Brada villosa		
Branchiomma infarcta		
Capitella capitata		
Chaetozone setosa		147
Chone duneri		29
Chone infundibuliformis		
Chone nr *murmanica*		104
Cirratulus cirratus		
Cistenides hyperborea		
Clymenura polaris		4
Cossura longocirrata		3
Cossura sp. A		

		$\#/0.5m^2$
Dexiospira spirillum		
Diplocirrus glaucus		
Diplocirrus hirsutus		2
Diplocirrus longisetosus		3
Dorvillea sp.		
Dysponetus sp. N		
Eclysippe sp. A		
Enipo gracilis		
Enipo canadensis		
Ephesiella macrocirrus		
Eteone flava		1
Eteone longa		13
Eteone spetsbergensis		
Eteone (Mysta) barbata		
Euchone analis		4
Euchone elegans		11
Euchone incolor		4
Euchone papillosa		
Euchone sp.		
Eucranta villosa		
Eunoe oerstedi		
Eusyllis blomstrandi		
Exogone dispar		
Exogone naidina		1
Exogone sp.		1
Fabricinae - sp. O		16
Fabricinae - sp. R		16
Fabrisabella schaudinni		
Flabelligera affinis		
Gattyana cirrosa		1
Glycera capitata		
Glycinde wireni		1
Glyphanostomum pallescens		
Harmothoe imbricata		
Hesionidae gen et sp. nov.		
Heteromastus filiformis		44
Jasmineira sp.		
Lagisca extenuata		
Lanassa nordenskjoldi		
Lanassa venusta		5
Laonice cirrata		2
Laonome kroyeri		
Laphania boecki		6

		#/0.5m^2
Lumbriclymene minor		
Lumbrineris fragilis		
Lumbrineris impatiens		193
Lumbrineris latreilli		11
Lumbrineris minuta		10
Lumbrineris sp. A		
Lumbrineris sp. B		1
Lumbrineris sp. X		35
Lysilla loveni		1
Lysippe labiata		121
Magelona longicornis		
Maldane sarsi		20
Marenzelleria wireni		
Melaenis loveni		
Melinna elisabethae		15
Microclymene sp.		11
Micronephthys minuta		189
Minuspio cirrifera		
Myriochele heeri		36
Myriochele oculata		1
Mystides borealis		1
Nemidia torelli		
Neosabellides sp.		
Nephtys caeca		
Nephtys ciliata		5
Nephtys discors		
Nephtys incisa		
Nephtys longosetosa		
Nephtys paradoxa		6
Nereimyra aphroditoides		44
Nereis zonata		3
Nicolea zostericola		
Nicomache lumbricalis		1
Nicon sp. A		
Nothria conchylega		1
Notomastus latericeus		1
Notoproctus oculatus		
Onuphis quadricuspis		
Ophelina acuminata		
Ophelina cylindricaudatus		
Ophelina groenlandica		
Ophelina sp. A		
Ophryotrocha sp.		
Orbinia sp.		
Owenia collaris		7
Owenia fusiformis		
Paramphitrite tetrabranchia		
Paranaitides wahlbergi		
Paraonis sp. A		4
Parheteromastus sp. A		15
Petaloproctus tenuis		19
Pherusa plumosa		1
Pholoe minuta		339

		#/0.5m^2
Pionosyllis compacta		1
Pista cristata		
Polycirrus medusa		4
Polydora caulleryi		132
Polydora quadrilobata		
Polydora socialis		1
Polyphysia crassa		
Praxillella gracilis		1
Praxillella praetermissa		5
Prionospio steenstrupi		22
Proclea graffii		12
Pygospio elegans		
Rhodine gracilior		
Sabella sp.		
Sabellastarte sp.		
Sabellides borealis		
Scalibregma inflatum		11
Schistomeringos caeca		19
Schistomeringos sp. A		
Scoloplos acutus		51
Scoloplos armiger		
Sigambra tentaculata		
Sphaerodoridium claparedii		
Sphaerodoridium sp. A		1
Sphaerodoropsis biserialis		
Sphaerodoropsis minuta		
Sphaerodoropsis sp. A		
Sphaerodoropsis sp. B		
Sphaerodorum gracilis		7
Sphaerosyllis erinaceus		46
Spinther sp.		
Spio filicornis		
Spio theeli		
Spiochaetopterus typicus		
Spiophanes bombyx		
Spirorbis granulatus		
Sternaspis scutata		
Syllides longocirrata		1
Syllides sp.		1
Tachytrypane abranchiata		
Tachytrypane sp. A		
Tauberia gracilis		1
Terebellides stroemi		58
Tharyx ?acutus		115
Travisia sp.		24
Trichobranchus glacialis		
Trochochaeta carica		7
Trochochaeta multisetosa		
Typosyllis cornuta		25
Typosyllis fasciata		3
unidentified		36
TOTAL 83 spp.		2204

		#/0.5m^2
Lumbriclymene minor		
Lumbrineris fragilis		
Lumbrineris impatiens		193
Lumbrineris latreilli		11
Lumbrineris minuta		10
Lumbrineris sp. A		
Lumbrineris sp. B		1
Lumbrineris sp. X		35
Lysilla loveni		1
Lysippe labiata		121
Magelona longicornis		
Maldane sarsi		20
Marenzelleria wireni		
Melaenis loveni		
Melinna elisabethae		15
Microclymene sp.		11
Micronephthys minuta		189
Minuspio cirrifera		
Myriochele heeri		36
Myriochele oculata		1
Mystides borealis		1
Nemidia torelli		
Neosabellides sp.		
Nephtys caeca		
Nephtys ciliata		5
Nephtys discors		
Nephtys incisa		
Nephtys longosetosa		
Nephtys paradoxa		6
Nereimyra aphroditoides		44
Nereis zonata		3
Nicolea zostericola		
Nicomache lumbricalis		1
Nicon sp. A		
Nothria conchylega		1
Notomastus latericeus		1
Notoproctus oculatus		
Onuphis quadricuspis		
Ophelina acuminata		
Ophelina cylindricaudatus		
Ophelina groenlandica		
Ophelina sp. A		
Ophryotrocha sp.		
Orbinia sp.		
Owenia collaris		7
Owenia fusiformis		
Paramphitrite tetrabranchia		
Paranaitides wahlbergi		
Paraonis sp. A		4
Parheteromastus sp. A		15
Petaloproctus tenuis		19
Pherusa plumosa		1
Pholoe minuta		339

		#/0.5m^2
Pionosyllis compacta		1
Pista cristata		
Polycirrus medusa		4
Polydora caulleryi		132
Polydora quadrilobata		
Polydora socialis		1
Polyphysia crassa		
Praxillella gracilis		1
Praxillella praetermissa		5
Prionospio steenstrupi		22
Proclea graffii		12
Pygospio elegans		
Rhodine gracilior		
Sabella sp.		
Sabellastarte sp.		
Sabellides borealis		
Scalibregma inflatum		11
Schistomeringos caeca		19
Schistomeringos sp. A		
Scoloplos acutus		51
Scoloplos armiger		
Sigambra tentaculata		
Sphaerodoridium claparedii		
Sphaerodoridium sp. A		1
Sphaerodoropsis biserialis		
Sphaerodoropsis minuta		
Sphaerodoropsis sp. A		
Sphaerodoropsis sp. B		
Sphaerodorum gracilis		7
Sphaerosyllis erinaceus		46
Spinther sp.		
Spio filicornis		
Spio theeli		
Spiochaetopterus typicus		
Spiophanes bombyx		
Spirorbis granulatus		
Sternaspis scutata		
Syllides longocirrata		1
Syllides sp.		1
Tachytrypane abranchiata		
Tachytrypane sp. A		
Tauberia gracilis		1
Terebellides stroemi		58
Tharyx ?acutus		115
Travisia sp.		24
Trichobranchus glacialis		
Trochochaeta carica		7
Trochochaeta multisetosa		
Typosyllis cornuta		25
Typosyllis fasciata		3
unidentified		36
TOTAL 83 spp.		2204

Appendix I (cont'd): Polychaete species data for Station PPB-25 (25m), Cruise OCS-4; accumulated from Smith-McIntyre Grab samples 1360, 1361, 1362, 1363 and 1364. The numbers represent totals per $0.5m^2$ of sea floor for the polychaetes retained on a 1.0 mm sieve.

		$\#/0.5m^2$
Aglaophamus malmgreni		
Allia abranchiata		
Allia nr *suecica*		26
Allia sp. B		10
Allia sp. C		
Amage auricula		
Ampharete acutifrons		
Ampharete arctica		
Ampharete goësi		
Ampharete lindstromi		1
Ampharete vega		
Ampharetidae - Genus A		
Ampharetidae - Genus B		
Amphicteis sundevalli		
Anaitides citrina		
Anaitides groenlandica		5
Antinoella badia		1
Antinoella sarsi		
Apistobranchus tullbergi		12
Apomatus globifer		
Arcteobia anticostiensis		
Arenicola glacialis		
Aricidea quadrilobata		
Aricidea tetrabranchiata		
Artacama proboscidea		8
Autolytus alexandri		
Autolytus fallax		
Axionice flexuosa		
Axionice maculata		
Barantolla sp.		
Brada incrustata		
Brada inhabilis		
Brada nuda		
Brada villosa		1
Branchiomma infarcta		
Capitella capitata		4
Chaetozone setosa		18
Chone duneri		
Chone infundibuliformis		
Chone nr *murmanica*		
Cirratulus cirratus		
Cistenides hyperborea		3
Clymenura polaris		
Cossura longocirrata		11
Cossura sp. A		

		$\#/0.5m^2$
Dexiospira spirillum		
Diplocirrus glaucus		
Diplocirrus hirsutus		
Diplocirrus longisetosus		
Dorvillea sp.		
Dysponetus sp. N		
Eclysippe sp. A		
Enipo gracilis		
Enipo canadensis		
Ephesiella macrocirrus		
Eteone flava		
Eteone longa		1
Eteone spetsbergensis		
Eteone (Mysta) barbata		
Euchone analis		
Euchone elegans		
Euchone incolor		
Euchone papillosa		
Euchone sp.		
Eucranta villosa		
Eunoe oerstedi		
Eusyllis blomstrandi		
Exogone dispar		
Exogone naidina		
Exogone sp.		
Fabricinae - sp. O		2
Fabricinae - sp. R		
Fabrisabella schaudinni		
Flabelligera affinis		
Gattyana cirrosa		1
Glycera capitata		
Glycinde wireni		1
Glyphanostomum pallescens		
Harmothoe imbricata		
Hesionidae gen et sp. nov.		
Heteromastus filiformis		1
Jasmineira sp.		
Lagisca extenuata		
Lanassa nordenskjoldi		
Lanassa venusta		
Laonice cirrata		
Laonome kroyeri		1
Laphania boecki		

		$\#/0.5m^2$
Lumbriclymene minor		
Lumbrineris fragilis		
Lumbrineris impatiens		
Lumbrineris latreilli		
Lumbrineris minuta		10
Lumbrineris sp. A		
Lumbrineris sp. B		
Lumbrineris sp. X		1
Lysilla loveni		1
Lysippe labiata		1
Magelona longicornis		
Maldane sarsi		
Marenzelleria wireni		
Melaenis loveni		
Melinna elisabethae		
Microclymene sp.		
Micronephthys minuta		61
Minuspio cirrifera		4
Myriochele heeri		
Myriochele oculata		
Mystides borealis		
Nemidia torelli		
Neosabellides sp.		
Nephtys caeca		
Nephtys ciliata		7
Nephtys discors		
Nephtys incisa		
Nephtys longosetosa		
Nephtys paradoxa		
Nereimyra aphroditoides		1
Nereis zonata		
Nicolea zostericola		
Nicomache lumbricalis		
Nicon sp. A		
Nothria conchylega		
Notomastus latericeus		
Notoproctus oculatus		
Onuphis quadricuspis		
Ophelina acuminata		
Ophelina cylindricaudatus		2
Ophelina groenlandica		
Ophelina sp. A		
Ophryotrocha sp.		
Orbinia sp.		
Owenia collaris		
Owenia fusiformis		
Paramphitrite tetrabranchia		1
Paranaitides wahlbergi		
Paraonis sp. A		2
Parheteromastus sp. A		
Petaloproctus tenuis		
Pherusa plumosa		
Pholoe minuta		27

		$\#/0.5m^2$
Pionosyllis compacta		
Pista cristata		
Polycirrus medusa		
Polydora caulleryi		1
Polydora quadrilobata		
Polydora socialis		1
Polyphysia crassa		
Praxillella gracilis		
Praxillella praetermissa		
Prionospio steenstrupi		6
Proclea graffii		
Pygospio elegans		
Rhodine gracilior		
Sabella sp.		
Sabellastarte sp.		
Sabellides borealis		
Scalibregma inflatum		
Schistomeringos caeca		12
Schistomeringos sp. A		
Scoloplos acutus		7
Scoloplos armiger		
Sigambra tentaculata		
Sphaerodoridium claparedii		
Sphaerodoridium sp. A		
Sphaerodoropsis biserialis		1
Sphaerodoropsis minuta		
Sphaerodoropsis sp. A		
Sphaerodoropsis sp. B		
Sphaerodorum gracilis		
Sphaerosyllis erinaceus		
Spinther sp.		
Spio filicornis		
Spio theeli		
Spiochaetopterus typicus		
Spiophanes bombyx		
Spirorbis granulatus		
Sternaspis scutata		10
Syllides longocirrata		
Syllides sp.		
Tachytrypane abranchiata		
Tachytrypane sp. A		
Tauberia gracilis		
Terebellides stroemi		2
Tharyx ?acutus		68
Travisia sp.		
Trichobranchus glacialis		
Trochochaeta carica		1
Trochochaeta multisetosa		1
Typosyllis cornuta		
Typosyllis fasciata		
unidentified		7
TOTAL 41 spp.		342

		$\#/0.5m^2$
Lumbriclymene minor		
Lumbrineris fragilis		
Lumbrineris impatiens		
Lumbrineris latreilli		
Lumbrineris minuta		10
Lumbrineris sp. A		
Lumbrineris sp. B		
Lumbrineris sp. X		1
Lysilla loveni		1
Lysippe labiata		1
Magelona longicornis		
Maldane sarsi		
Marenzelleria wireni		
Melaenis loveni		
Melinna elisabethae		
Microclymene sp.		
Micronephthys minuta		61
Minuspio cirrifera		4
Myriochele heeri		
Myriochele oculata		
Mystides borealis		
Nemidia torelli		
Neosabellides sp.		
Nephtys caeca		
Nephtys ciliata		7
Nephtys discors		
Nephtys incisa		
Nephtys longosetosa		
Nephtys paradoxa		
Nereimyra aphroditoides		1
Nereis zonata		
Nicolea zostericola		
Nicomache lumbricalis		
Nicon sp. A		
Nothria conchylega		
Notomastus latericeus		
Notoproctus oculatus		
Onuphis quadricuspis		
Ophelina acuminata		
Ophelina cylindricaudatus		2
Ophelina groenlandica		
Ophelina sp. A		
Ophryotrocha sp.		
Orbinia sp.		
Owenia collaris		
Owenia fusiformis		
Paramphitrite tetrabranchia		1
Paranaitides wahlbergi		
Paraonis sp. A		2
Parheteromastus sp. A		
Petaloproctus tenuis		
Pherusa plumosa		
Pholoe minuta		27

		$\#/0.5m^2$
Pionosyllis compacta		
Pista cristata		
Polycirrus medusa		
Polydora caulleryi		1
Polydora quadrilobata		
Polydora socialis		1
Polyphysia crassa		
Praxillella gracilis		
Praxillella praetermissa		
Prionospio steenstrupi		6
Proclea graffii		
Pygospio elegans		
Rhodine gracilior		
Sabella sp.		
Sabellastarte sp.		
Sabellides borealis		
Scalibregma inflatum		
Schistomeringos caeca		12
Schistomeringos sp. A		
Scoloplos acutus		7
Scoloplos armiger		
Sigambra tentaculata		
Sphaerodoridium claparedii		
Sphaerodoridium sp. A		
Sphaerodoropsis biserialis		1
Sphaerodoropsis minuta		
Sphaerodoropsis sp. A		
Sphaerodoropsis sp. B		
Sphaerodorum gracilis		
Sphaerosyllis erinaceus		
Spinther sp.		
Spio filicornis		
Spio theeli		
Spiochaetopterus typicus		
Spiophanes bombyx		
Spirorbis granulatus		
Sternaspis scutata		10
Syllides longocirrata		
Syllides sp.		
Tachytrypane abranchiata		
Tachytrypane sp. A		
Tauberia gracilis		
Terebellides stroemi		2
Tharyx ?acutus		68
Travisia sp.		
Trichobranchus glacialis		
Trochochaeta carica		1
Trochochaeta multisetosa		1
Typosyllis cornuta		
Typosyllis fasciata		
unidentified		7
TOTAL 41 spp.		342

Appendix I (cont'd): Polychaete species data for Station PPB-55 (55m), Cruise OCS-4; accumulated from Smith-McIntyre Grab samples 1330, 1335, 1336, 1340 and 1341. The numbers represent totals per $0.5m^2$ of sea floor for the polychaetes retained on a 1.0 mm sieve.

		$\#/0.5m^2$
Aglaophamus malmgreni		
Allia abranchiata		
Allia nr *suecica*		31
Allia sp. B		
Allia sp. C		
Amage auricula		
Ampharete acutifrons		
Ampharete arctica		
Ampharete goësi		1
Ampharete lindstromi		16
Ampharete vega		
Ampharetidae - Genus A		
Ampharetidae - Genus B		
Amphicteis sundevalli		
Anaitides citrina		
Anaitides groenlandica		10
Antinoella badia		
Antinoella sarsi		14
Apistobranchus tullbergi		
Apomatus globifer		
Arcteobia anticostiensis		1
Arenicola glacialis		
Aricidea quadrilobata		
Aricidea tetrabranchiata		
Artacama proboscidea		
Autolytus alexandri		
Autolytus fallax		
Axionice flexuosa		
Axionice maculata		
Barantolla sp.		25
Brada incrustata		
Brada inhabilis		
Brada nuda		
Brada villosa		1
Branchiomma infarcta		
Capitella capitata		1
Chaetozone setosa		52
Chone duneri		
Chone infundibuliformis		
Chone nr *murmanica*		12
Cirratulus cirratus		
Cistenides hyperborea		1
Clymenura polaris		20
Cossura longocirrata		14
Cossura sp. A		

		$\#/0.5m^2$
Dexiospira spirillum		
Diplocirrus glaucus		
Diplocirrus hirsutus		
Diplocirrus longisetosus		1
Dorvillea sp.		
Dysponetus sp. N		
Eclysippe sp. A		
Enipo gracilis		
Enipo canadensis		1
Ephesiella macrocirrus		
Eteone flava		2
Eteone longa		6
Eteone spetsbergensis		
Eteone (Mysta) barbata		
Euchone analis		
Euchone elegans		1
Euchone incolor		8
Euchone papillosa		
Euchone sp.		
Eucranta villosa		
Eunoe oerstedi		
Eusyllis blomstrandi		
Exogone dispar		
Exogone naidina		17
Exogone sp.		
Fabricinae - sp. O		18
Fabricinae - sp. R		
Fabrisabella schaudinni		
Flabelligera affinis		
Gattyana cirrosa		3
Glycera capitata		
Glycinde wireni		2
Glyphanostomum pallescens		
Harmothoe imbricata		
Hesionidae gen et sp. nov.		1
Heteromastus filiformis		26
Jasmineira sp.		
Lagisca extenuata		
Lanassa nordenskjoldi		
Lanassa venusta		
Laonice cirrata		
Laonome kroyeri		
Laphania boecki		17

		$\#/0.5m^2$
Lumbriclymene minor		
Lumbrineris fragilis		
Lumbrineris impatiens		1
Lumbrineris latreilli		9
Lumbrineris minuta		18
Lumbrineris sp. A		
Lumbrineris sp. B		2
Lumbrineris sp. X		39
Lysilla loveni		3
Lysippe labiata		47
Magelona longicornis		6
Maldane sarsi		50
Marenzelleria wireni		
Melaenis loveni		
Melinna elisabethae		2
Microclymene sp.		3
Micronephthys minuta		222
Minuspio cirrifera		1
Myriochele heeri		11
Myriochele oculata		
Mystides borealis		1
Nemidia torelli		
Neosabellides sp.		
Nephtys caeca		
Nephtys ciliata		9
Nephtys discors		4
Nephtys incisa		
Nephtys longosetosa		
Nephtys paradoxa		
Nereimyra aphroditoides		1
Nereis zonata		
Nicolea zostericola		
Nicomache lumbricalis		
Nicon sp. A		
Nothria conchylega		
Notomastus latericeus		
Notoproctus oculatus		
Onuphis quadricuspis		82
Ophelina acuminata		
Ophelina cylindricaudatus		
Ophelina groenlandica		2
Ophelina sp. A		
Ophryotrocha sp.		
Orbinia sp.		
Owenia collaris		
Owenia fusiformis		
Paramphitrite tetrabranchia		
Paranaitides wahlbergi		
Paraonis sp. A		6
Parheteromastus sp. A		1
Petaloproctus tenuis		
Pherusa plumosa		
Pholoe minuta		102

		$\#/0.5m^2$
Pionosyllis compacta		
Pista cristata		
Polycirrus medusa		
Polydora caulleryi		5
Polydora quadrilobata		
Polydora socialis		
Polyphysia crassa		
Praxillella gracilis		2
Praxillella praetermissa		4
Prionospio steenstrupi		22
Proclea graffii		15
Pygospio elegans		
Rhodine gracilior		4
Sabella sp.		1
Sabellastarte sp.		
Sabellides borealis		
Scalibregma inflatum		7
Schistomeringos caeca		3
Schistomeringos sp. A		
Scoloplos acutus		48
Scoloplos armiger		
Sigambra tentaculata		
Sphaerodoridium claparedii		
Sphaerodoridium sp. A		1
Sphaerodoropsis biserialis		
Sphaerodoropsis minuta		
Sphaerodoropsis sp. A		
Sphaerodoropsis sp. B		
Sphaerodorum gracilis		
Sphaerosyllis erinaceus		
Spinther sp.		
Spio filicornis		
Spio theeli		
Spiochaetopterus typicus		4
Spiophanes bombyx		
Spirorbis granulatus		
Sternaspis scutata		24
Syllides longocirrata		4
Syllides sp.		1
Tachytrypane abranchiata		
Tachytrypane sp. A		
Tauberia gracilis		75
Terebellides stroemi		85
Tharyx ?acutus		287
Travisia sp.		
Trichobranchus glacialis		
Trochochaeta carica		2
Trochochaeta multisetosa		1
Typosyllis cornuta		2
Typosyllis fasciata		
unidentified		5
TOTAL 71 spp.		1526

		$\#/0.5m^2$
Lumbriclymene minor		
Lumbrineris fragilis		
Lumbrineris impatiens		1
Lumbrineris latreilli		9
Lumbrineris minuta		18
Lumbrineris sp. A		
Lumbrineris sp. B		2
Lumbrineris sp. X		39
Lysilla loveni		3
Lysippe labiata		47
Magelona longicornis		6
Maldane sarsi		50
Marenzelleria wireni		
Melaenis loveni		
Melinna elisabethae		2
Microclymene sp.		3
Micronephthys minuta		222
Minuspio cirrifera		1
Myriochele heeri		11
Myriochele oculata		
Mystides borealis		1
Nemidia torelli		
Neosabellides sp.		
Nephtys caeca		
Nephtys ciliata		9
Nephtys discors		4
Nephtys incisa		
Nephtys longosetosa		
Nephtys paradoxa		
Nereimyra aphroditoides		1
Nereis zonata		
Nicolea zostericola		
Nicomache lumbricalis		
Nicon sp. A		
Nothria conchylega		
Notomastus latericeus		
Notoproctus oculatus		
Onuphis quadricuspis		82
Ophelina acuminata		
Ophelina cylindricaudatus		
Ophelina groenlandica		2
Ophelina sp. A		
Ophryotrocha sp.		
Orbinia sp.		
Owenia collaris		
Owenia fusiformis		
Paramphitrite tetrabranchia		
Paranaitides wahlbergi		
Paraonis sp. A		6
Parheteromastus sp. A		1
Petaloproctus tenuis		
Pherusa plumosa		
Pholoe minuta		102

		$\#/0.5m^2$
Pionosyllis compacta		
Pista cristata		
Polycirrus medusa		
Polydora caulleryi		5
Polydora quadrilobata		
Polydora socialis		
Polyphysia crassa		
Praxillella gracilis		2
Praxillella praetermissa		4
Prionospio steenstrupi		22
Proclea graffii		15
Pygospio elegans		
Rhodine gracilior		4
Sabella sp.		1
Sabellastarte sp.		
Sabellides borealis		
Scalibregma inflatum		7
Schistomeringos caeca		3
Schistomeringos sp. A		
Scoloplos acutus		48
Scoloplos armiger		
Sigambra tentaculata		
Sphaerodoridium claparedii		
Sphaerodoridium sp. A		1
Sphaerodoropsis biserialis		
Sphaerodoropsis minuta		
Sphaerodoropsis sp. A		
Sphaerodoropsis sp. B		
Sphaerodorum gracilis		
Sphaerosyllis erinaceus		
Spinther sp.		
Spio filicornis		
Spio theeli		
Spiochaetopterus typicus		4
Spiophanes bombyx		
Spirorbis granulatus		
Sternaspis scutata		24
Syllides longocirrata		4
Syllides sp.		1
Tachytrypane abranchiata		
Tachytrypane sp. A		
Tauberia gracilis		75
Terebellides stroemi		85
Tharyx ?acutus		287
Travisia sp.		
Trichobranchus glacialis		
Trochochaeta carica		2
Trochochaeta multisetosa		1
Typosyllis cornuta		2
Typosyllis fasciata		
unidentified		5
TOTAL 71 spp.		1526

Appendix I (cont'd): Polychaete species data for Station PPB-100 (100m), Cruise OCS-4; accumulated from Smith-McIntyre Grab samples 1318, 1319, 1320, 1322 and 1323. The numbers represent totals per $0.5m^2$ of sea floor for the polychaetes retained on a 1.0 mm sieve.

		$\#/0.5m^2$
Aglaophamus malmgreni		
Allia abranchiata		
Allia nr *suecica*		67
Allia sp. B		
Allia sp. C		
Amage auricula		
Ampharete acutifrons		1
Ampharete arctica		2
Ampharete goësi		1
Ampharete lindstromi		13
Ampharete vega		
Ampharetidae - Genus A		
Ampharetidae - Genus B		
Amphicteis sundevalli		
Anaitides citrina		
Anaitides groenlandica		3
Antinoella badia		
Antinoella sarsi		
Apistobranchus tullbergi		3
Apomatus globifer		
Arcteobia anticostiensis		
Arenicola glacialis		
Aricidea quadrilobata		
Aricidea tetrabranchiata		
Artacama proboscidea		
Autolytus alexandri		1
Autolytus fallax		
Axionice flexuosa		
Axionice maculata		2
Barantolla sp.		22
Brada incrustata		
Brada inhabilis		
Brada nuda		
Brada villosa		
Branchiomma infarcta		
Capitella capitata		1
Chaetozone setosa		208
Chone duneri		11
Chone infundibuliformis		
Chone nr *murmanica*		114
Cirratulus cirratus		
Cistenides hyperborea		
Clymenura polaris		12
Cossura longocirrata		8
Cossura sp. A		

		$\#/0.5m^2$
Dexiospira spirillum		
Diplocirrus glaucus		2
Diplocirrus hirsutus		7
Diplocirrus longisetosus		5
Dorvillea sp.		
Dysponetus sp. N		
		2
Eclysippe sp. A		
Enipo gracilis		1
Enipo canadensis		
Ephesiella macrocirrus		
Eteone flava		
Eteone longa		3
Eteone spetsbergensis		
Eteone (Mysta) barbata		
Euchone analis		3
Euchone elegans		7
Euchone incolor		8
Euchone papillosa		
Euchone sp.		
Eucranta villosa		
Eunoe oerstedi		
Eusyllis blomstrandi		1
Exogone dispar		
Exogone naidina		
Exogone sp.		
Fabricinae - sp. O		43
Fabricinae - sp. R		2
Fabrisabella schaudinni		
Flabelligera affinis		1
Gattyana cirrosa		1
Glycera capitata		1
Glycinde wireni		2
Glyphanostomum pallescens		2
Harmothoe imbricata		
Hesionidae gen et sp. nov.		1
Heteromastus filiformis		29
Jasmineira sp.		
Lagisca extenuata		
Lanassa nordenskjoldi		
Lanassa venusta		5
Laonice cirrata		1
Laonome kroyeri		1
Laphania boecki		4

		#/0.5m^2
Lumbriclymene minor		
Lumbrineris fragilis		1
Lumbrineris impatiens		172
Lumbrineris latreilli		3
Lumbrineris minuta		8
Lumbrineris sp. A		
Lumbrineris sp. B		9
Lumbrineris sp. X		39
Lysilla loveni		
Lysippe labiata		120
Magelona longicornis		
Maldane sarsi		12
Marenzelleria wireni		
Melaenis loveni		
Melinna elisabethae		28
Microclymene sp.		11
Micronephthys minuta		55
Minuspio cirrifera		
Myriochele heeri		50
Myriochele oculata		4
Mystides borealis		2
Nemidia torelli		
Neosabellides sp.		
Nephtys caeca		
Nephtys ciliata		1
Nephtys discors		
Nephtys incisa		
Nephtys longosetosa		
Nephtys paradoxa		13
Nereimyra aphroditoides		80
Nereis zonata		
Nicolea zostericola		
Nicomache lumbricalis		1
Nicon sp. A		
Nothria conchylega		2
Notomastus latericeus		
Notoproctus oculatus		
Onuphis quadricuspis		4
Ophelina acuminata		
Ophelina cylindricaudatus		2
Ophelina groenlandica		7
Ophelina sp. A		
Ophryotrocha sp.		
Orbinia sp.		
Owenia collaris		2
Owenia fusiformis		
Paramphitrite tetrabranchia		2
Paranaitides wahlbergi		
Paraonis sp. A		2
Parheteromastus sp. A		6
Petaloproctus tenuis		11
Pherusa plumosa		1
Pholoe minuta		231

		#/0.5m^2
Pionosyllis compacta		3
Pista cristata		1
Polycirrus medusa		16
Polydora caulleryi		12
Polydora quadrilobata		
Polydora socialis		1
Polyphysia crassa		
Praxillella gracilis		
Praxillella praetermissa		1
Prionospio steenstrupi		10
Proclea graffii		8
Pygospio elegans		
Rhodine gracilior		
Sabella sp.		
Sabellastarte sp.		
Sabellides borealis		
Scalibregma inflatum		14
Schistomeringos caeca		1
Schistomeringos sp. A		
Scoloplos acutus		39
Scoloplos armiger		
Sigambra tentaculata		
Sphaerodoridium claparedii		
Sphaerodoridium sp. A		2
Sphaerodoropsis biserialis		
Sphaerodoropsis minuta		
Sphaerodoropsis sp. A		
Sphaerodoropsis sp. B		
Sphaerodorum gracilis		
Sphaerosyllis erinaceus		25
Spinther sp.		
Spio filicornis		
Spio theeli		
Spiochaetopterus typicus		
Spiophanes bombyx		
Spirorbis granulatus		
Sternaspis scutata		
Syllides longocirrata		
Syllides sp.		
Tachytrypane abranchiata		
Tachytrypane sp. A		
Tauberia gracilis		1
Terebellides stroemi		51
Tharyx ?acutus		61
Travisia sp.		8
Trichobranchus glacialis		8
Trochochaeta carica		1
Trochochaeta multisetosa		
Typosyllis cornuta		30
Typosyllis fasciata		5
unidentified		8
TOTAL 89 spp.		1786

		#/0.5m²
Lumbriclymene minor		
Lumbrineris fragilis		1
Lumbrineris impatiens		172
Lumbrineris latreilli		3
Lumbrineris minuta		8
Lumbrineris sp. A		
Lumbrineris sp. B		9
Lumbrineris sp. X		39
Lysilla loveni		
Lysippe labiata		120
Magelona longicornis		
Maldane sarsi		12
Marenzelleria wireni		
Melaenis loveni		
Melinna elisabethae		28
Microclymene sp.		11
Micronephthys minuta		55
Minuspio cirrifera		
Myriochele heeri		50
Myriochele oculata		4
Mystides borealis		2
Nemidia torelli		
Neosabellides sp.		
Nephtys caeca		
Nephtys ciliata		1
Nephtys discors		
Nephtys incisa		
Nephtys longosetosa		
Nephtys paradoxa		13
Nereimyra aphroditoides		80
Nereis zonata		
Nicolea zostericola		
Nicomache lumbricalis		1
Nicon sp. A		
Nothria conchylega		2
Notomastus latericeus		
Notoproctus oculatus		
Onuphis quadricuspis		4
Ophelina acuminata		
Ophelina cylindricaudatus		2
Ophelina groenlandica		7
Ophelina sp. A		
Ophryotrocha sp.		
Orbinia sp.		
Owenia collaris		2
Owenia fusiformis		
Paramphitrite tetrabranchia		2
Paranaitides wahlbergi		
Paraonis sp. A		2
Parheteromastus sp. A		6
Petaloproctus tenuis		11
Pherusa plumosa		1
Pholoe minuta		231

		#/0.5m²
Pionosyllis compacta		3
Pista cristata		1
Polycirrus medusa		16
Polydora caulleryi		12
Polydora quadrilobata		
Polydora socialis		1
Polyphysia crassa		
Praxillella gracilis		
Praxillella praetermissa		1
Prionospio steenstrupi		10
Proclea graffii		8
Pygospio elegans		
Rhodine gracilior		
Sabella sp.		
Sabellastarte sp.		
Sabellides borealis		
Scalibregma inflatum		14
Schistomeringos caeca		1
Schistomeringos sp. A		
Scoloplos acutus		39
Scoloplos armiger		
Sigambra tentaculata		
Sphaerodoridium claparedii		
Sphaerodoridium sp. A		2
Sphaerodoropsis biserialis		
Sphaerodoropsis minuta		
Sphaerodoropsis sp. A		
Sphaerodoropsis sp. B		
Sphaerodorum gracilis		
Sphaerosyllis erinaceus		25
Spinther sp.		
Spio filicornis		
Spio theeli		
Spiochaetopterus typicus		
Spiophanes bombyx		
Spirorbis granulatus		
Sternaspis scutata		
Syllides longocirrata		
Syllides sp.		
Tachytrypane abranchiata		
Tachytrypane sp. A		
Tauberia gracilis		1
Terebellides stroemi		51
Tharyx ?acutus		61
Travisia sp.		8
Trichobranchus glacialis		8
Trochochaeta carica		1
Trochochaeta multisetosa		
Typosyllis cornuta		30
Typosyllis fasciata		5
unidentified		8
TOTAL 89 spp.		1786

Appendix I (cont'd): Polychaete species data for Station BRB-5 (5m), Cruise OCS-5; accumulated from Smith-McIntyre Grab samples 1389, 1390, 1392, 1393 and 1394. The numbers represent totals per $0.5m^2$ of sea floor for the polychaetes retained on a 1.0 mm sieve.

		$\#/0.5m^2$
Aglaophamus malmgreni		
Allia abranchiata		
Allia nr *suecica*		
Allia sp. B		
Allia sp. C		
Amage auricula		
Ampharete acutifrons		2
Ampharete arctica		
Ampharete goësi		
Ampharete lindstromi		
Ampharete vega		2
Ampharetidae - Genus A		
Ampharetidae - Genus B		
Amphicteis sundevalli		
Anaitides citrina		
Anaitides groenlandica		5
Antinoella badia		
Antinoella sarsi		1
Apistobranchus tullbergi		
Apomatus globifer		
Arcteobia anticostiensis		4
Arenicola glacialis		
Aricidea quadrilobata		
Aricidea tetrabranchiata		
Artacama proboscidea		
Autolytus alexandri		
Autolytus fallax		
Axionice flexuosa		
Axionice maculata		
Barantolla sp.		
Brada incrustata		
Brada inhabilis		
Brada nuda		
Brada villosa		1
Branchiomma infarcta		
Capitella capitata		11
Chaetozone setosa		11
Chone duneri		
Chone infundibuliformis		
Chone nr *murmanica*		11
Cirratulus cirratus		
Cistenides hyperborea		6
Clymenura polaris		
Cossura longocirrata		
Cossura sp. A		

		$\#/0.5m^2$
Dexiospira spirillum		
Diplocirrus glaucus		
Diplocirrus hirsutus		
Diplocirrus longisetosus		
Dorvillea sp.		
Dysponetus sp. N		
Eclysippe sp. A		
Enipo gracilis		
Enipo canadensis		
Ephesiella macrocirrus		
Eteone flava		
Eteone longa		12
Eteone spetsbergensis		
Eteone (Mysta) barbata		1
Euchone analis		
Euchone elegans		
Euchone incolor		
Euchone papillosa		
Euchone sp.		
Eucranta villosa		
Eunoe oerstedi		
Eusyllis blomstrandi		
Exogone dispar		
Exogone naidina		
Exogone sp.		
Fabricinae - sp. O		
Fabricinae - sp. R		
Fabrisabella schaudinni		
Flabelligera affinis		
Gattyana cirrosa		
Glycera capitata		
Glycinde wireni		
Glyphanostomum pallescens		
Harmothoe imbricata		
Hesionidae gen et sp. nov.		24
Heteromastus filiformis		
Jasmineira sp.		
Lagisca extenuata		
Lanassa nordenskjoldi		
Lanassa venusta		
Laonice cirrata		
Laonome kroyeri		
Laphania boecki		

		#/0.5m^2
Lumbriclymene minor		
Lumbrineris fragilis		
Lumbrineris impatiens		
Lumbrineris latreilli		
Lumbrineris minuta		
Lumbrineris sp. A		
Lumbrineris sp. B		
Lumbrineris sp. X		
Lysilla loveni		
Lysippe labiata		
Magelona longicornis		
Maldane sarsi		
Marenzelleria wireni		2
Melaenis loveni		
Melinna elisabethae		
Microclymene sp.		
Micronephthys minuta		1
Minuspio cirrifera		
Myriochele heeri		
Myriochele oculata		
Mystides borealis		
Nemidia torelli		
Neosabellides sp.		2
Nephtys caeca		
Nephtys ciliata		
Nephtys discors		
Nephtys incisa		
Nephtys longosetosa		80
Nephtys paradoxa		
Nereimyra aphroditoides		28
Nereis zonata		
Nicolea zostericola		
Nicomache lumbricalis		
Nicon sp. A		
Nothria conchylega		
Notomastus latericeus		
Notoproctus oculatus		
Onuphis quadricuspis		
Ophelina acuminata		
Ophelina cylindricaudatus		
Ophelina groenlandica		
Ophelina sp. A		
Ophryotrocha sp.		1
Orbinia sp.		
Owenia collaris		
Owenia fusiformis		
Paramphitrite tetrabranchia		
Paranaitides wahlbergi		
Paraonis sp. A		
Parheteromastus sp. A		2
Petaloproctus tenuis		
Pherusa plumosa		
Pholoe minuta		

		#/0.5m^2
Pionosyllis compacta		
Pista cristata		
Polycirrus medusa		
Polydora caulleryi		1
Polydora quadrilobata		2
Polydora socialis		
Polyphysia crassa		
Praxillella gracilis		
Praxillella praetermissa		
Prionospio steenstrupi		7
Proclea graffii		
Pygospio elegans		2
Rhodine gracilior		
Sabella sp.		
Sabellastarte sp.		
Sabellides borealis		
Scalibregma inflatum		
Schistomeringos caeca		
Schistomeringos sp. A		
Scoloplos acutus		
Scoloplos armiger		17
Sigambra tentaculata		
Sphaerodoridium claparedii		
Sphaerodoridium sp. A		
Sphaerodoropsis biserialis		
Sphaerodoropsis minuta		
Sphaerodoropsis sp. A		
Sphaerodoropsis sp. B		
Sphaerodorum gracilis		
Sphaerosyllis erinaceus		
Spinther sp.		
Spio filicornis		5
Spio theeli		195
Spiochaetopterus typicus		
Spiophanes bombyx		1
Spirorbis granulatus		
Sternaspis scutata		
Syllides longocirrata		
Syllides sp.		
Tachytrypane abranchiata		
Tachytrypane sp. A		
Tauberia gracilis		
Terebellides stroemi		
Tharyx ?acutus		12
Travisia sp.		
Trichobranchus glacialis		
Trochochaeta carica		
Trochochaeta multisetosa		
Typosyllis cornuta		
Typosyllis fasciata		
unidentified		
TOTAL 29 spp.		449

		$\#/0.5m^2$
Lumbriclymene minor		
Lumbrineris fragilis		
Lumbrineris impatiens		
Lumbrineris latreilli		
Lumbrineris minuta		
Lumbrineris sp. A		
Lumbrineris sp. B		
Lumbrineris sp. X		
Lysilla loveni		
Lysippe labiata		
Magelona longicornis		
Maldane sarsi		
Marenzelleria wireni		2
Melaenis loveni		
Melinna elisabethae		
Microclymene sp.		
Micronephthys minuta		1
Minuspio cirrifera		
Myriochele heeri		
Myriochele oculata		
Mystides borealis		
Nemidia torelli		
Neosabellides sp.		2
Nephtys caeca		
Nephtys ciliata		
Nephtys discors		
Nephtys incisa		
Nephtys longosetosa		80
Nephtys paradoxa		
Nereimyra aphroditoides		28
Nereis zonata		
Nicolea zostericola		
Nicomache lumbricalis		
Nicon sp. A		
Nothria conchylega		
Notomastus latericeus		
Notoproctus oculatus		
Onuphis quadricuspis		
Ophelina acuminata		
Ophelina cylindricaudatus		
Ophelina groenlandica		
Ophelina sp. A		
Ophryotrocha sp.		1
Orbinia sp.		
Owenia collaris		
Owenia fusiformis		
Paramphitrite tetrabranchia		
Paranaitides wahlbergi		
Paraonis sp. A		
Parheteromastus sp. A		2
Petaloproctus tenuis		
Pherusa plumosa		
Pholoe minuta		

		$\#/0.5m^2$
Pionosyllis compacta		
Pista cristata		
Polycirrus medusa		
Polydora caulleryi		1
Polydora quadrilobata		2
Polydora socialis		
Polyphysia crassa		
Praxillella gracilis		
Praxillella praetermissa		
Prionospio steenstrupi		7
Proclea graffii		
Pygospio elegans		2
Rhodine gracilior		
Sabella sp.		
Sabellastarte sp.		
Sabellides borealis		
Scalibregma inflatum		
Schistomeringos caeca		
Schistomeringos sp. A		
Scoloplos acutus		
Scoloplos armiger		17
Sigambra tentaculata		
Sphaerodoridium claparedii		
Sphaerodoridium sp. A		
Sphaerodoropsis biserialis		
Sphaerodoropsis minuta		
Sphaerodoropsis sp. A		
Sphaerodoropsis sp. B		
Sphaerodorum gracilis		
Sphaerosyllis erinaceus		
Spinther sp.		
Spio filicornis		5
Spio theeli		195
Spiochaetopterus typicus		
Spiophanes bombyx		1
Spirorbis granulatus		
Sternaspis scutata		
Syllides longocirrata		
Syllides sp.		
Tachytrypane abranchiata		
Tachytrypane sp. A		
Tauberia gracilis		
Terebellides stroemi		
Tharyx ?acutus		12
Travisia sp.		
Trichobranchus glacialis		
Trochochaeta carica		
Trochochaeta multisetosa		
Typosyllis cornuta		
Typosyllis fasciata		
unidentified		
TOTAL 29 spp.		449

Appendix I (cont'd): Polychaete species data for Station BRB-10 (10m), Cruise OCS-5; accumulated from Smith-McIntyre Grab samples 1384, 1385, 1386, 1387 and 1388. The numbers represent totals per $0.5m^2$ of sea floor for the polychaetes retained on a 1.0 mm sieve.

		$\#/0.5m^2$
Aglaophamus malmgreni		
Allia abranchiata		
Allia nr *suecica*		
Allia sp. B		
Allia sp. C		
Amage auricula		
Ampharete acutifrons		
Ampharete arctica		
Ampharete goësi		
Ampharete lindstromi		1
Ampharete vega		3
Ampharetidae - Genus A		3
Ampharetidae - Genus B		
Amphicteis sundevalli		
Anaitides citrina		
Anaitides groenlandica		12
Antinoella badia		
Antinoella sarsi		2
Apistobranchus tullbergi		
Apomatus globifer		
Arcteobia anticostiensis		5
Arenicola glacialis		
Aricidea quadrilobata		
Aricidea tetrabranchiata		
Artacama proboscidea		
Autolytus alexandri		
Autolytus fallax		
Axionice flexuosa		
Axionice maculata		
Barantolla sp.		1
Brada incrustata		
Brada inhabilis		
Brada nuda		
Brada villosa		69
Branchiomma infarcta		
Capitella capitata		9
Chaetozone setosa		22
Chone duneri		
Chone infundibuliformis		
Chone nr *murmanica*		8
Cirratulus cirratus		
Cistenides hyperborea		1153
Clymenura polaris		
Cossura longocirrata		
Cossura sp. A		

		$\#/0.5m^2$
Dexiospira spirillum		
Diplocirrus glaucus		
Diplocirrus hirsutus		
Diplocirrus longisetosus		
Dorvillea sp.		
Dysponetus sp. N		
Eclysippe sp. A		
Enipo gracilis		
Enipo canadensis		
Ephesiella macrocirrus		
Eteone flava		
Eteone longa		32
Eteone spetsbergensis		
Eteone (Mysta) barbata		
Euchone analis		
Euchone elegans		
Euchone incolor		
Euchone papillosa		
Euchone sp.		
Eucranta villosa		
Eunoe oerstedi		
Eusyllis blomstrandi		
Exogone dispar		
Exogone naidina		
Exogone sp.		
Fabricinae - sp. O		
Fabricinae - sp. R		
Fabrisabella schaudinni		
Flabelligera affinis		
Gattyana cirrosa		
Glycera capitata		
Glycinde wireni		
Glyphanostomum pallescens		
Harmothoe imbricata		
Hesionidae gen et sp. nov.		1
Heteromastus filiformis		1
Jasmineira sp.		
Lagisca extenuata		
Lanassa nordenskjoldi		
Lanassa venusta		
Laonice cirrata		
Laonome kroyeri		
Laphania boecki		

		#/0.5m²
Lumbriclymene minor		
Lumbrineris fragilis		
Lumbrineris impatiens		
Lumbrineris latreilli		
Lumbrineris minuta		
Lumbrineris sp. A		
Lumbrineris sp. B		
Lumbrineris sp. X		
Lysilla loveni		
Lysippe labiata		
Magelona longicornis		1
Maldane sarsi		
Marenzelleria wireni		5
Melaenis loveni		
Melinna elisabethae		
Microclymene sp.		
Micronephthys minuta		1
Minuspio cirrifera		2
Myriochele heeri		
Myriochele oculata		
Mystides borealis		1
Nemidia torelli		
Neosabellides sp.		7
Nephtys caeca		
Nephtys ciliata		
Nephtys discors		2
Nephtys incisa		1
Nephtys longosetosa		32
Nephtys paradoxa		
Nereimyra aphroditoides		4
Nereis zonata		
Nicolea zostericola		
Nicomache lumbricalis		
Nicon sp. A		
Nothria conchylega		
Notomastus latericeus		
Notoproctus oculatus		
Onuphis quadricuspis		
Ophelina acuminata		
Ophelina cylindricaudatus		
Ophelina groenlandica		1
Ophelina sp. A		
Ophryotrocha sp.		3
Orbinia sp.		
Owenia collaris		
Owenia fusiformis		
Paramphitrite tetrabranchia		
Paranaitides wahlbergi		
Paraonis sp. A		
Parheteromastus sp. A		31
Petaloproctus tenuis		
Pherusa plumosa		
Pholoe minuta		7

		#/0.5m²
Pionosyllis compacta		
Pista cristata		
Polycirrus medusa		1
Polydora caulleryi		
Polydora quadrilobata		1
Polydora socialis		
Polyphysia crassa		
Praxillella gracilis		
Praxillella praetermissa		
Prionospio steenstrupi		5
Proclea graffii		
Pygospio elegans		19
Rhodine gracilior		
Sabella sp.		
Sabellastarte sp.		
Sabellides borealis		
Scalibregma inflatum		1
Schistomeringos caeca		1
Schistomeringos sp. A		
Scoloplos acutus		3
Scoloplos armiger		27
Sigambra tentaculata		
Sphaerodoridium claparedii		
Sphaerodoridium sp. A		
Sphaerodoropsis biserialis		
Sphaerodoropsis minuta		
Sphaerodoropsis sp. A		
Sphaerodoropsis sp. B		
Sphaerodorum gracilis		
Sphaerosyllis erinaceus		
Spinther sp.		
Spio filicornis		1
Spio theeli		3
Spiochaetopterus typicus		
Spiophanes bombyx		
Spirorbis granulatus		
Sternaspis scutata		
Syllides longocirrata		
Syllides sp.		
Tachytrypane abranchiata		
Tachytrypane sp. A		
Tauberia gracilis		
Terebellides stroemi		5
Tharyx ?acutus		19
Travisia sp.		
Trichobranchus glacialis		
Trochochaeta carica		
Trochochaeta multisetosa		
Typosyllis cornuta		
Typosyllis fasciata		
unidentified		3
TOTAL 41 spp.		1509

		$\#/0.5m^2$
Lumbriclymene minor		
Lumbrineris fragilis		
Lumbrineris impatiens		
Lumbrineris latreilli		
Lumbrineris minuta		
Lumbrineris sp. A		
Lumbrineris sp. B		
Lumbrineris sp. X		
Lysilla loveni		
Lysippe labiata		
Magelona longicornis		1
Maldane sarsi		
Marenzelleria wireni		5
Melaenis loveni		
Melinna elisabethae		
Microclymene sp.		
Micronephthys minuta		1
Minuspio cirrifera		2
Myriochele heeri		
Myriochele oculata		
Mystides borealis		1
Nemidia torelli		
Neosabellides sp.		7
Nephtys caeca		
Nephtys ciliata		
Nephtys discors		2
Nephtys incisa		1
Nephtys longosetosa		32
Nephtys paradoxa		
Nereimyra aphroditoides		4
Nereis zonata		
Nicolea zostericola		
Nicomache lumbricalis		
Nicon sp. A		
Nothria conchylega		
Notomastus latericeus		
Notoproctus oculatus		
Onuphis quadricuspis		
Ophelina acuminata		
Ophelina cylindricaudatus		
Ophelina groenlandica		1
Ophelina sp. A		
Ophryotrocha sp.		3
Orbinia sp.		
Owenia collaris		
Owenia fusiformis		
Paramphitrite tetrabranchia		
Paranaitides wahlbergi		
Paraonis sp. A		
Parheteromastus sp. A		31
Petaloproctus tenuis		
Pherusa plumosa		
Pholoe minuta		7

		$\#/0.5m^2$
Pionosyllis compacta		
Pista cristata		
Polycirrus medusa		1
Polydora caulleryi		
Polydora quadrilobata		1
Polydora socialis		
Polyphysia crassa		
Praxillella gracilis		
Praxillella praetermissa		
Prionospio steenstrupi		5
Proclea graffii		
Pygospio elegans		19
Rhodine gracilior		
Sabella sp.		
Sabellastarte sp.		
Sabellides borealis		
Scalibregma inflatum		1
Schistomeringos caeca		1
Schistomeringos sp. A		
Scoloplos acutus		3
Scoloplos armiger		27
Sigambra tentaculata		
Sphaerodoridium claparedii		
Sphaerodoridium sp. A		
Sphaerodoropsis biserialis		
Sphaerodoropsis minuta		
Sphaerodoropsis sp. A		
Sphaerodoropsis sp. B		
Sphaerodorum gracilis		
Sphaerosyllis erinaceus		
Spinther sp.		
Spio filicornis		1
Spio theeli		3
Spiochaetopterus typicus		
Spiophanes bombyx		
Spirorbis granulatus		
Sternaspis scutata		
Syllides longocirrata		
Syllides sp.		
Tachytrypane abranchiata		
Tachytrypane sp. A		
Tauberia gracilis		
Terebellides stroemi		5
Tharyx ?acutus		19
Travisia sp.		
Trichobranchus glacialis		
Trochochaeta carica		
Trochochaeta multisetosa		
Typosyllis cornuta		
Typosyllis fasciata		
unidentified		3
TOTAL 41 spp.		1509

Appendix I (cont'd): Polychaete species data for Station BRB-15 (15m), Cruise OCS-5; accumulated from Smith-McIntyre Grab samples 1377, 1378, 1379, 1381 and 1382. The numbers represent totals per $0.5m^2$ of sea floor for the polychaetes retained on a 1.0 mm sieve.

		$\#/0.5m^2$
Aglaophamus malmgreni		
Allia abranchiata		
Allia nr *suecica*		
Allia sp. B		
Allia sp. C		
Amage auricula		
Ampharete acutifrons		
Ampharete arctica		
Ampharete goësi		
Ampharete lindstromi		
Ampharete vega		
Ampharetidae - Genus A		
Ampharetidae - Genus B		
Amphicteis sundevalli		
Anaitides citrina		
Anaitides groenlandica		5
Antinoella badia		
Antinoella sarsi		14
Apistobranchus tullbergi		
Aponatus globifer		
Arcteobia anticostiensis		
Arenicola glacialis		
Aricidea quadrilobata		
Aricidea tetrabranchiata		
Artacama proboscidea		
Autolytus alexandri		
Autolytus fallax		
Axionice flexuosa		
Axionice maculata		
Barantolla sp.		
Brada incrustata		
Brada inhabilis		
Brada nuda		
Brada villosa		2
Branchiomma infarcta		
Capitella capitata		3
Chaetozone setosa		2
Chone duneri		
Chone infundibuliformis		
Chone nr *murmanica*		
Cirratulus cirratus		
Cistenides hyperborea		176
Clymenura polaris		
Cossura longocirrata		
Cossura sp. A		

		$\#/0.5m^2$
Dexiospira spirillum		
Diplocirrus glaucus		
Diplocirrus hirsutus		
Diplocirrus longisetosus		
Dorvillea sp.		
Dysponetus sp. N		
Eclysippe sp. A		
Enipo gracilis		
Enipo canadensis		
Ephesiella macrocirrus		
Eteone flava		
Eteone longa		2
Eteone spetsbergensis		
Eteone (Mysta) barbata		
Euchone analis		
Euchone elegans		
Euchone incolor		
Euchone papillosa		
Euchone sp.		
Eucranta villosa		
Eunoe oerstedi		
Eusyllis blomstrandi		
Exogone dispar		
Exogone naidina		
Exogone sp.		
Fabricinae - sp. O		
Fabricinae - sp. R		
Fabrisabella schaudinni		
Flabelligera affinis		
Gattyana cirrosa		
Glycera capitata		
Glycinde wireni		
Glyphanostomum pallescens		
Harmothoe imbricata		
Hesionidae gen et sp. nov.		
Heteromastus filiformis		4
Jasmineira sp.		
Lagisca extenuata		
Lanassa nordenskjoldi		
Lanassa venusta		
Laonice cirrata		
Laonome kroyeri		
Laphania boecki		

		#/0.5m^2
Lumbriclymene minor		
Lumbrineris fragilis		
Lumbrineris impatiens		
Lumbrineris latreilli		
Lumbrineris minuta		
Lumbrineris sp. A		
Lumbrineris sp. B		
Lumbrineris sp. X		
Lysilla loveni		
Lysippe labiata		
Magelona longicornis		
Maldane sarsi		
Marenzelleria wireni		
Melaenis loveni		
Melinna elisabethae		
Microclymene sp.		
Micronephthys minuta		5
Minuspio cirrifera		1
Myriochele heeri		
Myriochele oculata		
Mystides borealis		
Nemidia torelli		
Neosabellides sp.		
Nephtys caeca		
Nephtys ciliata		1
Nephtys discors		
Nephtys incisa		
Nephtys longosetosa		
Nephtys paradoxa		
Nereimyra aphroditoides		
Nereis zonata		
Nicolea zostericola		
Nicomache lumbricalis		
Nicon sp. A		
Nothria conchylega		
Notomastus latericeus		
Notoproctus oculatus		
Onuphis quadricuspis		
Ophelina acuminata		
Ophelina cylindricaudatus		
Ophelina groenlandica		
Ophelina sp. A		
Ophryotrocha sp.		
Orbinia sp.		
Owenia collaris		
Owenia fusiformis		
Paramphitrite tetrabranchia		
Paranaitides wahlbergi		
Paraonis sp. A		
Parheteromastus sp. A		
Petaloproctus tenuis		
Pherusa plumosa		
Pholoe minuta		1

		#/0.5m^2
Pionosyllis compacta		
Pista cristata		
Polycirrus medusa		
Polydora caulleryi		
Polydora quadrilobata		
Polydora socialis		
Polyphysia crassa		
Praxillella gracilis		
Praxillella praetermissa		
Prionospio steenstrupi		7
Proclea graffii		
Pygospio elegans		1
Rhodine gracilior		
Sabella sp.		
Sabellastarte sp.		
Sabellides borealis		
Scalibregma inflatum		
Schistomeringos caeca		
Schistomeringos sp. A		
Scoloplos acutus		1
Scoloplos armiger		
Sigambra tentaculata		
Sphaerodoridium claparedii		
Sphaerodoridium sp. A		
Sphaerodoropsis biserialis		
Sphaerodoropsis minuta		
Sphaerodoropsis sp. A		
Sphaerodoropsis sp. B		
Sphaerodorum gracilis		
Sphaerosyllis erinaceus		
Spinther sp.		
Spio filicornis		
Spio theeli		
Spiochaetopterus typicus		
Spiophanes bombyx		
Spirorbis granulatus		
Sternaspis scutata		
Syllides longocirrata		
Syllides sp.		
Tachytrypane abranchiata		
Tachytrypane sp. A		
Tauberia gracilis		
Terebellides stroemi		1
Tharyx ?acutus		2
Travisia sp.		
Trichobranchus glacialis		
Trochochaeta carica		
Trochochaeta multisetosa		
Typosyllis cornuta		
Typosyllis fasciata		
unidentified		
TOTAL 17 spp.		228

		$\#/0.5m^2$
Lumbriclymene minor		
Lumbrineris fragilis		
Lumbrineris impatiens		
Lumbrineris latreilli		
Lumbrineris minuta		
Lumbrineris sp. A		
Lumbrineris sp. B		
Lumbrineris sp. X		
Lysilla loveni		
Lysippe labiata		
Magelona longicornis		
Maldane sarsi		
Marenzelleria wireni		
Melaenis loveni		
Melinna elisabethae		
Microclymene sp.		
Micronephthys minuta		5
Minuspio cirrifera		1
Myriochele heeri		
Myriochele oculata		
Mystides borealis		
Nemidia torelli		
Neosabellides sp.		
Nephtys caeca		
Nephtys ciliata		1
Nephtys discors		
Nephtys incisa		
Nephtys longosetosa		
Nephtys paradoxa		
Nereimyra aphroditoides		
Nereis zonata		
Nicolea zostericola		
Nicomache lumbricalis		
Nicon sp. A		
Nothria conchylega		
Notomastus latericeus		
Notoproctus oculatus		
Onuphis quadricuspis		
Ophelina acuminata		
Ophelina cylindricaudatus		
Ophelina groenlandica		
Ophelina sp. A		
Ophryotrocha sp.		
Orbinia sp.		
Owenia collaris		
Owenia fusiformis		
Paramphitrite tetrabranchia		
Paranaitides wahlbergi		
Paraonis sp. A		
Parheteromastus sp. A		
Petaloproctus tenuis		
Pherusa plumosa		
Pholoe minuta		1

		$\#/0.5m^2$
Pionosyllis compacta		
Pista cristata		
Polycirrus medusa		
Polydora caulleryi		
Polydora quadrilobata		
Polydora socialis		
Polyphysia crassa		
Praxillella gracilis		
Praxillella praetermissa		
Prionospio steenstrupi		7
Proclea graffii		
Pygospio elegans		1
Rhodine gracilior		
Sabella sp.		
Sabellastarte sp.		
Sabellides borealis		
Scalibregma inflatum		
Schistomeringos caeca		
Schistomeringos sp. A		
Scoloplos acutus		1
Scoloplos armiger		
Sigambra tentaculata		
Sphaerodoridium claparedii		
Sphaerodoridium sp. A		
Sphaerodoropsis biserialis		
Sphaerodoropsis minuta		
Sphaerodoropsis sp. A		
Sphaerodoropsis sp. B		
Sphaerodorum gracilis		
Sphaerosyllis erinaceus		
Spinther sp.		
Spio filicornis		
Spio theeli		
Spiochaetopterus typicus		
Spiophanes bombyx		
Spirorbis granulatus		
Sternaspis scutata		
Syllides longocirrata		
Syllides sp.		
Tachytrypane abranchiata		
Tachytrypane sp. A		
Tauberia gracilis		
Terebellides stroemi		1
Tharyx ?acutus		2
Travisia sp.		
Trichobranchus glacialis		
Trochochaeta carica		
Trochochaeta multisetosa		
Typosyllis cornuta		
Typosyllis fasciata		
unidentified		
TOTAL 17 spp.		228

Appendix I (cont'd): Polychaete species data for Station BRB-20 (20m), Cruise OCS-5; accumulated from Smith-McIntyre Grab samples 1371, 1372, 1374, 1375 and 1376. The numbers represent totals per $0.5m^2$ of sea floor for the polychaetes retained on a 1.0 mm sieve.

		$\#/0.5m^2$
Aglaophamus malmgreni		
Allia abranchiata		
Allia nr *suecica*		
Allia sp. B		
Allia sp. C		
Amage auricula		
Ampharete acutifrons		
Ampharete arctica		
Ampharete goësi		
Ampharete lindstromi		
Ampharete vega		
Ampharetidae - Genus A		1
Ampharetidae - Genus B		
Amphicteis sundevalli		
Anaitides citrina		
Anaitides groenlandica		11
Antinoella badia		
Antinoella sarsi		14
Apistobranchus tullbergi		
Apomatus globifer		
Arcteobia anticostiensis		
Arenicola glacialis		
Aricidea quadrilobata		
Aricidea tetrabranchiata		
Artacama proboscidea		
Autolytus alexandri		
Autolytus fallax		
Axionice flexuosa		
Axionice maculata		
Barantolla sp.		4
Brada incrustata		
Brada inhabilis		
Brada nuda		
Brada villosa		2
Branchiomma infarcta		
Capitella capitata		1
Chaetozone setosa		6
Chone duneri		
Chone infundibuliformis		
Chone nr *murmanica*		
Cirratulus cirratus		
Cistenides hyperborea		243
Clymenura polaris		
Cossura longocirrata		1
Cossura sp. A		

		$\#/0.5m^2$
Dexiospira spirillum		
Diplocirrus glaucus		
Diplocirrus hirsutus		
Diplocirrus longisetosus		
Dorvillea sp.		
Dysponetus sp. N		
Eclysippe sp. A		
Enipo gracilis		
Enipo canadensis		
Ephesiella macrocirrus		
Eteone flava		
Eteone longa		7
Eteone spetsbergensis		
Eteone (Mysta) barbata		
Euchone analis		
Euchone elegans		
Euchone incolor		
Euchone papillosa		
Euchone sp.		
Eucranta villosa		
Eunoe oerstedi		
Eusyllis blomstrandi		
Exogone dispar		
Exogone naidina		
Exogone sp.		
Fabricinae - sp. O		
Fabricinae - sp. R		
Fabrisabella schaudinni		
Flabelligera affinis		1
Gattyana cirrosa		
Glycera capitata		
Glycinde wireni		
Glyphanostomum pallescens		
Harmothoe imbricata		
Hesionidae gen et sp. nov.		
Heteromastus filiformis		
Jasmineira sp.		
Lagisca extenuata		
Lanassa nordenskjoldi		
Lanassa venusta		
Laonice cirrata		
Laonome kroyeri		
Laphania boecki		

		$\#/0.5m^2$
Lumbriclymene minor		
Lumbrineris fragilis		
Lumbrineris impatiens		
Lumbrineris latreilli		1
Lumbrineris minuta		
Lumbrineris sp. A		
Lumbrineris sp. B		
Lumbrineris sp. X		
Lysilla loveni		
Lysippe labiata		
Magelona longicornis		
Maldane sarsi		
Marenzelleria wireni		
Melaenis loveni		
Melinna elisabethae		
Microclymene sp.		
Micronephthys minuta		150
Minuspio cirrifera		1
Myriochele heeri		
Myriochele oculata		
Mystides borealis		
Nemidia torelli		
Neosabellides sp.		3
Nephtys caeca		
Nephtys ciliata		7
Nephtys discors		
Nephtys incisa		
Nephtys longosetosa		1
Nephtys paradoxa		
Nereimyra aphroditoides		
Nereis zonata		
Nicolea zostericola		
Nicomache lumbricalis		
Nicon sp. A		
Nothria conchylega		
Notomastus latericeus		
Notoproctus oculatus		
Onuphis quadricuspis		
Ophelina acuminata		
Ophelina cylindricaudatus		
Ophelina groenlandica		
Ophelina sp. A		
Ophryotrocha sp.		
Orbinia sp.		
Owenia collaris		
Owenia fusiformis		
Paramphitrite tetrabranchia		
Paranaitides wahlbergi		
Paraonis sp. A		
Parheteromastus sp. A		1
Petaloproctus tenuis		
Pherusa plumosa		
Pholoe minuta		1

		$\#/0.5m^2$
Pionosyllis compacta		
Pista cristata		
Polycirrus medusa		
Polydora caulleryi		
Polydora quadrilobata		1
Polydora socialis		1
Polyphysia crassa		
Praxillella gracilis		
Praxillella praetermissa		
Prionospio steenstrupi		
Proclea graffii		
Pygospio elegans		
Rhodine gracilior		
Sabella sp.		
Sabellastarte sp.		
Sabellides borealis		
Scalibregma inflatum		
Schistomeringos caeca		
Schistomeringos sp. A		
Scoloplos acutus		2
Scoloplos armiger		
Sigambra tentaculata		
Sphaerodoridium claparedii		
Sphaerodoridium sp. A		
Sphaerodoropsis biserialis		
Sphaerodoropsis minuta		
Sphaerodoropsis sp. A		
Sphaerodoropsis sp. B		
Sphaerodorum gracilis		
Sphaerosyllis erinaceus		
Spinther sp.		
Spio filicornis		1
Spio theeli		
Spiochaetopterus typicus		
Spiophanes bombyx		
Spirorbis granulatus		
Sternaspis scutata		4
Syllides longocirrata		
Syllides sp.		
Tachytrypane abranchiata		
Tachytrypane sp. A		
Tauberia gracilis		
Terebellides stroemi		
Tharyx ?acutus		7
Travisia sp.		
Trichobranchus glacialis		
Trochochaeta carica		
Trochochaeta multisetosa		
Typosyllis cornuta		
Typosyllis fasciata		
unidentified		1
TOTAL 25 spp.		473

		$\#/0.5m^2$
Lumbriclymene minor		
Lumbrineris fragilis		
Lumbrineris impatiens		
Lumbrineris latreilli		1
Lumbrineris minuta		
Lumbrineris sp. A		
Lumbrineris sp. B		
Lumbrineris sp. X		
Lysilla loveni		
Lysippe labiata		
Magelona longicornis		
Maldane sarsi		
Marenzelleria wireni		
Melaenis loveni		
Melinna elisabethae		
Microclymene sp.		
Micronephthys minuta		150
Minuspio cirrifera		1
Myriochele heeri		
Myriochele oculata		
Mystides borealis		
Nemidia torelli		
Neosabellides sp.		3
Nephtys caeca		
Nephtys ciliata		7
Nephtys discors		
Nephtys incisa		
Nephtys longosetosa		1
Nephtys paradoxa		
Nereimyra aphroditoides		
Nereis zonata		
Nicolea zostericola		
Nicomache lumbricalis		
Nicon sp. A		
Nothria conchylega		
Notomastus latericeus		
Notoproctus oculatus		
Onuphis quadricuspis		
Ophelina acuminata		
Ophelina cylindricaudatus		
Ophelina groenlandica		
Ophelina sp. A		
Ophryotrocha sp.		
Orbinia sp.		
Owenia collaris		
Owenia fusiformis		
Paramphitrite tetrabranchia		
Paranaitides wahlbergi		
Paraonis sp. A		
Parheteromastus sp. A		1
Petaloproctus tenuis		
Pherusa plumosa		
Pholoe minuta		1

		$\#/0.5m^2$
Pionosyllis compacta		
Pista cristata		
Polycirrus medusa		
Polydora caulleryi		
Polydora quadrilobata		1
Polydora socialis		1
Polyphysia crassa		
Praxillella gracilis		
Praxillella praetermissa		
Prionospio steenstrupi		
Proclea graffii		
Pygospio elegans		
Rhodine gracilior		
Sabella sp.		
Sabellastarte sp.		
Sabellides borealis		
Scalibregma inflatum		
Schistomeringos caeca		
Schistomeringos sp. A		
Scoloplos acutus		2
Scoloplos armiger		
Sigambra tentaculata		
Sphaerodoridium claparedii		
Sphaerodoridium sp. A		
Sphaerodoropsis biserialis		
Sphaerodoropsis minuta		
Sphaerodoropsis sp. A		
Sphaerodoropsis sp. B		
Sphaerodorum gracilis		
Sphaerosyllis erinaceus		
Spinther sp.		
Spio filicornis		1
Spio theeli		
Spiochaetopterus typicus		
Spiophanes bombyx		
Spirorbis granulatus		
Sternaspis scutata		4
Syllides longocirrata		
Syllides sp.		
Tachytrypane abranchiata		
Tachytrypane sp. A		
Tauberia gracilis		
Terebellides stroemi		
Tharyx ?acutus		7
Travisia sp.		
Trichobranchus glacialis		
Trochochaeta carica		
Trochochaeta multisetosa		
Typosyllis cornuta		
Typosyllis fasciata		
unidentified		1
TOTAL 25 spp.		473

Appendix I (cont'd): Polychaete species data for Station BRB-25 (25m), Cruise OCS-5; accumulated from Smith-McIntyre Grab samples 1365, 1366, 1367, 1368 and 1369. The numbers represent totals per $0.5m^2$ of sea floor for the polychaetes retained on a 1.0 mm sieve.

		$\#/0.5m^2$
Aglaophamus malmgreni		
Allia abranchiata		
Allia nr *suecica*		
Allia sp. B		
Allia sp. C		
Amage auricula		
Ampharete acutifrons		1
Ampharete arctica		
Ampharete goësi		
Ampharete lindstromi		
Ampharete vega		
Ampharetidae - Genus A		6
Ampharetidae - Genus B		
Amphicteis sundevalli		
Anaitides citrina		
Anaitides groenlandica		20
Antinoella badia		
Antinoella sarsi		20
Apistobranchus tullbergi		
Apomatus globifer		
Arcteobia anticostiensis		3
Arenicola glacialis		
Aricidea quadrilobata		
Aricidea tetrabranchiata		
Artacama proboscidea		
Autolytus alexandri		
Autolytus fallax		
Axionice flexuosa		
Axionice maculata		
Barantolla sp.		15
Brada incrustata		
Brada inhabilis		
Brada nuda		
Brada villosa		
Branchiomma infarcta		
Capitella capitata		10
Chaetozone setosa		14
Chone duneri		
Chone infundibuliformis		
Chone nr *murmanica*		
Cirratulus cirratus		
Cistenides hyperborea		176
Clymenura polaris		
Cossura longocirrata		
Cossura sp. A		

		$\#/0.5m^2$
Dexiospira spirillum		
Diplocirrus glaucus		
Diplocirrus hirsutus		
Diplocirrus longisetosus		
Dorvillea sp.		
Dysponetus sp. N		
Eclysippe sp. A		
Enipo gracilis		
Enipo canadensis		
Ephesiella macrocirrus		
Eteone flava		1
Eteone longa		24
Eteone spetsbergensis		
Eteone (Mysta) barbata		
Euchone analis		
Euchone elegans		
Euchone incolor		
Euchone papillosa		
Euchone sp.		
Eucranta villosa		
Eunoe oerstedi		
Eusyllis blomstrandi		
Exogone dispar		
Exogone naidina		
Exogone sp.		
Fabricinae - sp. O		
Fabricinae - sp. R		
Fabrisabella schaudinni		
Flabelligera affinis		
Gattyana cirrosa		
Glycera capitata		
Glycinde wireni		
Glyphanostomum pallescens		
Harmothoe imbricata		
Hesionidae gen et sp. nov.		3
Heteromastus filiformis		5
Jasmineira sp.		
Lagisca extenuata		
Lanassa nordenskjoldi		
Lanassa venusta		
Laonice cirrata		
Laonome kroyeri		
Laphania boecki		

		#/0.5m^2
Lumbriclymene minor		
Lumbrineris fragilis		1
Lumbrineris impatiens		
Lumbrineris latreilli		
Lumbrineris minuta		
Lumbrineris sp. A		
Lumbrineris sp. B		
Lumbrineris sp. X		
Lysilla loveni		
Lysippe labiata		
Magelona longicornis		
Maldane sarsi		
Marenzelleria wireni		
Melaenis loveni		
Melinna elisabethae		
Microclymene sp.		
Micronephthys minuta		34
Minuspio cirrifera		3
Myriochele heeri		
Myriochele oculata		
Mystides borealis		
Nemidia torelli		
Neosabellides sp.		1
Nephtys caeca		
Nephtys ciliata		8
Nephtys discors		2
Nephtys incisa		
Nephtys longosetosa		
Nephtys paradoxa		
Nereimyra aphroditoides		1
Nereis zonata		
Nicolea zostericola		
Nicomache lumbricalis		
Nicon sp. A		
Nothria conchylega		
Notomastus latericeus		
Notoproctus oculatus		
Onuphis quadricuspis		
Ophelina acuminata		
Ophelina cylindricaudatus		
Ophelina groenlandica		
Ophelina sp. A		
Ophryotrocha sp.		
Orbinia sp.		
Owenia collaris		
Owenia fusiformis		
Paramphitrite tetrabranchia		
Paranaitides wahlbergi		
Paraonis sp. A		
Parheteromastus sp. A		8
Petaloproctus tenuis		
Pherusa plumosa		
Pholoe minuta		25

		#/0.5m^2
Pionosyllis compacta		
Pista cristata		
Polycirrus medusa		
Polydora caulleryi		13
Polydora quadrilobata		5
Polydora socialis		
Polyphysia crassa		
Praxillella gracilis		
Praxillella praetermissa		
Prionospio steenstrupi		33
Proclea graffii		
Pygospio elegans		2
Rhodine gracilior		
Sabella sp.		
Sabellastarte sp.		
Sabellides borealis		
Scalibregma inflatum		
Schistomeringos caeca		
Schistomeringos sp. A		
Scoloplos acutus		11
Scoloplos armiger		
Sigambra tentaculata		
Sphaerodoridium claparedii		
Sphaerodoridium sp. A		
Sphaerodoropsis biserialis		
Sphaerodoropsis minuta		
Sphaerodoropsis sp. A		
Sphaerodoropsis sp. B		
Sphaerodorum gracilis		
Sphaerosyllis erinaceus		
Spinther sp.		
Spio filicornis		
Spio theeli		
Spiochaetopterus typicus		
Spiophanes bombyx		
Spirorbis granulatus		
Sternaspis scutata		2
Syllides longocirrata		
Syllides sp.		
Tachytrypane abranchiata		
Tachytrypane sp. A		
Tauberia gracilis		
Terebellides stroemi		
Tharyx ?acutus		9
Travisia sp.		
Trichobranchus glacialis		
Trochochaeta carica		
Trochochaeta multisetosa		
Typosyllis cornuta		
Typosyllis fasciata		
unidentified		10
TOTAL 29 spp.		466

		$\#/0.5m^2$
Lumbriclymene minor		
Lumbrineris fragilis		1
Lumbrineris impatiens		
Lumbrineris latreilli		
Lumbrineris minuta		
Lumbrineris sp. A		
Lumbrineris sp. B		
Lumbrineris sp. X		
Lysilla loveni		
Lysippe labiata		
Magelona longicornis		
Maldane sarsi		
Marenzelleria wireni		
Melaenis loveni		
Melinna elisabethae		
Microclymene sp.		
Micronephthys minuta		34
Minuspio cirrifera		3
Myriochele heeri		
Myriochele oculata		
Mystides borealis		
Nemidia torelli		
Neosabellides sp.		1
Nephtys caeca		
Nephtys ciliata		8
Nephtys discors		2
Nephtys incisa		
Nephtys longosetosa		
Nephtys paradoxa		
Nereimyra aphroditoides		1
Nereis zonata		
Nicolea zostericola		
Nicomache lumbricalis		
Nicon sp. A		
Nothria conchylega		
Notomastus latericeus		
Notoproctus oculatus		
Onuphis quadricuspis		
Ophelina acuminata		
Ophelina cylindricaudatus		
Ophelina groenlandica		
Ophelina sp. A		
Ophryotrocha sp.		
Orbinia sp.		
Owenia collaris		
Owenia fusiformis		
Paramphitrite tetrabranchia		
Paranaitides wahlbergi		
Paraonis sp. A		
Parheteromastus sp. A		8
Petaloproctus tenuis		
Pherusa plumosa		
Pholoe minuta		25

		$\#/0.5m^2$
Pionosyllis compacta		
Pista cristata		
Polycirrus medusa		
Polydora caulleryi		13
Polydora quadrilobata		5
Polydora socialis		
Polyphysia crassa		
Praxillella gracilis		
Praxillella praetermissa		
Prionospio steenstrupi		33
Proclea graffii		
Pygospio elegans		2
Rhodine gracilior		
Sabella sp.		
Sabellastarte sp.		
Sabellides borealis		
Scalibregma inflatum		
Schistomeringos caeca		
Schistomeringos sp. A		
Scoloplos acutus		11
Scoloplos armiger		
Sigambra tentaculata		
Sphaerodoridium claparedii		
Sphaerodoridium sp. A		
Sphaerodoropsis biserialis		
Sphaerodoropsis minuta		
Sphaerodoropsis sp. A		
Sphaerodoropsis sp. B		
Sphaerodorum gracilis		
Sphaerosyllis erinaceus		
Spinther sp.		
Spio filicornis		
Spio theeli		
Spiochaetopterus typicus		
Spiophanes bombyx		
Spirorbis granulatus		
Sternaspis scutata		2
Syllides longocirrata		
Syllides sp.		
Tachytrypane abranchiata		
Tachytrypane sp. A		
Tauberia gracilis		
Terebellides stroemi		
Tharyx ?acutus		9
Travisia sp.		
Trichobranchus glacialis		
Trochochaeta carica		
Trochochaeta multisetosa		
Typosyllis cornuta		
Typosyllis fasciata		
unidentified		10
TOTAL 29 spp.		466

Appendix I (cont'd): Polychaete species data for Station PPB-5 (5m), Cruise OCS-5; accumulated from Smith-McIntyre Grab samples 1395, 1396. 1398, 1399 and 1400. The numbers represent totals per $0.5m^2$ of sea floor for the polychaetes retained on a 1.0 mm sieve.

		$\#/0.5m^2$
Aglaophamus malmgreni		
Allia abranchiata		
Allia nr *suecica*		
Allia sp. B		
Allia sp. C		1
Amage auricula		
Ampharete acutifrons		24
Ampharete arctica		
Ampharete goësi		
Ampharete lindstromi		2
Ampharete vega		270
Ampharetidae - Genus A		
Ampharetidae - Genus B		
Amphicteis sundevalli		
Anaitides citrina		
Anaitides groenlandica		2
Antinoella badia		
Antinoella sarsi		
Apistobranchus tullbergi		7
Apomatus globifer		
Arcteobia anticostiensis		
Arenicola glacialis		1
Aricidea quadrilobata		
Aricidea tetrabranchiata		
Artacama proboscidea		
Autolytus alexandri		
Autolytus fallax		
Axionice flexuosa		
Axionice maculata		
Barantolla sp.		
Brada incrustata		
Brada inhabilis		
Brada nuda		
Brada villosa		
Branchiomma infarcta		
Capitella capitata		42
Chaetozone setosa		
Chone duneri		
Chone infundibuliformis		
Chone nr *murmanica*		206
Cirratulus cirratus		
Cistenides hyperborea		
Clymenura polaris		
Cossura longocirrata		1
Cossura sp. A		

		$\#/0.5m^2$
Dexiospira spirillum		
Diplocirrus glaucus		
Diplocirrus hirsutus		
Diplocirrus longisetosus		
Dorvillea sp.		
Dysponetus sp. N		
Eclysippe sp. A		
Enipo gracilis		
Enipo canadensis		
Ephesiella macrocirrus		
Eteone flava		
Eteone longa		43
Eteone spetsbergensis		
Eteone (Mysta) barbata		
Euchone analis		
Euchone elegans		
Euchone incolor		
Euchone papillosa		
Euchone sp.		
Eucranta villosa		
Eunoe oerstedi		
Eusyllis blomstrandi		
Exogone dispar		
Exogone naidina		
Exogone sp.		
Fabricinae - sp. O		
Fabricinae - sp. R		
Fabrisabella schaudinni		
Flabelligera affinis		
Gattyana cirrosa		
Glycera capitata		
Glycinde wireni		
Glyphanostomum pallescens		
Harmothoe imbricata		
Hesionidae gen et sp. nov.		
Heteromastus filiformis		
Jasmineira sp.		
Lagisca extenuata		
Lanassa nordenskjoldi		
Lanassa venusta		
Laonice cirrata		
Laonome kroyeri		
Laphania boecki		

		#/0.5m^2
Lumbriclymene minor		
Lumbrineris fragilis		
Lumbrineris impatiens		
Lumbrineris latreilli		
Lumbrineris minuta		
Lumbrineris sp. A		
Lumbrineris sp. B		
Lumbrineris sp. X		
Lysilla loveni		
Lysippe labiata		
Magelona longicornis		
Maldane sarsi		
Marenzelleria wireni		12
Melaenis loveni		
Melinna elisabethae		
Microclymene sp.		
Micronephthys minuta		1
Minuspio cirrifera		467
Myriochele heeri		
Myriochele oculata		
Mystides borealis		5
Nemidia torelli		
Neosabellides sp.		
Nephtys caeca		
Nephtys ciliata		
Nephtys discors		
Nephtys incisa		
Nephtys longosetosa		
Nephtys paradoxa		
Nereimyra aphroditoides		
Nereis zonata		
Nicolea zostericola		
Nicomache lumbricalis		
Nicon sp. A		
Nothria conchylega		
Notomastus latericeus		
Notoproctus oculatus		
Onuphis quadricuspis		
Ophelina acuminata		
Ophelina cylindricaudatus		
Ophelina groenlandica		
Ophelina sp. A		
Ophryotrocha sp.		12
Orbinia sp.		
Owenia collaris		
Owenia fusiformis		
Paramphitrite tetrabranchia		13
Paranaitides wahlbergi		
Paraonis sp. A		
Parheteromastus sp. A		6
Petaloproctus tenuis		
Pherusa plumosa		
Pholoe minuta		11
Pionosyllis compacta		
Pista cristata		
Polycirrus medusa		1
Polydora caulleryi		
Polydora quadrilobata		
Polydora socialis		
Polyphysia crassa		
Praxillella gracilis		
Praxillella praetermissa		
Prionospio steenstrupi		
Proclea graffii		4
Pygospio elegans		
Rhodine gracilior		
Sabella sp.		
Sabellastarte sp.		
Sabellides borealis		
Scalibregma inflatum		
Schistomeringos caeca		
Schistomeringos sp. A		
Scoloplos acutus		
Scoloplos armiger		238
Sigambra tentaculata		
Sphaerodoridium claparedii		
Sphaerodoridium sp. A		1
Sphaerodoropsis biserialis		
Sphaerodoropsis minuta		110
Sphaerodoropsis sp. A		
Sphaerodoropsis sp. B		
Sphaerodorum gracilis		
Sphaerosyllis erinaceus		
Spinther sp.		
Spio filicornis		
Spio theeli		530
Spiochaetopterus typicus		
Spiophanes bombyx		
Spirorbis granulatus		
Sternaspis scutata		
Syllides longocirrata		
Syllides sp.		
Tachytrypane abranchiata		
Tachytrypane sp. A		
Tauberia gracilis		
Terebellides stroemi		175
Tharyx ?acutus		60
Travisia sp.		1
Trichobranchus glacialis		
Trochochaeta carica		
Trochochaeta multisetosa		
Typosyllis cornuta		
Typosyllis fasciata		
unidentified		4
TOTAL 28 spp.		2250

		$\#/0.5m^2$
Lumbriclymene minor		
Lumbrineris fragilis		
Lumbrineris impatiens		
Lumbrineris latreilli		
Lumbrineris minuta		
Lumbrineris sp. A		
Lumbrineris sp. B		
Lumbrineris sp. X		
Lysilla loveni		
Lysippe labiata		
Magelona longicornis		
Maldane sarsi		
Marenzelleria wireni		12
Melaenis loveni		
Melinna elisabethae		
Microclymene sp.		
Micronephthys minuta		1
Minuspio cirrifera		467
Myriochele heeri		
Myriochele oculata		
Mystides borealis		5
Nemidia torelli		
Neosabellides sp.		
Nephtys caeca		
Nephtys ciliata		
Nephtys discors		
Nephtys incisa		
Nephtys longosetosa		
Nephtys paradoxa		
Nereimyra aphroditoides		
Nereis zonata		
Nicolea zostericola		
Nicomache lumbricalis		
Nicon sp. A		
Nothria conchylega		
Notomastus latericeus		
Notoproctus oculatus		
Onuphis quadricuspis		
Ophelina acuminata		
Ophelina cylindricaudatus		
Ophelina groenlandica		
Ophelina sp. A		
Ophryotrocha sp.		12
Orbinia sp.		
Owenia collaris		
Owenia fusiformis		
Paramphitrite tetrabranchia		13
Paranaitides wahlbergi		
Paraonis sp. A		
Parheteromastus sp. A		6
Petaloproctus tenuis		
Pherusa plumosa		
Pholoe minuta		11

		$\#/0.5m^2$
Pionosyllis compacta		
Pista cristata		
Polycirrus medusa		1
Polydora caulleryi		
Polydora quadrilobata		
Polydora socialis		
Polyphysia crassa		
Praxillella gracilis		
Praxillella praetermissa		
Prionospio steenstrupi		
Proclea graffii		4
Pygospio elegans		
Rhodine gracilior		
Sabella sp.		
Sabellastarte sp.		
Sabellides borealis		
Scalibregma inflatum		
Schistomeringos caeca		
Schistomeringos sp. A		
Scoloplos acutus		
Scoloplos armiger		238
Sigambra tentaculata		
Sphaerodoridium claparedii		
Sphaerodoridium sp. A		1
Sphaerodoropsis biserialis		
Sphaerodoropsis minuta		110
Sphaerodoropsis sp. A		
Sphaerodoropsis sp. B		
Sphaerodorum gracilis		
Sphaerosyllis erinaceus		
Spinther sp.		
Spio filicornis		
Spio theeli		530
Spiochaetopterus typicus		
Spiophanes bombyx		
Spirorbis granulatus		
Sternaspis scutata		
Syllides longocirrata		
Syllides sp.		
Tachytrypane abranchiata		
Tachytrypane sp. A		
Tauberia gracilis		
Terebellides stroemi		175
Tharyx ?acutus		60
Travisia sp.		1
Trichobranchus glacialis		
Trochochaeta carica		
Trochochaeta multisetosa		
Typosyllis cornuta		
Typosyllis fasciata		
unidentified		4
TOTAL 28 spp.		2250

Appendix I (cont'd): Polychaete species data for Station PPB-10 (10m), Cruise OCS-5; accumulated from Smith McIntyre Grab samples 1401, 1402, 1403, 1404 and 1406. The numbers represent totals per $0.5m^2$ of sea floor for the polychaetes retained on a 1.0 mm sieve.

		$\#/0.5m^2$
Aglaophamus malmgreni		
Allia abranchiata		
Allia nr *suecica*		8
Allia sp. B		1
Allia sp. C		4
Amage auricula		
Ampharete acutifrons		
Ampharete arctica		1
Ampharete goësi		
Ampharete lindstromi		1
Ampharete vega		
Ampharetidae - Genus A		
Ampharetidae - Genus B		
Amphicteis sundevalli		
Anaitides citrina		
Anaitides groenlandica		
Antinoella badia		
Antinoella sarsi		2
Apistobranchus tullbergi		1
Apomatus globifer		
Arcteobia anticostiensis		1
Arenicola glacialis		
Aricidea quadrilobata		
Aricidea tetrabranchiata		
Artacama proboscidea		1
Autolytus alexandri		
Autolytus fallax		
Axionice flexuosa		
Axionice maculata		
Barantolla sp.		
Brada incrustata		
Brada inhabilis		
Brada nuda		
Brada villosa		1
Branchiomma infarcta		
Capitella capitata		7
Chaetozone setosa		
Chone duneri		
Chone infundibuliformis		
Chone nr *murmanica*		138
Cirratulus cirratus		
Cistenides hyperborea		
Clymenura polaris		
Cossura longocirrata		
Cossura sp. A		

		$\#/0.5m^2$
Dexiospira spirillum		
Diplocirrus glaucus		
Diplocirrus hirsutus		
Diplocirrus longisetosus		
Dorvillea sp.		
Dysponetus sp. N		
Eclysippe sp. A		
Enipo gracilis		
Enipo canadensis		
Ephesiella macrocirrus		
Eteone flava		
Eteone longa		17
Eteone spetsbergensis		
Eteone (Mysta) barbata		
Euchone analis		
Euchone elegans		
Euchone incolor		
Euchone papillosa		
Euchone sp.		
Eucranta villosa		
Eunoe oerstedi		
Eusyllis blomstrandi		
Exogone dispar		
Exogone naidina		
Exogone sp.		
Fabricinae - sp. O		
Fabricinae - sp. R		
Fabrisabella schaudinni		
Flabelligera affinis		
Gattyana cirrosa		
Glycera capitata		
Glycinde wireni		
Glyphanostomum pallescens		
Harmothoe imbricata		
Hesionidae gen et sp. nov.		
Heteromastus filiformis		3
Jasmineira sp.		
Lagisca extenuata		
Lanassa nordenskjoldi		
Lanassa venusta		
Laonice cirrata		
Laonome kroyeri		
Laphania boecki		

		$\#/0.5m^2$
Lumbriclymene minor		
Lumbrineris fragilis		
Lumbrineris impatiens		
Lumbrineris latreilli		
Lumbrineris minuta		1
Lumbrineris sp. A		
Lumbrineris sp. B		
Lumbrineris sp. X		
Lysilla loveni		
Lysippe labiata		
Magelona longicornis		
Maldane sarsi		
Marenzelleria wireni		9
Melaenis loveni		
Melinna elisabethae		
Microclymene sp.		
Micronephthys minuta		1
Minuspio cirrifera		50
Myriochele heeri		
Myriochele oculata		
Mystides borealis		
Nemidia torelli		
Neosabellides sp.		
Nephtys caeca		
Nephtys ciliata		2
Nephtys discors		
Nephtys incisa		
Nephtys longosetosa		4
Nephtys paradoxa		
Nereimyra aphroditoides		
Nereis zonata		
Nicolea zostericola		
Nicomache lumbricalis		
Nicon sp. A		
Nothria conchylega		
Notomastus latericeus		
Notoproctus oculatus		
Onuphis quadricuspis		
Ophelina acuminata		
Ophelina cylindricaudatus		
Ophelina groenlandica		
Ophelina sp. A		
Ophryotrocha sp.		
Orbinia sp.		
Owenia collaris		
Owenia fusiformis		
Paramphitrite tetrabranchia		23
Paranaitides wahlbergi		
Paraonis sp. A		
Parheteromastus sp. A		7
Petaloproctus tenuis		
Pherusa plumosa		
Pholoe minuta		

		$\#/0.5m^2$
Pionosyllis compacta		
Pista cristata		
Polycirrus medusa		
Polydora caulleryi		
Polydora quadrilobata		
Polydora socialis		
Polyphysia crassa		
Praxillella gracilis		
Praxillella praetermissa		1
Prionospio steenstrupi		
Proclea graffii		1
Pygospio elegans		
Rhodine gracilior		
Sabella sp.		
Sabellastarte sp.		
Sabellides borealis		
Scalibregma inflatum		8
Schistomeringos caeca		
Schistomeringos sp. A		
Scoloplos acutus		17
Scoloplos armiger		6
Sigambra tentaculata		
Sphaerodoridium claparedii		
Sphaerodoridium sp. A		3
Sphaerodoropsis biserialis		
Sphaerodoropsis minuta		
Sphaerodoropsis sp. A		
Sphaerodoropsis sp. B		
Sphaerodorum gracilis		
Sphaerosyllis erinaceus		
Spinther sp.		
Spio filicornis		
Spio theeli		14
Spiochaetopterus typicus		
Spiophanes bombyx		
Spirorbis granulatus		
Sternaspis scutata		6
Syllides longocirrata		
Syllides sp.		
Tachytrypane abranchiata		
Tachytrypane sp. A		
Tauberia gracilis		
Terebellides stroemi		14
Tharyx ?acutus		59
Travisia sp.		
Trichobranchus glacialis		
Trochochaeta carica		
Trochochaeta multisetosa		
Typosyllis cornuta		
Typosyllis fasciata		
unidentified		7
TOTAL 32 spp.		419

		#/0.5m²
Lumbriclymene minor		
Lumbrineris fragilis		
Lumbrineris impatiens		
Lumbrineris latreilli		
Lumbrineris minuta		1
Lumbrineris sp. A		
Lumbrineris sp. B		
Lumbrineris sp. X		
Lysilla loveni		
Lysippe labiata		
Magelona longicornis		
Maldane sarsi		
Marenzelleria wireni		9
Melaenis loveni		
Melinna elisabethae		
Microclymene sp.		
Micronephthys minuta		1
Minuspio cirrifera		50
Myriochele heeri		
Myriochele oculata		
Mystides borealis		
Nemidia torelli		
Neosabellides sp.		
Nephtys caeca		
Nephtys ciliata		2
Nephtys discors		
Nephtys incisa		
Nephtys longosetosa		4
Nephtys paradoxa		
Nereimyra aphroditoides		
Nereis zonata		
Nicolea zostericola		
Nicomache lumbricalis		
Nicon sp. A		
Nothria conchylega		
Notomastus latericeus		
Notoproctus oculatus		
Onuphis quadricuspis		
Ophelina acuminata		
Ophelina cylindricaudatus		
Ophelina groenlandica		
Ophelina sp. A		
Ophryotrocha sp.		
Orbinia sp.		
Owenia collaris		
Owenia fusiformis		
Paramphitrite tetrabranchia		23
Paranaitides wahlbergi		
Paraonis sp. A		
Parheteromastus sp. A		7
Petaloproctus tenuis		
Pherusa plumosa		
Pholoe minuta		

		#/0.5m²
Pionosyllis compacta		
Pista cristata		
Polycirrus medusa		
Polydora caulleryi		
Polydora quadrilobata		
Polydora socialis		
Polyphysia crassa		
Praxillella gracilis		
Praxillella praetermissa		1
Prionospio steenstrupi		
Proclea graffii		1
Pygospio elegans		
Rhodine gracilior		
Sabella sp.		
Sabellastarte sp.		
Sabellides borealis		
Scalibregma inflatum		8
Schistomeringos caeca		
Schistomeringos sp. A		
Scoloplos acutus		17
Scoloplos armiger		6
Sigambra tentaculata		
Sphaerodoridium claparedii		
Sphaerodoridium sp. A		3
Sphaerodoropsis biserialis		
Sphaerodoropsis minuta		
Sphaerodoropsis sp. A		
Sphaerodoropsis sp. B		
Sphaerodorum gracilis		
Sphaerosyllis erinaceus		
Spinther sp.		
Spio filicornis		
Spio theeli		14
Spiochaetopterus typicus		
Spiophanes bombyx		
Spirorbis granulatus		
Sternaspis scutata		6
Syllides longocirrata		
Syllides sp.		
Tachytrypane abranchiata		
Tachytrypane sp. A		
Tauberia gracilis		
Terebellides stroemi		14
Tharyx ?acutus		59
Travisia sp.		
Trichobranchus glacialis		
Trochochaeta carica		
Trochochaeta multisetosa		
Typosyllis cornuta		
Typosyllis fasciata		
unidentified		7
TOTAL 32 spp.		419

Appendix I (cont'd): Polychaete species data for Station PPB-15 (15m), Cruise OCS-5; accumulated from Smith-McIntyre Grab samples 1407, 1408, 1409, 1410 and 1411. The numbers represent totals per $0.5m^2$ of sea floor for the polychaetes retained on a 1.0 mm sieve.

		$\#/0.5m^2$			$\#/0.5m^2$
Aglaophamus malmgreni			*Dexiospira spirillum*		
Allia abranchiata			*Diplocirrus glaucus*		
Allia nr *suecica*		1	*Diplocirrus hirsutus*		
Allia sp. B		7	*Diplocirrus longisetosus*		
Allia sp. C			*Dorvillea sp.*		
Amage auricula			*Dysponetus sp. N*		
Ampharete acutifrons					
Ampharete arctica			*Eclysippe sp. A*		
Ampharete goësi			*Enipo gracilis*		
Ampharete lindstromi			*Enipo canadensis*		
Ampharete vega			*Ephesiella macrocirrus*		
Ampharetidae - Genus A			*Eteone flava*		
Ampharetidae - Genus B			*Eteone longa*		2
Amphicteis sundevalli			*Eteone spetsbergensis*		
Anaitides citrina			*Eteone (Mysta) barbata*		
Anaitides groenlandica			*Euchone analis*		
Antinoella badia			*Euchone elegans*		
Antinoella sarsi			*Euchone incolor*		
Apistobranchus tullbergi		1	*Euchone papillosa*		
Apomatus globifer			*Euchone sp.*		
Arcteobia anticostiensis			*Eucranta villosa*		
Arenicola glacialis			*Eunoe oerstedi*		
Aricidea quadrilobata			*Eusyllis blomstrandi*		
Aricidea tetrabranchiata			*Exogone dispar*		
Artacama proboscidea			*Exogone naidina*		
Autolytus alexandri			*Exogone sp.*		
Autolytus fallax			*Fabricinae - sp. O*		
Axionice flexuosa			*Fabricinae - sp. R*		
Axionice maculata			*Fabrisabella schaudinni*		
			Flabelligera affinis		
Barantolla sp.					
Brada incrustata			*Gattyana cirrosa*		
Brada inhabilis			*Glycera capitata*		
Brada nuda			*Glycinde wireni*		
Brada villosa			*Glyphanostomum pallescens*		
Branchiomma infarcta			*Harmothoe imbricata*		
Capitella capitata		11	*Hesionidae gen et sp. nov.*		
Chaetozone setosa			*Heteromastus filiformis*		
Chone duneri			*Jasmineira sp.*		
Chone infundibuliformis					
Chone nr *murmanica*			*Lagisca extenuata*		
Cirratulus cirratus			*Lanassa nordenskjoldi*		
Cistenides hyperborea			*Lanassa venusta*		
Clymenura polaris			*Laonice cirrata*		
Cossura longocirrata		4	*Laonome kroyeri*		
Cossura sp. A			*Laphania boecki*		

		#/0.5m²
Lumbriclymene minor		
Lumbrineris fragilis		
Lumbrineris impatiens		
Lumbrineris latreilli		
Lumbrineris minuta		
Lumbrineris sp. A		
Lumbrineris sp. B		
Lumbrineris sp. X		
Lysilla loveni		
Lysippe labiata		
Magelona longicornis		
Maldane sarsi		
Marenzelleria wireni		
Melaenis loveni		
Melinna elisabethae		
Microclymene sp.		
Micronephthys minuta		5
Minuspio cirrifera		242
Myriochele heeri		
Myriochele oculata		
Mystides borealis		
Nemidia torelli		
Neosabellides sp.		
Nephtys caeca		
Nephtys ciliata		2
Nephtys discors		
Nephtys incisa		
Nephtys longosetosa		
Nephtys paradoxa		
Nereimyra aphroditoides		3
Nereis zonata		
Nicolea zostericola		
Nicomache lumbricalis		
Nicon sp. A		
Nothria conchylega		
Notomastus latericeus		
Notoproctus oculatus		
Onuphis quadricuspis		
Ophelina acuminata		1
Ophelina cylindricaudatus		
Ophelina groenlandica		
Ophelina sp. A		
Ophryotrocha sp.		
Orbinia sp.		
Owenia collaris		
Owenia fusiformis		
Paramphitrite tetrabranchia		
Paranaitides wahlbergi		
Paraonis sp. A		
Parheteromastus sp. A		
Petaloproctus tenuis		
Pherusa plumosa		
Pholoe minuta		

		#/0.5m²
Pionosyllis compacta		
Pista cristata		
Polycirrus medusa		
Polydora caulleryi		
Polydora quadrilobata		
Polydora socialis		
Polyphysia crassa		
Praxillella gracilis		
Praxillella praetermissa		
Prionospio steenstrupi		
Proclea graffii		
Pygospio elegans		
Rhodine gracilior		
Sabella sp.		
Sabellastarte sp.		
Sabellides borealis		
Scalibregma inflatum		
Schistomeringos caeca		
Schistomeringos sp. A		
Scoloplos acutus		
Scoloplos armiger		
Sigambra tentaculata		
Sphaerodoridium claparedii		
Sphaerodoridium sp. A		
Sphaerodoropsis biserialis		
Sphaerodoropsis minuta		
Sphaerodoropsis sp. A		
Sphaerodoropsis sp. B		
Sphaerodorum gracilis		
Sphaerosyllis erinaceus		
Spinther sp.		
Spio filicornis		
Spio theeli		1
Spiochaetopterus typicus		
Spiophanes bombyx		
Spirorbis granulatus		
Sternaspis scutata		
Syllides longocirrata		
Syllides sp.		
Tachytrypane abranchiata		
Tachytrypane sp. A		
Tauberia gracilis		
Terebellides stroemi		
Tharyx ?acutus		1
Travisia sp.		
Trichobranchus glacialis		
Trochochaeta carica		
Trochochaeta multisetosa		
Typosyllis cornuta		
Typosyllis fasciata		
unidentified		1
TOTAL 13 spp.		282

		$\#/0.5m^2$
Lumbriclymene minor		
Lumbrineris fragilis		
Lumbrineris impatiens		
Lumbrineris latreilli		
Lumbrineris minuta		
Lumbrineris sp. A		
Lumbrineris sp. B		
Lumbrineris sp. X		
Lysilla loveni		
Lysippe labiata		
Magelona longicornis		
Maldane sarsi		
Marenzelleria wireni		
Melaenis loveni		
Melinna elisabethae		
Microclymene sp.		
Micronephthys minuta		5
Minuspio cirrifera		242
Myriochele heeri		
Myriochele oculata		
Mystides borealis		
Nemidia torelli		
Neosabellides sp.		
Nephtys caeca		
Nephtys ciliata		2
Nephtys discors		
Nephtys incisa		
Nephtys longosetosa		
Nephtys paradoxa		
Nereimyra aphroditoides		3
Nereis zonata		
Nicolea zostericola		
Nicomache lumbricalis		
Nicon sp. A		
Nothria conchylega		
Notomastus latericeus		
Notoproctus oculatus		
Onuphis quadricuspis		
Ophelina acuminata		1
Ophelina cylindricaudatus		
Ophelina groenlandica		
Ophelina sp. A		
Ophryotrocha sp.		
Orbinia sp.		
Owenia collaris		
Owenia fusiformis		
Paramphitrite tetrabranchia		
Paranaitides wahlbergi		
Paraonis sp. A		
Parheteromastus sp. A		
Petaloproctus tenuis		
Pherusa plumosa		
Pholoe minuta		

		$\#/0.5m^2$
Pionosyllis compacta		
Pista cristata		
Polycirrus medusa		
Polydora caulleryi		
Polydora quadrilobata		
Polydora socialis		
Polyphysia crassa		
Praxillella gracilis		
Praxillella praetermissa		
Prionospio steenstrupi		
Proclea graffii		
Pygospio elegans		
Rhodine gracilior		
Sabella sp.		
Sabellastarte sp.		
Sabellides borealis		
Scalibregma inflatum		
Schistomeringos caeca		
Schistomeringos sp. A		
Scoloplos acutus		
Scoloplos armiger		
Sigambra tentaculata		
Sphaerodoridium claparedii		
Sphaerodoridium sp. A		
Sphaerodoropsis biserialis		
Sphaerodoropsis minuta		
Sphaerodoropsis sp. A		
Sphaerodoropsis sp. B		
Sphaerodorum gracilis		
Sphaerosyllis erinaceus		
Spinther sp.		
Spio filicornis		
Spio theeli		1
Spiochaetopterus typicus		
Spiophanes bombyx		
Spirorbis granulatus		
Sternaspis scutata		
Syllides longocirrata		
Syllides sp.		
Tachytrypane abranchiata		
Tachytrypane sp. A		
Tauberia gracilis		
Terebellides stroemi		
Tharyx ?acutus		1
Travisia sp.		
Trichobranchus glacialis		
Trochochaeta carica		
Trochochaeta multisetosa		
Typosyllis cornuta		
Typosyllis fasciata		
unidentified		1
TOTAL 13 spp.		282

Appendix I (cont'd): Polychaete species data for Station PPB-20 (20m), Cruise OCS-5; accumulated from Smith-McIntyre Grab samples 1413, 1414, 1415, 1416 and 1417. The numbers represent totals per $0.5m^2$ of sea floor for the polychaetes retained on a 1.0 mm sieve.

		$\#/0.5m^2$			$\#/0.5m^2$
Aglaophamus malmgreni			*Dexiospira spirillum*		
Allia abranchiata		25	*Diplocirrus glaucus*		
Allia nr *suecica*		5	*Diplocirrus hirsutus*		
Allia sp. B			*Diplocirrus longisetosus*		
Allia sp. C			*Dorvillea sp.*		
Amage auricula			*Dysponetus sp. N*		
Ampharete acutifrons					
Ampharete arctica			*Eclysippe sp. A*		
Ampharete goësi			*Enipo gracilis*		
Ampharete lindstromi			*Enipo canadensis*		
Ampharete vega			*Ephesiella macrocirrus*		
Ampharetidae - Genus A			*Eteone flava*		
Ampharetidae - Genus B			*Eteone longa*		2
Amphicteis sundevalli			*Eteone spetsbergensis*		
Anaitides citrina			*Eteone (Mysta) barbata*		
Anaitides groenlandica			*Euchone analis*		
Antinoella badia			*Euchone elegans*		
Antinoella sarsi		1	*Euchone incolor*		
Apistobranchus tullbergi			*Euchone papillosa*		2
Apomatus globifer			*Euchone sp.*		
Arcteobia anticostiensis			*Eucranta villosa*		
Arenicola glacialis			*Eunoe oerstedi*		
Aricidea quadrilobata			*Eusyllis blomstrandi*		
Aricidea tetrabranchiata			*Exogone dispar*		
Artacama proboscidea		2	*Exogone naidina*		
Autolytus alexandri			*Exogone sp.*		
Autolytus fallax			*Fabricinae - sp. O*		
Axionice flexuosa			*Fabricinae - sp. R*		
Axionice maculata			*Fabrisabella schaudinni*		
			Flabelligera affinis		
Barantolla sp.					
Brada incrustata			*Gattyana cirrosa*		
Brada inhabilis			*Glycera capitata*		
Brada nuda			*Glycinde wireni*		
Brada villosa			*Glyphanostomum pallescens*		
Branchiomma infarcta			*Harmothoe imbricata*		
Capitella capitata		33	*Hesionidae gen et sp. nov.*		1
Chaetozone setosa		2	*Heteromastus filiformis*		2
Chone duneri			*Jasmineira sp.*		1
Chone infundibuliformis					
Chone nr *murmanica*		1	*Lagisca extenuata*		
Cirratulus cirratus			*Lanassa nordenskjoldi*		
Cistenides hyperborea		4	*Lanassa venusta*		
Clymenura polaris			*Laonice cirrata*		
Cossura longocirrata		8	*Laonome kroyeri*		
Cossura sp. A			*Laphania boecki*		

		$\#/0.5m^2$
Lumbriclymene minor		
Lumbrineris fragilis		
Lumbrineris impatiens		
Lumbrineris latreilli		
Lumbrineris minuta		
Lumbrineris sp. A		
Lumbrineris sp. B		
Lumbrineris sp. X		
Lysilla loveni		
Lysippe labiata		
Magelona longicornis		
Maldane sarsi		
Marenzelleria wireni		
Melaenis loveni		
Melinna elisabethae		
Microclymene sp.		
Micronephthys minuta		8
Minuspio cirrifera		23
Myriochele heeri		
Myriochele oculata		
Mystides borealis		
Nemidia torelli		
Neosabellides sp.		
Nephtys caeca		
Nephtys ciliata		
Nephtys discors		
Nephtys incisa		
Nephtys longosetosa		
Nephtys paradoxa		
Nereimyra aphroditoides		4
Nereis zonata		
Nicolea zostericola		
Nicomache lumbricalis		
Nicon sp. A		
Nothria conchylega		
Notomastus latericeus		
Notoproctus oculatus		
Onuphis quadricuspis		
Ophelina acuminata		1
Ophelina cylindricaudatus		
Ophelina groenlandica		
Ophelina sp. A		
Ophryotrocha sp.		
Orbinia sp.		
Owenia collaris		
Owenia fusiformis		
Paramphitrite tetrabranchia		2
Paranaitides wahlbergi		
Paraonis sp. A		
Parheteromastus sp. A		
Petaloproctus tenuis		
Pherusa plumosa		
Pholoe minuta		1

		$\#/0.5m^2$
Pionosyllis compacta		
Pista cristata		
Polycirrus medusa		
Polydora caulleryi		8
Polydora quadrilobata		
Polydora socialis		
Polyphysia crassa		
Praxillella gracilis		
Praxillella praetermissa		
Prionospio steenstrupi		1
Proclea graffii		
Pygospio elegans		
Rhodine gracilior		
Sabella sp.		
Sabellastarte sp.		
Sabellides borealis		
Scalibregma inflatum		
Schistomeringos caeca		
Schistomeringos sp. A		
Scoloplos acutus		
Scoloplos armiger		
Sigambra tentaculata		
Sphaerodoridium claparedii		
Sphaerodoridium sp. A		
Sphaerodoropsis biserialis		
Sphaerodoropsis minuta		
Sphaerodoropsis sp. A		
Sphaerodoropsis sp. B		
Sphaerodorum gracilis		
Sphaerosyllis erinaceus		
Spinther sp.		
Spio filicornis		
Spio theeli		
Spiochaetopterus typicus		
Spiophanes bombyx		
Spirorbis granulatus		
Sternaspis scutata		1
Syllides longocirrata		
Syllides sp.		
Tachytrypane abranchiata		
Tachytrypane sp. A		
Tauberia gracilis		
Terebellides stroemi		
Tharyx ?acutus		16
Travisia sp.		
Trichobranchus glacialis		
Trochochaeta carica		2
Trochochaeta multisetosa		
Typosyllis cornuta		
Typosyllis fasciata		
unidentified		2
TOTAL 25 spp.		158

		#/0.5m^2
Lumbriclymene minor		
Lumbrineris fragilis		
Lumbrineris impatiens		
Lumbrineris latreilli		
Lumbrineris minuta		
Lumbrineris sp. A		
Lumbrineris sp. B		
Lumbrineris sp. X		
Lysilla loveni		
Lysippe labiata		
Magelona longicornis		
Maldane sarsi		
Marenzelleria wireni		
Melaenis loveni		
Melinna elisabethae		
Microclymene sp.		
Micronephthys minuta		8
Minuspio cirrifera		23
Myriochele heeri		
Myriochele oculata		
Mystides borealis		
Nemidia torelli		
Neosabellides sp.		
Nephtys caeca		
Nephtys ciliata		
Nephtys discors		
Nephtys incisa		
Nephtys longosetosa		
Nephtys paradoxa		
Nereimyra aphroditoides		4
Nereis zonata		
Nicolea zostericola		
Nicomache lumbricalis		
Nicon sp. A		
Nothria conchylega		
Notomastus latericeus		
Notoproctus oculatus		
Onuphis quadricuspis		
Ophelina acuminata		1
Ophelina cylindricaudatus		
Ophelina groenlandica		
Ophelina sp. A		
Ophryotrocha sp.		
Orbinia sp.		
Owenia collaris		
Owenia fusiformis		
Paramphitrite tetrabranchia		2
Paranaitides wahlbergi		
Paraonis sp. A		
Parheteromastus sp. A		
Petaloproctus tenuis		
Pherusa plumosa		
Pholoe minuta		1

		#/0.5m^2
Pionosyllis compacta		
Pista cristata		
Polycirrus medusa		
Polydora caulleryi		8
Polydora quadrilobata		
Polydora socialis		
Polyphysia crassa		
Praxillella gracilis		
Praxillella praetermissa		
Prionospio steenstrupi		1
Proclea graffii		
Pygospio elegans		
Rhodine gracilior		
Sabella sp.		
Sabellastarte sp.		
Sabellides borealis		
Scalibregma inflatum		
Schistomeringos caeca		
Schistomeringos sp. A		
Scoloplos acutus		
Scoloplos armiger		
Sigambra tentaculata		
Sphaerodoridium claparedii		
Sphaerodoridium sp. A		
Sphaerodoropsis biserialis		
Sphaerodoropsis minuta		
Sphaerodoropsis sp. A		
Sphaerodoropsis sp. B		
Sphaerodorum gracilis		
Sphaerosyllis erinaceus		
Spinther sp.		
Spio filicornis		
Spio theeli		
Spiochaetopterus typicus		
Spiophanes bombyx		
Spirorbis granulatus		
Sternaspis scutata		1
Syllides longocirrata		
Syllides sp.		
Tachytrypane abranchiata		
Tachytrypane sp. A		
Tauberia gracilis		
Terebellides stroemi		
Tharyx ?acutus		16
Travisia sp.		
Trichobranchus glacialis		
Trochochaeta carica		2
Trochochaeta multisetosa		
Typosyllis cornuta		
Typosyllis fasciata		
unidentified		2
TOTAL 25 spp.		158

Appendix I (cont'd): Polychaete species data for Station PIB-5 (5m), Cruise OCS5; accumulated from Smith-McIntyre Grab samples 1419, 1420, 1421, 1423 and 1424. The numbers represent totals per $0.5m^2$ of sea floor for the polychaetes retained on a 1.0 mm sieve.

		$\#/0.5m^2$
Aglaophamus malmgreni		
Allia abranchiata		
Allia nr *suecica*		
Allia sp. B		
Allia sp. C		
Amage auricula		
Ampharete acutifrons		
Ampharete arctica		
Ampharete goësi		
Ampharete lindstromi		
Ampharete vega		155
Ampharetidae - Genus A		
Ampharetidae - Genus B		
Amphicteis sundevalli		
Anaitides citrina		
Anaitides groenlandica		
Antinoella badia		
Antinoella sarsi		
Apistobranchus tullbergi		
Apomatus globifer		
Arcteobia anticostiensis		
Arenicola glacialis		
Aricidea quadrilobata		
Aricidea tetrabranchiata		
Artacama proboscidea		
Autolytus alexandri		
Autolytus fallax		
Axionice flexuosa		
Axionice maculata		
Barantolla sp.		
Brada incrustata		
Brada inhabilis		
Brada nuda		
Brada villosa		
Branchiomma infarcta		
Capitella capitata		15
Chaetozone setosa		
Chone duneri		
Chone infundibuliformis		
Chone nr *murmanica*		30
Cirratulus cirratus		
Cistenides hyperborea		
Clymenura polaris		
Cossura longocirrata		
Cossura sp. A		

		$\#/0.5m^2$
Dexiospira spirillum		
Diplocirrus glaucus		
Diplocirrus hirsutus		
Diplocirrus longisetosus		
Dorvillea sp.		
Dysponetus sp. N		
Eclysippe sp. A		
Enipo gracilis		
Enipo canadensis		
Ephesiella macrocirrus		
Eteone flava		
Eteone longa		7
Eteone spetsbergensis		
Eteone (Mysta) barbata		
Euchone analis		
Euchone elegans		
Euchone incolor		
Euchone papillosa		
Euchone sp.		
Eucranta villosa		
Eunoe oerstedi		
Eusyllis blomstrandi		
Exogone dispar		
Exogone naidina		
Exogone sp.		
Fabricinae - sp. O		
Fabricinae - sp. R		
Fabrisabella schaudinni		
Flabelligera affinis		
Gattyana cirrosa		
Glycera capitata		
Glycinde wireni		
Glyphanostomum pallescens		
Harmothoe imbricata		
Hesionidae gen et sp. nov.		
Heteromastus filiformis		
Jasmineira sp.		
Lagisca extenuata		
Lanassa nordenskjoldi		/
Lanassa venusta		
Laonice cirrata		
Laonome kroyeri		
Laphania boecki		

		#/0.5m^2
Lumbriclymene minor		
Lumbrineris fragilis		
Lumbrineris impatiens		
Lumbrineris latreilli		
Lumbrineris minuta		
Lumbrineris sp. A		
Lumbrineris sp. B		
Lumbrineris sp. X		
Lysilla loveni		
Lysippe labiata		
Magelona longicornis		
Maldane sarsi		
Marenzelleria wireni		55
Melaenis loveni		
Melinna elisabethae		
Microclymene sp.		
Micronephthys minuta		1
Minuspio cirrifera		262
Myriochele heeri		
Myriochele oculata		
Mystides borealis		
Nemidia torelli		
Neosabellides sp.		
Nephtys caeca		
Nephtys ciliata		
Nephtys discors		
Nephtys incisa		
Nephtys longosetosa		
Nephtys paradoxa		
Nereimyra aphroditoides		
Nereis zonata		
Nicolea zostericola		
Nicomache lumbricalis		
Nicon sp. A		
Nothria conchylega		
Notomastus latericeus		
Notoproctus oculatus		
Onuphis quadricuspis		1
Ophelina acuminata		
Ophelina cylindricaudatus		
Ophelina groenlandica		
Ophelina sp. A		
Ophryotrocha sp.		
Orbinia sp.		2
Owenia collaris		
Owenia fusiformis		
Paramphitrite tetrabranchia		1
Paranaitides wahlbergi		
Paraonis sp. A		
Parheteromastus sp. A		
Petaloproctus tenuis		
Pherusa plumosa		
Pholoe minuta		

		#/0.5m^2
Pionosyllis compacta		
Pista cristata		
Polycirrus medusa		
Polydora caulleryi		
Polydora quadrilobata		
Polydora socialis		
Polyphysia crassa		
Praxillella gracilis		
Praxillella praetermissa		
Prionospio steenstrupi		
Proclea graffii		
Pygospio elegans		
Rhodine gracilior		
Sabella sp.		
Sabellastarte sp.		
Sabellides borealis		
Scalibregma inflatum		
Schistomeringos caeca		
Schistomeringos sp. A		
Scoloplos acutus		
Scoloplos armiger		3
Sigambra tentaculata		
Sphaerodoridium claparedii		
Sphaerodoridium sp. A		3
Sphaerodoropsis biserialis		
Sphaerodoropsis minuta		13
Sphaerodoropsis sp. A		
Sphaerodoropsis sp. B		
Sphaerodorum gracilis		
Sphaerosyllis erinaceus		
Spinther sp.		
Spio filicornis		
Spio theeli		
Spiochaetopterus typicus		
Spiophanes bombyx		
Spirorbis granulatus		
Sternaspis scutata		
Syllides longocirrata		
Syllides sp.		
Tachytrypane abranchiata		
Tachytrypane sp. A		
Tauberia gracilis		
Terebellides stroemi		1
Tharyx ?acutus		16
Travisia sp.		
Trichobranchus glacialis		
Trochochaeta carica		
Trochochaeta multisetosa		
Typosyllis cornuta		
Typosyllis fasciata		
unidentified		
TOTAL 15 spp.		565

	#/0.5m^2	
Lumbriclymene minor		
Lumbrineris fragilis		
Lumbrineris impatiens		
Lumbrineris latreilli		
Lumbrineris minuta		
Lumbrineris sp. A		
Lumbrineris sp. B		
Lumbrineris sp. X		
Lysilla loveni		
Lysippe labiata		
Magelona longicornis		
Maldane sarsi		
Marenzelleria wireni		55
Melaenis loveni		
Melinna elisabethae		
Microclymene sp.		
Micronephthys minuta		1
Minuspio cirrifera		262
Myriochele heeri		
Myriochele oculata		
Mystides borealis		
Nemidia torelli		
Neosabellides sp.		
Nephtys caeca		
Nephtys ciliata		
Nephtys discors		
Nephtys incisa		
Nephtys longosetosa		
Nephtys paradoxa		
Nereimyra aphroditoides		
Nereis zonata		
Nicolea zostericola		
Nicomache lumbricalis		
Nicon sp. A		
Nothria conchylega		
Notomastus latericeus		
Notoproctus oculatus		
Onuphis quadricuspis		1
Ophelina acuminata		
Ophelina cylindricaudatus		
Ophelina groenlandica		
Ophelina sp. A		
Ophryotrocha sp.		
Orbinia sp.		2
Owenia collaris		
Owenia fusiformis		
Paramphitrite tetrabranchia		1
Paranaitides wahlbergi		
Paraonis sp. A		
Parheteromastus sp. A		
Petaloproctus tenuis		
Pherusa plumosa		
Pholoe minuta		

	#/0.5m^2	
Pionosyllis compacta		
Pista cristata		
Polycirrus medusa		
Polydora caulleryi		
Polydora quadrilobata		
Polydora socialis		
Polyphysia crassa		
Praxillella gracilis		
Praxillella praetermissa		
Prionospio steenstrupi		
Proclea graffii		
Pygospio elegans		
Rhodine gracilior		
Sabella sp.		
Sabellastarte sp.		
Sabellides borealis		
Scalibregma inflatum		
Schistomeringos caeca		
Schistomeringos sp. A		
Scoloplos acutus		
Scoloplos armiger		3
Sigambra tentaculata		
Sphaerodoridium claparedii		
Sphaerodoridium sp. A		3
Sphaerodoropsis biserialis		
Sphaerodoropsis minuta		13
Sphaerodoropsis sp. A		
Sphaerodoropsis sp. B		
Sphaerodorum gracilis		
Sphaerosyllis erinaceus		
Spinther sp.		
Spio filicornis		
Spio theeli		
Spiochaetopterus typicus		
Spiophanes bombyx		
Spirorbis granulatus		
Sternaspis scutata		
Syllides longocirrata		
Syllides sp.		
Tachytrypane abranchiata		
Tachytrypane sp. A		
Tauberia gracilis		
Terebellides stroemi		1
Tharyx ?acutus		16
Travisia sp.		
Trichobranchus glacialis		
Trochochaeta carica		
Trochochaeta multisetosa		
Typosyllis cornuta		
Typosyllis fasciata		
unidentified		
TOTAL 15 spp.		565

Appendix I (cont'd): Polychaete species data for Station PIB-10 (10m), Cruise OCS-5; accumulated from Smith-McIntyre Grab samples 1425, 1426, 1427, 1429 and 1430. The numbers represent totals per $0.5m^2$ of sea floor for the polychaetes retained on a 1.0 mm sieve.

		$\#/0.5m^2$			$\#/0.5m^2$
Aglaophamus malmgreni			*Dexiospira spirillum*		
Allia abranchiata			*Diplocirrus glaucus*		
Allia nr *suecica*		7	*Diplocirrus hirsutus*		
Allia sp. B			*Diplocirrus longisetosus*		
Allia sp. C			*Dorvillea sp.*		
Amage auricula			*Dysponetus sp. N*		
Ampharete acutifrons					
Ampharete arctica			*Eclysippe sp. A*		
Ampharete goësi			*Enipo gracilis*		
Ampharete lindstromi			*Enipo canadensis*		
Ampharete vega		9	*Ephesiella macrocirrus*		
Ampharetidae - Genus A			*Eteone flava*		
Ampharetidae - Genus B			*Eteone longa*		23
Amphicteis sundevalli			*Eteone spetsbergensis*		
Anaitides citrina			*Eteone (Mysta) barbata*		
Anaitides groenlandica			*Euchone analis*		1
Antinoella badia			*Euchone elegans*		
Antinoella sarsi			*Euchone incolor*		
Apistobranchus tullbergi			*Euchone papillosa*		
Apomatus globifer			*Euchone sp.*		
Arcteobia anticostiensis			*Eucranta villosa*		
Arenicola glacialis			*Eunoe oerstedi*		
Aricidea quadrilobata			*Eusyllis blomstrandi*		
Aricidea tetrabranchiata			*Exogone dispar*		
Artacama proboscidea			*Exogone naidina*		
Autolytus alexandri			*Exogone sp.*		
Autolytus fallax			*Fabricinae - sp. O*		
Axionice flexuosa			*Fabricinae - sp. R*		
Axionice maculata			*Fabrisabella schaudinni*		
			Flabelligera affinis		
Barantolla sp.					
Brada incrustata			*Gattyana cirrosa*		
Brada inhabilis			*Glycera capitata*		
Brada nuda			*Glycinde wireni*		
Brada villosa			*Glyphanostomum pallescens*		
Branchiomma infarcta			*Harmothoe imbricata*		
Capitella capitata		24	*Hesionidae gen et sp. nov.*		
Chaetozone setosa			*Heteromastus filiformis*		1
Chone duneri			*Jasmineira sp.*		
Chone infundibuliformis					
Chone nr *murmanica*		206	*Lagisca extenuata*		
Cirratulus cirratus			*Lanassa nordenskjoldi*		
Cistenides hyperborea			*Lanassa venusta*		
Clymenura polaris			*Laonice cirrata*		
Cossura longocirrata		39	*Laonome kroyeri*		
Cossura sp. A			*Laphania boecki*		

		$\#/0.5m^2$
Lumbriclymene minor		
Lumbrineris fragilis		
Lumbrineris impatiens		
Lumbrineris latreilli		
Lumbrineris minuta		
Lumbrineris sp. A		
Lumbrineris sp. B		
Lumbrineris sp. X		
Lysilla loveni		
Lysippe labiata		
Magelona longicornis		
Maldane sarsi		
Marenzelleria wireni		5
Melaenis loveni		
Melinna elisabethae		
Microclymene sp.		
Micronephthys minuta		42
Minuspio cirrifera		2344
Myriochele heeri		
Myriochele oculata		
Mystides borealis		1
Nemidia torelli		
Neosabellides sp.		
Nephtys caeca		
Nephtys ciliata		1
Nephtys discors		
Nephtys incisa		
Nephtys longosetosa		
Nephtys paradoxa		
Nereimyra aphroditoides		
Nereis zonata		
Nicolea zostericola		
Nicomache lumbricalis		
Nicon sp. A		
Nothria conchylega		
Notomastus latericeus		
Notoproctus oculatus		
Onuphis quadricuspis		
Ophelina acuminata		
Ophelina cylindricaudatus		
Ophelina groenlandica		
Ophelina sp. A		
Ophryotrocha sp.		7
Orbinia sp.		
Owenia collaris		
Owenia fusiformis		
Paramphitrite tetrabranchia		1
Paranaitides wahlbergi		
Paraonis sp. A		
Parheteromastus sp. A		3
Petaloproctus tenuis		
Pherusa plumosa		
Pholoe minuta		

		$\#/0.5m^2$
Pionosyllis compacta		
Pista cristata		
Polycirrus medusa		
Polydora caulleryi		
Polydora quadrilobata		
Polydora socialis		
Polyphysia crassa		
Praxillella gracilis		
Praxillella praetermissa		1
Prionospio steenstrupi		
Proclea graffii		
Pygospio elegans		
Rhodine gracilior		
Sabella sp.		
Sabellastarte sp.		
Sabellides borealis		
Scalibregma inflatum		1
Schistomeringos caeca		
Schistomeringos sp. A		
Scoloplos acutus		
Scoloplos armiger		
Sigambra tentaculata		
Sphaerodoridium claparedii		
Sphaerodoridium sp. A		9
Sphaerodoropsis biserialis		
Sphaerodoropsis minuta		117
Sphaerodoropsis sp. A		
Sphaerodoropsis sp. B		
Sphaerodorum gracilis		
Sphaerosyllis erinaceus		
Spinther sp.		
Spio filicornis		
Spio theeli		
Spiochaetopterus typicus		
Spiophanes bombyx		
Spirorbis granulatus		
Sternaspis scutata		7
Syllides longocirrata		
Syllides sp.		
Tachytrypane abranchiata		
Tachytrypane sp. A		
Tauberia gracilis		
Terebellides stroemi		6
Tharyx ?acutus		72
Travisia sp.		
Trichobranchus glacialis		
Trochochaeta carica		
Trochochaeta multisetosa		
Typosyllis cornuta		
Typosyllis fasciata		
unidentified		1
TOTAL 23 spp.		2928

		#/0.5m²
Lumbriclymene minor		
Lumbrineris fragilis		
Lumbrineris impatiens		
Lumbrineris latreilli		
Lumbrineris minuta		
Lumbrineris sp. A		
Lumbrineris sp. B		
Lumbrineris sp. X		
Lysilla loveni		
Lysippe labiata		
Magelona longicornis		
Maldane sarsi		
Marenzelleria wireni		5
Melaenis loveni		
Melinna elisabethae		
Microclymene sp.		
Micronephthys minuta		42
Minuspio cirrifera		2344
Myriochele heeri		
Myriochele oculata		
Mystides borealis		1
Nemidia torelli		
Neosabellides sp.		
Nephtys caeca		
Nephtys ciliata		1
Nephtys discors		
Nephtys incisa		
Nephtys longosetosa		
Nephtys paradoxa		
Nereimyra aphroditoides		
Nereis zonata		
Nicolea zostericola		
Nicomache lumbricalis		
Nicon sp. A		
Nothria conchylega		
Notomastus latericeus		
Notoproctus oculatus		
Onuphis quadricuspis		
Ophelina acuminata		
Ophelina cylindricaudatus		
Ophelina groenlandica		
Ophelina sp. A		
Ophryotrocha sp.		7
Orbinia sp.		
Owenia collaris		
Owenia fusiformis		
Paramphitrite tetrabranchia		1
Paranaitides wahlbergi		
Paraonis sp. A		
Parheteromastus sp. A		3
Petaloproctus tenuis		
Pherusa plumosa		
Pholoe minuta		

		#/0.5m²
Pionosyllis compacta		
Pista cristata		
Polycirrus medusa		
Polydora caulleryi		
Polydora quadrilobata		
Polydora socialis		
Polyphysia crassa		
Praxillella gracilis		
Praxillella praetermissa		1
Prionospio steenstrupi		
Proclea graffii		
Pygospio elegans		
Rhodine gracilior		
Sabella sp.		
Sabellastarte sp.		
Sabellides borealis		
Scalibregma inflatum		1
Schistomeringos caeca		
Schistomeringos sp. A		
Scoloplos acutus		
Scoloplos armiger		
Sigambra tentaculata		
Sphaerodoridium claparedii		
Sphaerodoridium sp. A		9
Sphaerodoropsis biserialis		
Sphaerodoropsis minuta		117
Sphaerodoropsis sp. A		
Sphaerodoropsis sp. B		
Sphaerodorum gracilis		
Sphaerosyllis erinaceus		
Spinther sp.		
Spio filicornis		
Spio theeli		
Spiochaetopterus typicus		
Spiophanes bombyx		
Spirorbis granulatus		
Sternaspis scutata		7
Syllides longocirrata		
Syllides sp.		
Tachytrypane abranchiata		
Tachytrypane sp. A		
Tauberia gracilis		
Terebellides stroemi		6
Tharyx ?acutus		72
Travisia sp.		
Trichobranchus glacialis		
Trochochaeta carica		
Trochochaeta multisetosa		
Typosyllis cornuta		
Typosyllis fasciata		
unidentified		1
TOTAL 23 spp.		2928

Appendix I (cont'd): Polychaete species data for Station PIB-15 (15m), Cruise OCS-5; accumulated from Smith-McIntyre Grab samples 1432, 1433 1434, 1435 and 1436. The numbers represent totals per $0.5m^2$ of sea floor for the polychaetes retained on a 1.0 mm sieve.

		#/0.5m^2
Aglaophamus malmgreni		
Allia abranchiata		
Allia nr *suecica*		2
Allia sp. B		
Allia sp. C		1
Amage auricula		
Ampharete acutifrons		
Ampharete arctica		
Ampharete goësi		
Ampharete lindstromi		10
Ampharete vega		
Ampharetidae - Genus A		
Ampharetidae - Genus B		
Amphicteis sundevalli		3
Anaitides citrina		
Anaitides groenlandica		3
Antinoella badia		
Antinoella sarsi		3
Apistobranchus tullbergi		1
Apomatus globifer		
Arcteobia anticostiensis		
Arenicola glacialis		
Aricidea quadrilobata		
Aricidea tetrabranchiata		
Artacama proboscidea		
Autolytus alexandri		
Autolytus fallax		
Axionice flexuosa		
Axionice maculata		
Barantolla sp.		
Brada incrustata		
Brada inhabilis		
Brada nuda		
Brada villosa		7
Branchiomma infarcta		
Capitella capitata		3
Chaetozone setosa		24
Chone duneri		
Chone infundibuliformis		
Chone nr *murmanica*		
Cirratulus cirratus		
Cistenides hyperborea		
Clymenura polaris		19
Cossura longocirrata		
Cossura sp. A		

		#/0.5m^2
Dexiospira spirillum		1
Diplocirrus glaucus		
Diplocirrus hirsutus		
Diplocirrus longisetosus		1
Dorvillea sp.		
Dysponetus sp. N		1
Eclysippe sp. A		
Enipo gracilis		
Enipo canadensis		
Ephesiella macrocirrus		
Eteone flava		
Eteone longa		6
Eteone spetsbergensis		
Eteone (Mysta) barbata		
Euchone analis		
Euchone elegans		1
Euchone incolor		
Euchone papillosa		4
Euchone sp.		1
Eucranta villosa		
Eunoe oerstedi		
Eusyllis blomstrandi		
Exogone dispar		
Exogone naidina		
Exogone sp.		
Fabricinae - sp. O		
Fabricinae - sp. R		
Fabrisabella schaudinni		
Flabelligera affinis		
Gattyana cirrosa		
Glycera capitata		
Glycinde wireni		
Glyphanostomum pallescens		
Harmothoe imbricata		
Hesionidae gen et sp. nov.		7
Heteromastus filiformis		2
Jasmineira sp.		
Lagisca extenuata		
Lanassa nordenskjoldi		
Lanassa venusta		1
Laonice cirrata		
Laonome kroyeri		5
Laphania boecki		

		#/0.5m²
Lumbriclymene minor		
Lumbrineris fragilis		
Lumbrineris impatiens		
Lumbrineris latreilli		
Lumbrineris minuta		
Lumbrineris sp. A		
Lumbrineris sp. B		
Lumbrineris sp. X		
Lysilla loveni		
Lysippe labiata		4
Magelona longicornis		
Maldane sarsi		
Marenzelleria wireni		13
Melaenis loveni		1
Melinna elisabethae		
Microclymene sp.		12
Micronephthys minuta		13
Minuspio cirrifera		23
Myriochele heeri		
Myriochele oculata		
Mystides borealis		
Nemidia torelli		
Neosabellides sp.		
Nephtys caeca		
Nephtys ciliata		3
Nephtys discors		
Nephtys incisa		
Nephtys longosetosa		2
Nephtys paradoxa		
Nereimyra aphroditoides		9
Nereis zonata		
Nicolea zostericola		
Nicomache lumbricalis		
Nicon sp. A		
Nothria conchylega		
Notomastus latericeus		
Notoproctus oculatus		
Onuphis quadricuspis		
Ophelina acuminata		
Ophelina cylindricaudatus		3
Ophelina groenlandica		
Ophelina sp. A		
Ophryotrocha sp.		
Orbinia sp.		
Owenia collaris		
Owenia fusiformis		
Paramphitrite tetrabranchia		
Paranaitides wahlbergi		
Paraonis sp. A		
Parheteromastus sp. A		
Petaloproctus tenuis		
Pherusa plumosa		
Pholoe minuta		28

		#/0.5m²
Pionosyllis compacta		
Pista cristata		
Polycirrus medusa		
Polydora caulleryi		
Polydora quadrilobata		
Polydora socialis		3
Polyphysia crassa		
Praxillella gracilis		
Praxillella praetermissa		91
Prionospio steenstrupi		1
Proclea graffii		
Pygospio elegans		
Rhodine gracilior		
Sabella sp.		
Sabellastarte sp.		
Sabellides borealis		3
Scalibregma inflatum		5
Schistomeringos caeca		3
Schistomeringos sp. A		
Scoloplos acutus		21
Scoloplos armiger		4
Sigambra tentaculata		
Sphaerodoridium claparedii		
Sphaerodoridium sp. A		2
Sphaerodoropsis biserialis		
Sphaerodoropsis minuta		
Sphaerodoropsis sp. A		
Sphaerodoropsis sp. B		
Sphaerodorum gracilis		
Sphaerosyllis erinaceus		
Spinther sp.		
Spio filicornis		
Spio theeli		
Spiochaetopterus typicus		
Spiophanes bombyx		
Spirorbis granulatus		
Sternaspis scutata		4
Syllides longocirrata		
Syllides sp.		
Tachytrypane abranchiata		
Tachytrypane sp. A		
Tauberia gracilis		2
Terebellides stroemi		2
Tharyx ?acutus		28
Travisia sp.		
Trichobranchus glacialis		
Trochochaeta carica		
Trochochaeta multisetosa		
Typosyllis cornuta		
Typosyllis fasciata		
unidentified		4
TOTAL 46 spp.		390

		$\#/0.5m^2$
Lumbriclymene minor		
Lumbrineris fragilis		
Lumbrineris impatiens		
Lumbrineris latreilli		
Lumbrineris minuta		
Lumbrineris sp. A		
Lumbrineris sp. B		
Lumbrineris sp. X		
Lysilla loveni		
Lysippe labiata		4
Magelona longicornis		
Maldane sarsi		
Marenzelleria wireni		13
Melaenis loveni		1
Melinna elisabethae		
Microclymene sp.		12
Micronephthys minuta		13
Minuspio cirrifera		23
Myriochele heeri		
Myriochele oculata		
Mystides borealis		
Nemidia torelli		
Neosabellides sp.		
Nephtys caeca		
Nephtys ciliata		3
Nephtys discors		
Nephtys incisa		
Nephtys longosetosa		2
Nephtys paradoxa		
Nereimyra aphroditoides		9
Nereis zonata		
Nicolea zostericola		
Nicomache lumbricalis		
Nicon sp. A		
Nothria conchylega		
Notomastus latericeus		
Notoproctus oculatus		
Onuphis quadricuspis		
Ophelina acuminata		
Ophelina cylindricaudatus		3
Ophelina groenlandica		
Ophelina sp. A		
Ophryotrocha sp.		
Orbinia sp.		
Owenia collaris		
Owenia fusiformis		
Paramphitrite tetrabranchia		
Paranaitides wahlbergi		
Paraonis sp. A		
Parheteromastus sp. A		
Petaloproctus tenuis		
Pherusa plumosa		
Pholoe minuta		28

		$\#/0.5m^2$
Pionosyllis compacta		
Pista cristata		
Polycirrus medusa		
Polydora caulleryi		
Polydora quadrilobata		
Polydora socialis		3
Polyphysia crassa		
Praxillella gracilis		
Praxillella praetermissa		91
Prionospio steenstrupi		1
Proclea graffii		
Pygospio elegans		
Rhodine gracilior		
Sabella sp.		
Sabellastarte sp.		
Sabellides borealis		3
Scalibregma inflatum		5
Schistomeringos caeca		3
Schistomeringos sp. A		
Scoloplos acutus		21
Scoloplos armiger		4
Sigambra tentaculata		
Sphaerodoridium claparedii		
Sphaerodoridium sp. A		2
Sphaerodoropsis biserialis		
Sphaerodoropsis minuta		
Sphaerodoropsis sp. A		
Sphaerodoropsis sp. B		
Sphaerodorum gracilis		
Sphaerosyllis erinaceus		
Spinther sp.		
Spio filicornis		
Spio theeli		
Spiochaetopterus typicus		
Spiophanes bombyx		
Spirorbis granulatus		
Sternaspis scutata		4
Syllides longocirrata		
Syllides sp.		
Tachytrypane abranchiata		
Tachytrypane sp. A		
Tauberia gracilis		2
Terebellides stroemi		2
Tharyx ?acutus		28
Travisia sp.		
Trichobranchus glacialis		
Trochochaeta carica		
Trochochaeta multisetosa		
Typosyllis cornuta		
Typosyllis fasciata		
unidentified		4
TOTAL 46 spp.		390

Appendix I (cont'd): Polychaete species data for Station NIB-5 (5m), Cruise OCS-5; accumulated from Smith-McIntyre Grab samples 1437, 1439, 1440, 1441 and 1442. The numbers represent totals per $0.5m^2$ of sea floor for the polychaetes retained on a 1.0 mm sieve.

		$\#/0.5m^2$
Aglaophamus malmgreni		
Allia abranchiata		
Allia nr *suecica*		
Allia sp. B		
Allia sp. C		
Amage auricula		
Ampharete acutifrons		2
Ampharete arctica		
Ampharete goësi		
Ampharete lindstromi		
Ampharete vega		29
Ampharetidae - Genus A		
Ampharetidae - Genus B		
Amphicteis sundevalli		
Anaitides citrina		
Anaitides groenlandica		
Antinoella badia		
Antinoella sarsi		
Apistobranchus tullbergi		
Apomatus globifer		
Arcteobia anticostiensis		2
Arenicola glacialis		
Aricidea quadrilobata		
Aricidea tetrabranchiata		
Artacama proboscidea		
Autolytus alexandri		
Autolytus fallax		
Axionice flexuosa		
Axionice maculata		
Barantolla sp.		
Brada incrustata		
Brada inhabilis		
Brada nuda		
Brada villosa		5
Branchiomma infarcta		
Capitella capitata		32
Chaetozone setosa		29
Chone duneri		
Chone infundibuliformis		
Chone nr *murmanica*		71
Cirratulus cirratus		
Cistenides hyperborea		
Clymenura polaris		
Cossura longocirrata		
Cossura sp. A		

		$\#/0.5m^2$
Dexiospira spirillum		
Diplocirrus glaucus		
Diplocirrus hirsutus		
Diplocirrus longisetosus		
Dorvillea sp.		
Dysponetus sp. N		
Eclysippe sp. A		
Enipo gracilis		
Enipo canadensis		
Ephesiella macrocirrus		
Eteone flava		
Eteone longa		2
Eteone spetsbergensis		
Eteone (Mysta) barbata		
Euchone analis		
Euchone elegans		
Euchone incolor		
Euchone papillosa		1
Euchone sp.		
Eucranta villosa		
Eunoe oerstedi		
Eusyllis blomstrandi		
Exogone dispar		
Exogone naidina		
Exogone sp.		
Fabricinae - sp. O		
Fabricinae - sp. R		
Fabrisabella schaudinni		
Flabelligera affinis		
Gattyana cirrosa		
Glycera capitata		
Glycinde wireni		
Glyphanostomum pallescens		
Harmothoe imbricata		
Hesionidae gen et sp. nov.		3
Heteromastus filiformis		
Jasmineira sp.		
Lagisca extenuata		
Lanassa nordenskjoldi		
Lanassa venusta		
Laonice cirrata		
Laonome kroyeri		
Laphania boecki		

		#/0.5m^2
Lumbriclymene minor		
Lumbrineris fragilis		
Lumbrineris impatiens		
Lumbrineris latreilli		
Lumbrineris minuta		
Lumbrineris sp. A		
Lumbrineris sp. B		
Lumbrineris sp. X		
Lysilla loveni		
Lysippe labiata		
Magelona longicornis		
Maldane sarsi		
Marenzelleria wireni		157
Melaenis loveni		
Melinna elisabethae		
Microclymene sp.		
Micronephthys minuta		
Minuspio cirrifera		81
Myriochele heeri		
Myriochele oculata		
Mystides borealis		
Nemidia torelli		
Neosabellides sp.		
Nephtys caeca		
Nephtys ciliata		
Nephtys discors		
Nephtys incisa		
Nephtys longosetosa		
Nephtys paradoxa		
Nereimyra aphroditoides		126
Nereis zonata		
Nicolea zostericola		
Nicomache lumbricalis		
Nicon sp. A		
Nothria conchylega		
Notomastus latericeus		
Notoproctus oculatus		
Onuphis quadricuspis		
Ophelina acuminata		
Ophelina cylindricaudatus		1
Ophelina groenlandica		
Ophelina sp. A		
Ophryotrocha sp.		
Orbinia sp.		
Owenia collaris		
Owenia fusiformis		
Paramphitrite tetrabranchia		4
Paranaitides wahlbergi		
Paraonis sp. A		
Parheteromastus sp. A		
Petaloproctus tenuis		
Pherusa plumosa		
Pholoe minuta		

		#/0.5m^2
Pionosyllis compacta		
Pista cristata		
Polycirrus medusa		7
Polydora caulleryi		
Polydora quadrilobata		
Polydora socialis		
Polyphysia crassa		
Praxillella gracilis		
Praxillella praetermissa		2
Prionospio steenstrupi		
Proclea graffii		
Pygospio elegans		
Rhodine gracilior		
Sabella sp.		
Sabellastarte sp.		
Sabellides borealis		
Scalibregma inflatum		5
Schistomeringos caeca		5
Schistomeringos sp. A		
Scoloplos acutus		
Scoloplos armiger		
Sigambra tentaculata		
Sphaerodoridium claparedii		
Sphaerodoridium sp. A		
Sphaerodoropsis biserialis		
Sphaerodoropsis minuta		
Sphaerodoropsis sp. A		
Sphaerodoropsis sp. B		
Sphaerodorum gracilis		
Sphaerosyllis erinaceus		
Spinther sp.		
Spio filicornis		10
Spio theeli		
Spiochaetopterus typicus		
Spiophanes bombyx		
Spirorbis granulatus		
Sternaspis scutata		
Syllides longocirrata		
Syllides sp.		
Tachytrypane abranchiata		
Tachytrypane sp. A		
Tauberia gracilis		
Terebellides stroemi		35
Tharyx ?acutus		
Travisia sp.		
Trichobranchus glacialis		
Trochochaeta carica		
Trochochaeta multisetosa		
Typosyllis cornuta		
Typosyllis fasciata		
unidentified		3
TOTAL 21 spp.		612

		#/0.5m²
Lumbriclymene minor		
Lumbrineris fragilis		
Lumbrineris impatiens		
Lumbrineris latreilli		
Lumbrineris minuta		
Lumbrineris sp. A		
Lumbrineris sp. B		
Lumbrineris sp. X		
Lysilla loveni		
Lysippe labiata		
Magelona longicornis		
Maldane sarsi		
Marenzelleria wireni		157
Melaenis loveni		
Melinna elisabethae		
Microclymene sp.		
Micronephthys minuta		
Minuspio cirrifera		81
Myriochele heeri		
Myriochele oculata		
Mystides borealis		
Nemidia torelli		
Neosabellides sp.		
Nephtys caeca		
Nephtys ciliata		
Nephtys discors		
Nephtys incisa		
Nephtys longosetosa		
Nephtys paradoxa		
Nereimyra aphroditoides		126
Nereis zonata		
Nicolea zostericola		
Nicomache lumbricalis		
Nicon sp. A		
Nothria conchylega		
Notomastus latericeus		
Notoproctus oculatus		
Onuphis quadricuspis		
Ophelina acuminata		
Ophelina cylindricaudatus		1
Ophelina groenlandica		
Ophelina sp. A		
Ophryotrocha sp.		
Orbinia sp.		
Owenia collaris		
Owenia fusiformis		
Paramphitrite tetrabranchia		4
Paranaitides wahlbergi		
Paraonis sp. A		
Parheteromastus sp. A		
Petaloproctus tenuis		
Pherusa plumosa		
Pholoe minuta		

		#/0.5m²
Pionosyllis compacta		
Pista cristata		
Polycirrus medusa		7
Polydora caulleryi		
Polydora quadrilobata		
Polydora socialis		
Polyphysia crassa		
Praxillella gracilis		
Praxillella praetermissa		2
Prionospio steenstrupi		
Proclea graffii		
Pygospio elegans		
Rhodine gracilior		
Sabella sp.		
Sabellastarte sp.		
Sabellides borealis		
Scalibregma inflatum		5
Schistomeringos caeca		5
Schistomeringos sp. A		
Scoloplos acutus		
Scoloplos armiger		
Sigambra tentaculata		
Sphaerodoridium claparedii		
Sphaerodoridium sp. A		
Sphaerodoropsis biserialis		
Sphaerodoropsis minuta		
Sphaerodoropsis sp. A		
Sphaerodoropsis sp. B		
Sphaerodorum gracilis		
Sphaerosyllis erinaceus		
Spinther sp.		
Spio filicornis		10
Spio theeli		
Spiochaetopterus typicus		
Spiophanes bombyx		
Spirorbis granulatus		
Sternaspis scutata		
Syllides longocirrata		
Syllides sp.		
Tachytrypane abranchiata		
Tachytrypane sp. A		
Tauberia gracilis		
Terebellides stroemi		35
Tharyx ?acutus		
Travisia sp.		
Trichobranchus glacialis		
Trochochaeta carica		
Trochochaeta multisetosa		
Typosyllis cornuta		
Typosyllis fasciata		
unidentified		3
TOTAL 21 spp.		612

Appendix I (cont'd): Polychaete species data for Station NIB-10 (10m), Cruise OCS-5; accumulated from Smith-McIntyre Grab samples 1450, 1451, 1452, 1453 and 1454. The numbers represent totals per $0.5m^2$ of sea floor for the polychaetes retained on a 1.0 mm sieve.

		#/$0.5m^2$
Aglaophamus malmgreni		
Allia abranchiata		
Allia nr *suecica*		
Allia sp. B		
Allia sp. C		
Amage auricula		
Amphicteis acutifrons		
Amphicteis arctica		
Amphicteis goësi		
Amphicteis lindstromi		3
Amphicteis vega		366
Ampharetidae - Genus A		
Ampharetidae - Genus B		
Amphicteis sundevalli		15
Anaitides citrina		
Anaitides groenlandica		4
Antinoella badia		
Antinoella sarsi		
Apistobranchus tullbergi		1
Apomatus globifer		
Arcteobia anticostiensis		3
Arenicola glacialis		
Aricidea quadrilobata		
Aricidea tetrabranchiata		
Artacama proboscidea		
Autolytus alexandri		
Autolytus fallax		
Axionice flexuosa		
Axionice maculata		
Barantolla sp.		
Brada incrustata		
Brada inhabilis		
Brada nuda		
Brada villosa		7
Branchiomma infarcta		
Capitella capitata		5
Chaetozone setosa		76
Chone duneri		
Chone infundibuliformis		
Chone nr *murmanica*		7
Cirratulus cirratus		
Cistenides hyperborea		
Clymenura polaris		1
Cossura longocirrata		
Cossura sp. A		

		#/$0.5m^2$
Dexiospira spirillum		
Diplocirrus glaucus		
Diplocirrus hirsutus		
Diplocirrus longisetosus		
Dorvillea sp.		
Dysponetus sp. N		1
Eclysippe sp. A		
Enipo gracilis		
Enipo canadensis		
Ephesiella macrocirrus		
Eteone flava		
Eteone longa		20
Eteone spetsbergensis		
Eteone (Mysta) barbata		
Euchone analis		
Euchone elegans		
Euchone incolor		
Euchone papillosa		
Euchone sp.		
Eucranta villosa		
Eunoe oerstedi		
Eusyllis blomstrandi		
Exogone dispar		3
Exogone naidina		2
Exogone sp.		
Fabricinae - sp. O		
Fabricinae - sp. R		
Fabrisabella schaudinni		
Flabelligera affinis		
Gattyana cirrosa		
Glycera capitata		
Glycinde wireni		
Glyphanostomum pallescens		
Harmothoe imbricata		
Hesionidae gen et sp. nov.		1
Heteromastus filiformis		1
Jasmineira sp.		
Lagisca extenuata		
Lanassa nordenskjoldi		
Lanassa venusta		
Laonice cirrata		
Laonome kroyeri		
Laphania boecki		

Lumbriclymene minor		
Lumbrineris fragilis		
Lumbrineris impatiens		
Lumbrineris latreilli		
Lumbrineris minuta		
Lumbrineris sp. A		
Lumbrineris sp. B		
Lumbrineris sp. X		
Lysilla loveni		
Lysippe labiata		
Magelona longicornis		
Maldane sarsi		
Marenzelleria wireni		175
Melaenis loveni		2
Melinna elisabethae		
Microclymene sp.		
Micronephthys minuta		
Minuspio cirrifera		570
Myriochele heeri		
Myriochele oculata		
Mystides borealis		2
Nemidia torelli		
Neosabellides sp.		
Nephtys caeca		
Nephtys ciliata		1
Nephtys discors		
Nephtys incisa		
Nephtys longosetosa		1
Nephtys paradoxa		
Nereimyra aphroditoides		24
Nereis zonata		
Nicolea zostericola		
Nicomache lumbricalis		
Nicon sp. A		
Nothria conchylega		
Notomastus latericeus		
Notoproctus oculatus		
Onuphis quadricuspis		
Ophelina acuminata		
Ophelina cylindricaudatus		2
Ophelina groenlandica		
Ophelina sp. A		
Ophryotrocha sp.		
Orbinia sp.		1
Owenia collaris		
Owenia fusiformis		
Paramphitrite tetrabranchia		1
Paranaitides wahlbergi		
Paraonis sp. A		
Parheteromastus sp. A		1
Petaloproctus tenuis		
Pherusa plumosa		
Pholoe minuta		
Pionosyllis compacta		
Pista cristata		
Polycirrus medusa		2
Polydora caulleryi		
Polydora quadrilobata		
Polydora socialis		
Polyphysia crassa		
Praxillella gracilis		
Praxillella praetermissa		5
Prionospio steenstrupi		
Proclea graffii		
Pygospio elegans		
Rhodine gracilior		
Sabella sp.		
Sabellastarte sp.		
Sabellides borealis		1
Scalibregma inflatum		46
Schistomeringos caeca		2
Schistomeringos sp. A		
Scoloplos acutus		
Scoloplos armiger		1
Sigambra tentaculata		
Sphaerodoridium claparedii		
Sphaerodoridium sp. A		1
Sphaerodoropsis biserialis		
Sphaerodoropsis minuta		13
Sphaerodoropsis sp. A		
Sphaerodoropsis sp. B		
Sphaerodorum gracilis		
Sphaerosyllis erinaceus		
Spinther sp.		
Spio filicornis		5
Spio theeli		2
Spiochaetopterus typicus		
Spiophanes bombyx		
Spirorbis granulatus		
Sternaspis scutata		
Syllides longocirrata		
Syllides sp.		
Tachytrypane abranchiata		
Tachytrypane sp. A		
Tauberia gracilis		
Terebellides stroemi		39
Tharyx ?acutus		9
Travisia sp.		2
Trichobranchus glacialis		
Trochochaeta carica		
Trochochaeta multisetosa		
Typosyllis cornuta		
Typosyllis fasciata		
unidentified		5
TOTAL 41 spp.		1429

Lumbriclymene minor		
Lumbrineris fragilis		
Lumbrineris impatiens		
Lumbrineris latreilli		
Lumbrineris minuta		
Lumbrineris sp. A		
Lumbrineris sp. B		
Lumbrineris sp. X		
Lysilla loveni		
Lysippe labiata		
Magelona longicornis		
Maldane sarsi		
Marenzelleria wireni		175
Melaenis loveni		2
Melinna elisabethae		
Microclymene sp.		
Micronephthys minuta		
Minuspio cirrifera		570
Myriochele heeri		
Myriochele oculata		
Mystides borealis		2
Nemidia torelli		
Neosabellides sp.		
Nephtys caeca		
Nephtys ciliata		1
Nephtys discors		
Nephtys incisa		
Nephtys longosetosa		1
Nephtys paradoxa		
Nereimyra aphroditoides		24
Nereis zonata		
Nicolea zostericola		
Nicomache lumbricalis		
Nicon sp. A		
Nothria conchylega		
Notomastus latericeus		
Notoproctus oculatus		
Onuphis quadricuspis		
Ophelina acuminata		
Ophelina cylindricaudatus		2
Ophelina groenlandica		
Ophelina sp. A		
Ophryotrocha sp.		
Orbinia sp.		1
Owenia collaris		
Owenia fusiformis		
Paramphitrite tetrabranchia		1
Paranaitides wahlbergi		
Paraonis sp. A		
Parheteromastus sp. A		1
Petaloproctus tenuis		
Pherusa plumosa		
Pholoe minuta		

Pionosyllis compacta		
Pista cristata		
Polycirrus medusa		2
Polydora caulleryi		
Polydora quadrilobata		
Polydora socialis		
Polyphysia crassa		
Praxillella gracilis		
Praxillella praetermissa		5
Prionospio steenstrupi		
Proclea graffii		
Pygospio elegans		
Rhodine gracilior		
Sabella sp.		
Sabellastarte sp.		
Sabellides borealis		1
Scalibregma inflatum		46
Schistomeringos caeca		2
Schistomeringos sp. A		
Scoloplos acutus		
Scoloplos armiger		1
Sigambra tentaculata		
Sphaerodoridium claparedii		
Sphaerodoridium sp. A		1
Sphaerodoropsis biserialis		
Sphaerodoropsis minuta		13
Sphaerodoropsis sp. A		
Sphaerodoropsis sp. B		
Sphaerodorum gracilis		
Sphaerosyllis erinaceus		
Spinther sp.		
Spio filicornis		5
Spio theeli		2
Spiochaetopterus typicus		
Spiophanes bombyx		
Spirorbis granulatus		
Sternaspis scutata		
Syllides longocirrata		
Syllides sp.		
Tachytrypane abranchiata		
Tachytrypane sp. A		
Tauberia gracilis		
Terebellides stroemi		39
Tharyx ?acutus		9
Travisia sp.		2
Trichobranchus glacialis		
Trochochaeta carica		
Trochochaeta multisetosa		
Typosyllis cornuta		
Typosyllis fasciata		
unidentified		5
TOTAL 41 spp.		1429

Appendix I (cont'd): Polychaete species data for Station NIB-15 (15m), Cruise OCS-5; accumulated from Smith-McIntyre Grab samples 1443, 1445, 1446, 1447 and 1448. The numbers represent totals per $0.5m^2$ of sea floor for the polychaetes retained on a 1.0 mm sieve.

		$\#/0.5m^2$
Aglaophamus malmgreni		
Allia abranchiata		
Allia nr *suecica*		1
Allia sp. B		
Allia sp. C		
Amage auricula		
Ampharete acutifrons		
Ampharete arctica		
Ampharete goësi		
Ampharete lindstromi		4
Ampharete vega		2
Ampharetidae - Genus A		
Ampharetidae - Genus B		
Amphicteis sundevalli		
Anaitides citrina		
Anaitides groenlandica		10
Antinoella badia		
Antinoella sarsi		3
Apistobranchus tullbergi		1
Apomatus globifer		
Arcteobia anticostiensis		
Arenicola glacialis		
Aricidea quadrilobata		
Aricidea tetrabranchiata		
Artacama proboscidea		
Autolytus alexandri		
Autolytus fallax		
Axionice flexuosa		
Axionice maculata		
Barantolla sp.		
Brada incrustata		
Brada inhabilis		
Brada nuda		
Brada villosa		6
Branchiomma infarcta		
Capitella capitata		6
Chaetozone setosa		38
Chone duneri		
Chone infundibuliformis		
Chone nr *murmanica*		9
Cirratulus cirratus		
Cistenides hyperborea		
Clymenura polaris		2
Cossura longocirrata		
Cossura sp. A		

		$\#/0.5m^2$
Dexiospira spirillum		
Diplocirrus glaucus		1
Diplocirrus hirsutus		1
Diplocirrus longisetosus		
Dorvillea sp.		
Dysponetus sp. N		1
Eclysippe sp. A		
Enipo gracilis		
Enipo canadensis		
Ephesiella macrocirrus		
Eteone flava		
Eteone longa		13
Eteone spetsbergensis		
Eteone (Mysta) barbata		
Euchone analis		
Euchone elegans		2
Euchone incolor		
Euchone papillosa		1
Euchone sp.		
Eucranta villosa		
Eunoe oerstedi		
Eusyllis blomstrandi		
Exogone dispar		5
Exogone naidina		1
Exogone sp.		
Fabricinae - sp. O		
Fabricinae - sp. R		
Fabrisabella schaudinni		
Flabelligera affinis		
Gattyana cirrosa		
Glycera capitata		
Glycinde wireni		
Glyphanostomum pallescens		
Harmothoe imbricata		
Hesionidae gen et sp. nov.		5
Heteromastus filiformis		11
Jasmineira sp.		
Lagisca extenuata		
Lanassa nordenskjoldi		
Lanassa venusta		
Laonice cirrata		
Laonome kroyeri		
Laphania boecki		6

		#/0.5m^2
Lumbriclymene minor		
Lumbrineris fragilis		
Lumbrineris impatiens		1
Lumbrineris latreilli		
Lumbrineris minuta		
Lumbrineris sp. A		
Lumbrineris sp. B		
Lumbrineris sp. X		
Lysilla loveni		
Lysippe labiata		3
Magelona longicornis		
Maldane sarsi		
Marenzelleria wireni		1
Melaenis loveni		2
Melinna elisabethae		
Microclymene sp.		3
Micronephthys minuta		23
Minuspio cirrifera		44
Myriochele heeri		
Myriochele oculata		
Mystides borealis		4
Nemidia torelli		
Neosabellides sp.		
Nephtys caeca		
Nephtys ciliata		1
Nephtys discors		
Nephtys incisa		
Nephtys longosetosa		
Nephtys paradoxa		
Nereimyra aphroditoides		11
Nereis zonata		
Nicolea zostericola		
Nicomache lumbricalis		
Nicon sp. A		
Nothria conchylega		
Notomastus latericeus		
Notoproctus oculatus		
Onuphis quadricuspis		
Ophelina acuminata		1
Ophelina cylindricaudatus		8
Ophelina groenlandica		
Ophelina sp. A		
Ophryotrocha sp.		
Orbinia sp.		
Owenia collaris		
Owenia fusiformis		
Paramphitrite tetrabranchia		
Paranaitides wahlbergi		
Paraonis sp. A		
Parheteromastus sp. A		5
Petaloproctus tenuis		
Pherusa plumosa		
Pholoe minuta		9

		#/0.5m^2
Pionosyllis compacta		
Pista cristata		
Polycirrus medusa		
Polydora caulleryi		
Polydora quadrilobata		
Polydora socialis		
Polyphysia crassa		
Praxillella gracilis		
Praxillella praetermissa		15
Prionospio steenstrupi		
Proclea graffii		1
Pygospio elegans		1
Rhodine gracilior		
Sabella sp.		
Sabellastarte sp.		
Sabellides borealis		
Scalibregma inflatum		4
Schistomeringos caeca		19
Schistomeringos sp. A		
Scoloplos acutus		4
Scoloplos armiger		1
Sigambra tentaculata		
Sphaerodoridium claparedii		
Sphaerodoridium sp. A		1
Sphaerodoropsis biserialis		
Sphaerodoropsis minuta		
Sphaerodoropsis sp. A		
Sphaerodoropsis sp. B		
Sphaerodorum gracilis		
Sphaerosyllis erinaceus		
Spinther sp.		
Spio filicornis		
Spio theeli		
Spiochaetopterus typicus		
Spiophanes bombyx		
Spirorbis granulatus		
Sternaspis scutata		
Syllides longocirrata		
Syllides sp.		
Tachytrypane abranchiata		
Tachytrypane sp. A		
Tauberia gracilis		
Terebellides stroemi		5
Tharyx ?acutus		42
Travisia sp.		
Trichobranchus glacialis		
Trochochaeta carica		
Trochochaeta multisetosa		
Typosyllis cornuta		
Typosyllis fasciata		
unidentified		8
TOTAL 46 spp.		346

		$\#/0.5m^2$
Lumbriclymene minor		
Lumbrineris fragilis		
Lumbrineris impatiens		1
Lumbrineris latreilli		
Lumbrineris minuta		
Lumbrineris sp. A		
Lumbrineris sp. B		
Lumbrineris sp. X		
Lysilla loveni		
Lysippe labiata		3
Magelona longicornis		
Maldane sarsi		
Marenzelleria wireni		1
Melaenis loveni		2
Melinna elisabethae		
Microclymene sp.		3
Micronephthys minuta		23
Minuspio cirrifera		44
Myriochele heeri		
Myriochele oculata		
Mystides borealis		4
Nemidia torelli		
Neosabellides sp.		
Nephtys caeca		
Nephtys ciliata		1
Nephtys discors		
Nephtys incisa		
Nephtys longosetosa		
Nephtys paradoxa		
Nereimyra aphroditoides		11
Nereis zonata		
Nicolea zostericola		
Nicomache lumbricalis		
Nicon sp. A		
Nothria conchylega		
Notomastus latericeus		
Notoproctus oculatus		
Onuphis quadricuspis		
Ophelina acuminata		1
Ophelina cylindricaudatus		8
Ophelina groenlandica		
Ophelina sp. A		
Ophryotrocha sp.		
Orbinia sp.		
Owenia collaris		
Owenia fusiformis		
Paramphitrite tetrabranchia		
Paranaitides wahlbergi		
Paraonis sp. A		
Parheteromastus sp. A		5
Petaloproctus tenuis		
Pherusa plumosa		
Pholoe minuta		9

		$\#/0.5m^2$
Pionosyllis compacta		
Pista cristata		
Polycirrus medusa		
Polydora caulleryi		
Polydora quadrilobata		
Polydora socialis		
Polyphysia crassa		
Praxillella gracilis		
Praxillella praetermissa		15
Prionospio steenstrupi		
Proclea graffii		1
Pygospio elegans		1
Rhodine gracilior		
Sabella sp.		
Sabellastarte sp.		
Sabellides borealis		
Scalibregma inflatum		4
Schistomeringos caeca		19
Schistomeringos sp. A		
Scoloplos acutus		4
Scoloplos armiger		1
Sigambra tentaculata		
Sphaerodoridium claparedii		
Sphaerodoridium sp. A		1
Sphaerodoropsis biserialis		
Sphaerodoropsis minuta		
Sphaerodoropsis sp. A		
Sphaerodoropsis sp. B		
Sphaerodorum gracilis		
Sphaerosyllis erinaceus		
Spinther sp.		
Spio filicornis		
Spio theeli		
Spiochaetopterus typicus		
Spiophanes bombyx		
Spirorbis granulatus		
Sternaspis scutata		
Syllides longocirrata		
Syllides sp.		
Tachytrypane abranchiata		
Tachytrypane sp. A		
Tauberia gracilis		
Terebellides stroemi		5
Tharyx ?acutus		42
Travisia sp.		
Trichobranchus glacialis		
Trochochaeta carica		
Trochochaeta multisetosa		
Typosyllis cornuta		
Typosyllis fasciata		
unidentified		8
TOTAL 46 spp.		346

Appendix I (cont'd): Polychaete species data for Station NIB-25 (25m), Cruise OCS-5; accumulated from Smith-McIntyre Grab samples 1294, 1295, 1296, 1297 and 1298. The numbers represent totals per $0.5m^2$ of sea floor for the polychaetes retained on a 1.0 mm sieve.

		$\#/0.5m^2$
Aglaophamus malmgreni		2
Allia abranchiata		
Allia nr *suecica*		2
Allia sp. B		
Allia sp. C		
Amage auricula		
Ampharete acutifrons		2
Ampharete arctica		
Ampharete goësi		
Ampharete lindstromi		
Ampharete vega		
Ampharetidae - Genus A		
Ampharetidae - Genus B		
Amphicteis sundevalli		
Anaitides citrina		
Anaitides groenlandica		
Antinoella badia		
Antinoella sarsi		3
Apistobranchus tullbergi		
Apomatus globifer		
Arcteobia anticostiensis		
Arenicola glacialis		
Aricidea quadrilobata		
Aricidea tetrabranchiata		
Artacama proboscidea		
Autolytus alexandri		
Autolytus fallax		
Axionice flexuosa		
Axionice maculata		
Cheilonereis sp.		1
Barantolla sp.		
Brada incrustata		
Brada inhabilis		1
Brada nuda		
Brada villosa		4
Branchiomma infarcta		
Capitella capitata		2
Chaetozone setosa		3
Chone duneri		
Chone infundibuliformis		
Chone nr *murmanica*		18
Cirratulus cirratus		
Cistenides hyperborea		
Clymenura polaris		23
Cossura longocirrata		2
Cossura sp. A		
Dexiospira spirillum		
Diplocirrus glaucus		
Diplocirrus hirsutus		
Diplocirrus longisetosus		
Dorvillea sp.		
Dysponetus sp. N		
Eclysippe sp. A		
Enipo gracilis		
Enipo canadensis		
Ephesiella macrocirrus		
Eteone flava		
Eteone longa		1
Eteone spetsbergensis		
Eteone (Mysta) barbata		
Euchone analis		
Euchone elegans		
Euchone incolor		
Euchone papillosa		
Euchone sp.		2
Eucranta villosa		
Eunoe oerstedi		
Eusyllis blomstrandi		
Exogone dispar		
Exogone naidina		
Exogone sp.		
Fabricinae - sp. O		
Fabricinae - sp. R		
Fabrisabella schaudinni		
Flabelligera affinis		
Gattyana cirrosa		
Glycera capitata		
Glycinde wireni		
Glyphanostomum pallescens		2
Harmothoe imbricata		
Hesionidae gen et sp. nov.		2
Heteromastus filiformis		17
Jasmineira sp.		
Lagisca extenuata		
Lanassa nordenskjoldi		
Lanassa venusta		
Laonice cirrata		1
Laonome kroyeri		
Laphania boecki		1

		#/0.5m^2
Lumbriclymene minor		
Lumbrineris fragilis		
Lumbrineris impatiens		
Lumbrineris latreilli		
Lumbrineris minuta		
Lumbrineris sp. A		
Lumbrineris sp. B		
Lumbrineris sp. X		
Lysilla loveni		
Lysippe labiata		2
Magelona longicornis		
Maldane sarsi		
Marenzelleria wireni		
Melaenis loveni		
Melinna elisabethae		1
Microclymene sp.		
Micronephthys minuta		4
Minuspio cirrifera		
Myriochele heeri		
Myriochele oculata		
Mystides borealis		1
Nemidia torelli		
Neosabellides sp.		
Nephtys caeca		
Nephtys ciliata		1
Nephtys discors		
Nephtys incisa		
Nephtys longosetosa		1
Nephtys paradoxa		
Nereimyra aphroditoides		2
Nereis zonata		
Nicolea zostericola		
Nicomache lumbricalis		
Nicon sp. A		
Nothria conchylega		
Notomastus latericeus		
Notoproctus oculatus		
Onuphis quadricuspis		
Ophelina acuminata		
Ophelina cylindricaudatus		36
Ophelina groenlandica		
Ophelina sp. A		
Ophryotrocha sp.		
Orbinia sp.		
Owenia collaris		
Owenia fusiformis		
Paramphitrite tetrabranchia		
Paranaitides wahlbergi		
Paraonis sp. A		
Parheteromastus sp. A		2
Petaloproctus tenuis		
Pherusa plumosa		
Pholoe minuta		9

		#/0.5m^2
Pionosyllis compacta		
Pista cristata		
Polycirrus medusa		
Polydora caulleryi		
Polydora quadrilobata		
Polydora socialis		
Polyphysia crassa		
Praxillella gracilis		
Praxillella praetermissa		
Prionospio steenstrupi		29
Proclea graffii		2
Pygospio elegans		
Rhodine gracilior		
Sabella sp.		
Sabellastarte sp.		
Sabellides borealis		
Scalibregma inflatum		2
Schistomeringos caeca		
Schistomeringos sp. A		
Scoloplos acutus		
Scoloplos armiger		
Sigambra tentaculata		
Sphaerodoridium claparedii		
Sphaerodoridium sp. A		
Sphaerodoropsis biserialis		
Sphaerodoropsis minuta		
Sphaerodoropsis sp. A		
Sphaerodoropsis sp. B		
Sphaerodorum gracilis		
Sphaerosyllis erinaceus		
Spinther sp.		
Spio filicornis		
Spio theeli		
Spiochaetopterus typicus		
Spiophanes bombyx		
Spirorbis granulatus		
Sternaspis scutata		
Syllides longocirrata		
Syllides sp.		
Tachytrypane abranchiata		
Tachytrypane sp. A		
Tauberia gracilis		1
Terebellides stroemi		1
Tharyx ?acutus		36
Travisia sp.		
Trichobranchus glacialis		
Trochochaeta carica		
Trochochaeta multisetosa		
Typosyllis cornuta		
Typosyllis fasciata		
unidentified		14
TOTAL 35 spp.		233

		#/0.5m^2
Lumbriclymene minor		
Lumbrineris fragilis		
Lumbrineris impatiens		
Lumbrineris latreilli		
Lumbrineris minuta		
Lumbrineris sp. A		
Lumbrineris sp. B		
Lumbrineris sp. X		
Lysilla loveni		
Lysippe labiata		2
Magelona longicornis		
Maldane sarsi		
Marenzelleria wireni		
Melaenis loveni		
Melinna elisabethae		1
Microclymene sp.		
Micronephthys minuta		4
Minuspio cirrifera		
Myriochele heeri		
Myriochele oculata		
Mystides borealis		1
Nemidia torelli		
Neosabellides sp.		
Nephtys caeca		
Nephtys ciliata		1
Nephtys discors		
Nephtys incisa		
Nephtys longosetosa		1
Nephtys paradoxa		
Nereimyra aphroditoides		2
Nereis zonata		
Nicolea zostericola		
Nicomache lumbricalis		
Nicon sp. A		
Nothria conchylega		
Notomastus latericeus		
Notoproctus oculatus		
Onuphis quadricuspis		
Ophelina acuminata		
Ophelina cylindricaudatus		36
Ophelina groenlandica		
Ophelina sp. A		
Ophryotrocha sp.		
Orbinia sp.		
Owenia collaris		
Owenia fusiformis		
Paramphitrite tetrabranchia		
Paranaitides wahlbergi		
Paraonis sp. A		
Parheteromastus sp. A		2
Petaloproctus tenuis		
Pherusa plumosa		
Pholoe minuta		9

		#/0.5m^2
Pionosyllis compacta		
Pista cristata		
Polycirrus medusa		
Polydora caulleryi		
Polydora quadrilobata		
Polydora socialis		
Polyphysia crassa		
Praxillella gracilis		
Praxillella praetermissa		
Prionospio steenstrupi		29
Proclea graffii		2
Pygospio elegans		
Rhodine gracilior		
Sabella sp.		
Sabellastarte sp.		
Sabellides borealis		
Scalibregma inflatum		2
Schistomeringos caeca		
Schistomeringos sp. A		
Scoloplos acutus		
Scoloplos armiger		
Sigambra tentaculata		
Sphaerodoridium claparedii		
Sphaerodoridium sp. A		
Sphaerodoropsis biserialis		
Sphaerodoropsis minuta		
Sphaerodoropsis sp. A		
Sphaerodoropsis sp. B		
Sphaerodorum gracilis		
Sphaerosyllis erinaceus		
Spinther sp.		
Spio filicornis		
Spio theeli		
Spiochaetopterus typicus		
Spiophanes bombyx		
Spirorbis granulatus		
Sternaspis scutata		
Syllides longocirrata		
Syllides sp.		
Tachytrypane abranchiata		
Tachytrypane sp. A		
Tauberia gracilis		1
Terebellides stroemi		1
Tharyx ?acutus		36
Travisia sp.		
Trichobranchus glacialis		
Trochochaeta carica		
Trochochaeta multisetosa		
Typosyllis cornuta		
Typosyllis fasciata		
unidentified		14
TOTAL 35 spp.		233

Appendix I (cont'd): Polychaete species data for Station BAB-5 (5m), Cruise OCS-5; accumulated from Smith-McIntyre Grab samples 1479, 1480, 1481, 1482 and 1483. The numbers represent totals per $0.5m^2$ of sea floor for the polychaetes retained on a 1.0 mm sieve.

		#/$0.5m^2$			#/$0.5m^2$
Aglaophamus malmgreni			*Dexiospira spirillum*		
Allia abranchiata			*Diplocirrus glaucus*		
Allia nr *suecica*			*Diplocirrus hirsutus*		
Allia sp. B			*Diplocirrus longisetosus*		
Allia sp. C			*Dorvillea sp.*		
Amage auricula			*Dysponetus sp. N*		
Ampharete acutifrons		1			
Ampharete arctica			*Eclysippe sp. A*		
Ampharete goësi			*Enipo gracilis*		
Ampharete lindstromi			*Enipo canadensis*		
Ampharete vega		226	*Ephesiella macrocirrus*		
Ampharetidae - Genus A			*Eteone flava*		
Ampharetidae - Genus B			*Eteone longa*		7
Amphicteis sundevalli			*Eteone spetsbergensis*		
Anaitides citrina			*Eteone (Mysta) barbata*		
Anaitides groenlandica		1	*Euchone analis*		
Antinoella badia			*Euchone elegans*		
Antinoella sarsi			*Euchone incolor*		
Apistobranchus tullbergi		1	*Euchone papillosa*		
Apomatus globifer			*Euchone sp.*		
Arcteobia anticostiensis		3	*Eucranta villosa*		
Arenicola glacialis		1	*Eunoe oerstedi*		
Aricidea quadrilobata			*Eusyllis blomstrandi*		
Aricidea tetrabranchiata			*Exogone dispar*		
Artacama proboscidea			*Exogone naidina*		
Autolytus alexandri			*Exogone sp.*		
Autolytus fallax			*Fabricinae - sp. O*		
Axionice flexuosa			*Fabricinae - sp. R*		
Axionice maculata			*Fabrisabella schaudinni*		
			Flabelligera affinis		
Barantolla sp.					
Brada incrustata			*Gattyana cirrosa*		
Brada inhabilis			*Glycera capitata*		
Brada nuda			*Glycinde wireni*		
Brada villosa			*Glyphanostomum pallescens*		
Branchiomma infarcta			*Harmothoe imbricata*		
Capitella capitata			*Hesionidae gen et sp. nov.*		
Chaetozone setosa		3	*Heteromastus filiformis*		
Chone duneri			*Jasmineira sp.*		
Chone infundibuliformis					
Chone nr *murmanica*		127	*Lagisca extenuata*		
Cirratulus cirratus			*Lanassa nordenskjoldi*		
Cistenides hyperborea			*Lanassa venusta*		
Clymenura polaris			*Laonice cirrata*		
Cossura longocirrata			*Laonome kroyeri*		
Cossura sp. A			*Laphania boecki*		

		$\#/0.5m^2$
Lumbriclymene minor		
Lumbrineris fragilis		
Lumbrineris impatiens		
Lumbrineris latreilli		
Lumbrineris minuta		
Lumbrineris sp. A		
Lumbrineris sp. B		
Lumbrineris sp. X		
Lysilla loveni		
Lysippe labiata		
Magelona longicornis		
Maldane sarsi		
Marenzelleria wireni		33
Melaenis loveni		
Melinna elisabethae		
Microclymene sp.		
Micronephthys minuta		
Minuspio cirrifera		217
Myriochele heeri		
Myriochele oculata		
Mystides borealis		1
Nemidia torelli		
Neosabellides sp.		
Nephtys caeca		
Nephtys ciliata		
Nephtys discors		
Nephtys incisa		
Nephtys longosetosa		
Nephtys paradoxa		
Nereimyra aphroditoides		5
Nereis zonata		
Nicolea zostericola		
Nicomache lumbricalis		
Nicon sp. A		
Nothria conchylega		
Notomastus latericeus		
Notoproctus oculatus		
Onuphis quadricuspis		
Ophelina acuminata		
Ophelina cylindricaudatus		
Ophelina groenlandica		
Ophelina sp. A		
Ophryotrocha sp.		3
Orbinia sp.		1
Owenia collaris		
Owenia fusiformis		
Paramphitrite tetrabranchia		1
Paranaitides wahlbergi		
Paraonis sp. A		
Parheteromastus sp. A		
Petaloproctus tenuis		
Pherusa plumosa		
Pholoe minuta		

		$\#/0.5m^2$
Pionosyllis compacta		
Pista cristata		
Polycirrus medusa		
Polydora caulleryi		
Polydora quadrilobata		
Polydora socialis		
Polyphysia crassa		
Praxillella gracilis		
Praxillella praetermissa		
Prionospio steenstrupi		
Proclea graffii		
Pygospio elegans		
Rhodine gracilior		
Sabella sp.		
Sabellastarte sp.		
Sabellides borealis		
Scalibregma inflatum		
Schistomeringos caeca		
Schistomeringos sp. A		
Scoloplos acutus		
Scoloplos armiger		115
Sigambra tentaculata		
Sphaerodoridium claparedii		
Sphaerodoridium sp. A		22
Sphaerodoropsis biserialis		
Sphaerodoropsis minuta		112
Sphaerodoropsis sp. A		
Sphaerodoropsis sp. B		
Sphaerodorum gracilis		
Sphaerosyllis erinaceus		
Spinther sp.		
Spio filicornis		
Spio theeli		1
Spiochaetopterus typicus		
Spiophanes bombyx		
Spirorbis granulatus		
Sternaspis scutata		
Syllides longocirrata		
Syllides sp.		
Tachytrypane abranchiata		
Tachytrypane sp. A		
Tauberia gracilis		
Terebellides stroemi		10
Tharyx ?acutus		25
Travisia sp.		
Trichobranchus glacialis		
Trochochaeta carica		
Trochochaeta multisetosa		
Typosyllis cornuta		
Typosyllis fasciata		
unidentified		1
TOTAL 22 spp.		917

		$\#/0.5m^2$
Lumbriclymene minor		
Lumbrineris fragilis		
Lumbrineris impatiens		
Lumbrineris latreilli		
Lumbrineris minuta		
Lumbrineris sp. A		
Lumbrineris sp. B		
Lumbrineris sp. X		
Lysilla loveni		
Lysippe labiata		
Magelona longicornis		
Maldane sarsi		
Marenzelleria wireni		33
Melaenis loveni		
Melinna elisabethae		
Microclymene sp.		
Micronephthys minuta		
Minuspio cirrifera		217
Myriochele heeri		
Myriochele oculata		
Mystides borealis		1
Nemidia torelli		
Neosabellides sp.		
Nephtys caeca		
Nephtys ciliata		
Nephtys discors		
Nephtys incisa		
Nephtys longosetosa		
Nephtys paradoxa		
Nereimyra aphroditoides		5
Nereis zonata		
Nicolea zostericola		
Nicomache lumbricalis		
Nicon sp. A		
Nothria conchylega		
Notomastus latericeus		
Notoproctus oculatus		
Onuphis quadricuspis		
Ophelina acuminata		
Ophelina cylindricaudatus		
Ophelina groenlandica		
Ophelina sp. A		
Ophryotrocha sp.		3
Orbinia sp.		1
Owenia collaris		
Owenia fusiformis		
Paramphitrite tetrabranchia		1
Paranaitides wahlbergi		
Paraonis sp. A		
Parheteromastus sp. A		
Petaloproctus tenuis		
Pherusa plumosa		
Pholoe minuta		

		$\#/0.5m^2$
Pionosyllis compacta		
Pista cristata		
Polycirrus medusa		
Polydora caulleryi		
Polydora quadrilobata		
Polydora socialis		
Polyphysia crassa		
Praxillella gracilis		
Praxillella praetermissa		
Prionospio steenstrupi		
Proclea graffii		
Pygospio elegans		
Rhodine gracilior		
Sabella sp.		
Sabellastarte sp.		
Sabellides borealis		
Scalibregma inflatum		
Schistomeringos caeca		
Schistomeringos sp. A		
Scoloplos acutus		
Scoloplos armiger		115
Sigambra tentaculata		
Sphaerodoridium claparedii		
Sphaerodoridium sp. A		22
Sphaerodoropsis biserialis		
Sphaerodoropsis minuta		112
Sphaerodoropsis sp. A		
Sphaerodoropsis sp. B		
Sphaerodorum gracilis		
Sphaerosyllis erinaceus		
Spinther sp.		
Spio filicornis		
Spio theeli		1
Spiochaetopterus typicus		
Spiophanes bombyx		
Spirorbis granulatus		
Sternaspis scutata		
Syllides longocirrata		
Syllides sp.		
Tachytrypane abranchiata		
Tachytrypane sp. A		
Tauberia gracilis		
Terebellides stroemi		10
Tharyx ?acutus		25
Travisia sp.		
Trichobranchus glacialis		
Trochochaeta carica		
Trochochaeta multisetosa		
Typosyllis cornuta		
Typosyllis fasciata		
unidentified		1
TOTAL 22 spp.		917

Appendix I (cont'd): Polychaete species data for Station BAB-10 (10m), Cruise OCS-5; accumulated from Smith-McIntyre Grab samples 1473, 1475, 1476, 1477 and 1478. The numbers represent totals per $0.5m^2$ of sea floor for the polychaetes retained on a 1.0 mm sieve.

		$\#/0.5m^2$
Aglaophamus malmgreni		
Allia abranchiata		
Allia nr *suecica*		
Allia sp. B		
Allia sp. C		1
Amage auricula		
Ampharete acutifrons		1
Ampharete arctica		
Ampharete goësi		
Ampharete lindstromi		
Ampharete vega		39
Ampharetidae - Genus A		
Ampharetidae - Genus B		
Amphicteis sundevalli		
Anaitides citrina		
Anaitides groenlandica		2
Antinoella badia		
Antinoella sarsi		
Apistobranchus tullbergi		10
Apomatus globifer		
Arcteobia anticostiensis		
Arenicola glacialis		
Aricidea quadrilobata		
Aricidea tetrabranchiata		
Artacama proboscidea		
Autolytus alexandri		
Autolytus fallax		
Axionice flexuosa		
Axionice maculata		
Barantolla sp.		
Brada incrustata		
Brada inhabilis		
Brada nuda		
Brada villosa		3
Branchiomma infarcta		
Capitella capitata		5
Chaetozone setosa		5
Chone duneri		
Chone infundibuliformis		
Chone nr *murmanica*		
Cirratulus cirratus		
Cistenides hyperborea		
Clymenura polaris		
Cossura longocirrata		
Cossura sp. A		

		$\#/0.5m^2$
Dexiospira spirillum		
Diplocirrus glaucus		
Diplocirrus hirsutus		
Diplocirrus longisetosus		
Dorvillea sp.		
Dysponetus sp. N		
Eclysippe sp. A		
Enipo gracilis		
Enipo canadensis		
Ephesiella macrocirrus		
Eteone flava		
Eteone longa		14
Eteone spetsbergensis		
Eteone (Mysta) barbata		
Euchone analis		
Euchone elegans		
Euchone incolor		
Euchone papillosa		
Euchone sp.		
Eucranta villosa		
Eunoe oerstedi		
Eusyllis blomstrandi		
Exogone dispar		
Exogone naidina		
Exogone sp.		
Fabricinae - sp. O		
Fabricinae - sp. R		
Fabrisabella schaudinni		
Flabelligera affinis		
Gattyana cirrosa		
Glycera capitata		
Glycinde wireni		
Glyphanostomum pallescens		
Harmothoe imbricata		
Hesionidae gen et sp. nov.		
Heteromastus filiformis		3
Jasmineira sp.		
Lagisca extenuata		
Lanassa nordenskjoldi		
Lanassa venusta		
Laonice cirrata		
Laonome kroyeri		
Laphania boecki		

		$\#/0.5m^2$
Lumbriclymene minor		
Lumbrineris fragilis		
Lumbrineris impatiens		
Lumbrineris latreilli		
Lumbrineris minuta		
Lumbrineris sp. A		
Lumbrineris sp. B		
Lumbrineris sp. X		
Lysilla loveni		
Lysippe labiata		
Magelona longicornis		
Maldane sarsi		
Marenzelleria wireni		8
Melaenis loveni		
Melinna elisabethae		
Microclymene sp.		1
Micronephthys minuta		13
Minuspio cirrifera		351
Myriochele heeri		
Myriochele oculata		
Mystides borealis		
Nemidia torelli		
Neosabellides sp.		
Nephtys caeca		
Nephtys ciliata		
Nephtys discors		
Nephtys incisa		
Nephtys longosetosa		5
Nephtys paradoxa		
Nereimyra aphroditoides		1
Nereis zonata		
Nicolea zostericola		
Nicomache lumbricalis		
Nicon sp. A		
Nothria conchylega		
Notomastus latericeus		
Notoproctus oculatus		
Onuphis quadricuspis		
Ophelina acuminata		
Ophelina cylindricaudatus		
Ophelina groenlandica		
Ophelina sp. A		
Ophryotrocha sp.		2
Orbinia sp.		
Owenia collaris		
Owenia fusiformis		
Paramphitrite tetrabranchia		1
Paranaitides wahlbergi		
Paraonis sp. A		
Parheteromastus sp. A		4
Petaloproctus tenuis		
Pherusa plumosa		
Pholoe minuta		

		$\#/0.5m^2$
Pionosyllis compacta		
Pista cristata		
Polycirrus medusa		2
Polydora caulleryi		
Polydora quadrilobata		
Polydora socialis		
Polyphysia crassa		
Praxillella gracilis		
Praxillella praetermissa		
Prionospio steenstrupi		
Proclea graffii		1
Pygospio elegans		
Rhodine gracilior		
Sabella sp.		
Sabellastarte sp.		
Sabellides borealis		
Scalibregma inflatum		7
Schistomeringos caeca		1
Schistomeringos sp. A		
Scoloplos acutus		
Scoloplos armiger		16
Sigambra tentaculata		
Sphaerodoridium claparedii		
Sphaerodoridium sp. A		
Sphaerodoropsis biserialis		
Sphaerodoropsis minuta		4
Sphaerodoropsis sp. A		
Sphaerodoropsis sp. B		
Sphaerodorum gracilis		
Sphaerosyllis erinaceus		
Spinther sp.		
Spio filicornis		
Spio theeli		3
Spiochaetopterus typicus		
Spiophanes bombyx		
Spirorbis granulatus		
Sternaspis scutata		
Syllides longocirrata		
Syllides sp.		
Tachytrypane abranchiata		
Tachytrypane sp. A		
Tauberia gracilis		
Terebellides stroemi		18
Tharyx ?acutus		27
Travisia sp.		
Trichobranchus glacialis		
Trochochaeta carica		
Trochochaeta multisetosa		
Typosyllis cornuta		
Typosyllis fasciata		
unidentified		
TOTAL 28 spp.		548

		$\#/0.5m^2$
Lumbriclymene minor		
Lumbrineris fragilis		
Lumbrineris impatiens		
Lumbrineris latreilli		
Lumbrineris minuta		
Lumbrineris sp. A		
Lumbrineris sp. B		
Lumbrineris sp. X		
Lysilla loveni		
Lysippe labiata		
Magelona longicornis		
Maldane sarsi		
Marenzelleria wireni		8
Melaenis loveni		
Melinna elisabethae		
Microclymene sp.		1
Micronephthys minuta		13
Minuspio cirrifera		351
Myriochele heeri		
Myriochele oculata		
Mystides borealis		
Nemidia torelli		
Neosabellides sp.		
Nephtys caeca		
Nephtys ciliata		
Nephtys discors		
Nephtys incisa		
Nephtys longosetosa		5
Nephtys paradoxa		
Nereimyra aphroditoides		1
Nereis zonata		
Nicolea zostericola		
Nicomache lumbricalis		
Nicon sp. A		
Nothria conchylega		
Notomastus latericeus		
Notoproctus oculatus		
Onuphis quadricuspis		
Ophelina acuminata		
Ophelina cylindricaudatus		
Ophelina groenlandica		
Ophelina sp. A		
Ophryotrocha sp.		2
Orbinia sp.		
Owenia collaris		
Owenia fusiformis		
Paramphitrite tetrabranchia		1
Paranaitides wahlbergi		
Paraonis sp. A		
Parheteromastus sp. A		4
Petaloproctus tenuis		
Pherusa plumosa		
Pholoe minuta		

		$\#/0.5m^2$
Pionosyllis compacta		
Pista cristata		
Polycirrus medusa		2
Polydora caulleryi		
Polydora quadrilobata		
Polydora socialis		
Polyphysia crassa		
Praxillella gracilis		
Praxillella praetermissa		
Prionospio steenstrupi		
Proclea graffii		1
Pygospio elegans		
Rhodine gracilior		
Sabella sp.		
Sabellastarte sp.		
Sabellides borealis		
Scalibregma inflatum		7
Schistomeringos caeca		1
Schistomeringos sp. A		
Scoloplos acutus		
Scoloplos armiger		16
Sigambra tentaculata		
Sphaerodoridium claparedii		
Sphaerodoridium sp. A		
Sphaerodoropsis biserialis		
Sphaerodoropsis minuta		4
Sphaerodoropsis sp. A		
Sphaerodoropsis sp. B		
Sphaerodorum gracilis		
Sphaerosyllis erinaceus		
Spinther sp.		
Spio filicornis		
Spio theeli		3
Spiochaetopterus typicus		
Spiophanes bombyx		
Spirorbis granulatus		
Sternaspis scutata		
Syllides longocirrata		
Syllides sp.		
Tachytrypane abranchiata		
Tachytrypane sp. A		
Tauberia gracilis		
Terebellides stroemi		18
Tharyx ?acutus		27
Travisia sp.		
Trichobranchus glacialis		
Trochochaeta carica		
Trochochaeta multisetosa		
Typosyllis cornuta		
Typosyllis fasciata		
unidentified		
TOTAL 28 spp.		548

Appendix I (cont'd): Polychaete species data for Station BAB-15 (15m), Cruise OCS-5; accumulated from Smith-McIntyre Grab samples 1467, 1468, 1469, 1470 and 1471. The numbers represent totals per $0.5m^2$ of sea floor for the polychaetes retained on a 1.0 mm sieve.

		$\#/0.5m^2$
Aglaophamus malmgreni		
Allia abranchiata		
Allia nr *suecica*		16
Allia sp. B		1
Allia sp. C		9
Amage auricula		
Ampharete acutifrons		
Ampharete arctica		
Ampharete goësi		
Ampharete lindstromi		4
Ampharete vega		3
Ampharetidae - Genus A		
Ampharetidae - Genus B		
Amphicteis sundevalli		
Anaitides citrina		
Anaitides groenlandica		4
Antinoella badia		
Antinoella sarsi		4
Apistobranchus tullbergi		17
Apomatus globifer		
Arcteobia anticostiensis		
Arenicola glacialis		
Aricidea quadrilobata		
Aricidea tetrabranchiata		
Artacama proboscidea		
Autolytus alexandri		
Autolytus fallax		
Axionice flexuosa		
Axionice maculata		
Barantolla sp.		
Brada incrustata		1
Brada inhabilis		
Brada nuda		
Brada villosa		40
Branchiomma infarcta		
Capitella capitata		17
Chaetozone setosa		10
Chone duneri		
Chone infundibuliformis		
Chone nr *murmanica*		4
Cirratulus cirratus		
Cistenides hyperborea		1
Clymenura polaris		
Cossura longocirrata		
Cossura sp. A		

		$\#/0.5m^2$
Dexiospira spirillum		
Diplocirrus glaucus		
Diplocirrus hirsutus		
Diplocirrus longisetosus		
Dorvillea sp.		
Dysponetus sp. N		14
Eclysippe sp. A		
Enipo gracilis		
Enipo canadensis		
Ephesiella macrocirrus		
Eteone flava		
Eteone longa		7
Eteone spetsbergensis		2
Eteone (Mysta) barbata		
Euchone analis		
Euchone elegans		1
Euchone incolor		
Euchone papillosa		4
Euchone sp.		4
Eucranta villosa		
Eunoe oerstedi		
Eusyllis blomstrandi		
Exogone dispar		
Exogone naidina		
Exogone sp.		
Fabricinae - sp. O		
Fabricinae - sp. R		
Fabrisabella schaudinni		
Flabelligera affinis		
Gattyana cirrosa		
Glycera capitata		
Glycinde wireni		
Glyphanostomum pallescens		
Harmothoe imbricata		
Hesionidae gen et sp. nov.		60
Heteromastus filiformis		12
Jasmineira sp.		
Lagisca extenuata		
Lanassa nordenskjoldi		
Lanassa venusta		
Laonice cirrata		
Laonome kroyeri		4
Laphania boecki		

		#/0.5m^2
Lumbriclymene minor		
Lumbrineris fragilis		
Lumbrineris impatiens		
Lumbrineris latreilli		
Lumbrineris minuta		1
Lumbrineris sp. A		
Lumbrineris sp. B		
Lumbrineris sp. X		
Lysilla loveni		
Lysippe labiata		2
Magelona longicornis		
Maldane sarsi		
Marenzelleria wireni		
Melaenis loveni		2
Melinna elisabethae		
Microclymene sp.		102
Micronephthys minuta		133
Minuspio cirrifera		162
Myriochele heeri		
Myriochele oculata		
Mystides borealis		1
Nemidia torelli		
Neosabellides sp.		
Nephtys caeca		
Nephtys ciliata		2
Nephtys discors		
Nephtys incisa		
Nephtys longosetosa		8
Nephtys paradoxa		
Nereimyra aphroditoides		28
Nereis zonata		
Nicolea zostericola		
Nicomache lumbricalis		
Nicon sp. A		
Nothria conchylega		
Notomastus latericeus		
Notoproctus oculatus		
Onuphis quadricuspis		
Ophelina acuminata		
Ophelina cylindricaudatus		6
Ophelina groenlandica		1
Ophelina sp. A		
Ophryotrocha sp.		23
Orbinia sp.		
Owenia collaris		
Owenia fusiformis		
Paramphitrite tetrabranchia		
Paranaitides wahlbergi		
Paraonis sp. A		
Parheteromastus sp. A		8
Petaloproctus tenuis		
Pherusa plumosa		
Pholoe minuta		6

		#/0.5m^2
Pionosyllis compacta		
Pista cristata		
Polycirrus medusa		
Polydora caulleryi		
Polydora quadrilobata		
Polydora socialis		2
Polyphysia crassa		
Praxillella gracilis		
Praxillella praetermissa		19
Prionospio steenstrupi		
Proclea graffii		
Pygospio elegans		1
Rhodine gracilior		
Sabella sp.		
Sabellastarte sp.		
Sabellides borealis		
Scalibregma inflatum		3
Schistomeringos caeca		47
Schistomeringos sp. A		
Scoloplos acutus		2
Scoloplos armiger		
Sigambra tentaculata		
Sphaerodoridium claparedii		
Sphaerodoridium sp. A		
Sphaerodoropsis biserialis		
Sphaerodoropsis minuta		1
Sphaerodoropsis sp. A		
Sphaerodoropsis sp. B		
Sphaerodorum gracilis		
Sphaerosyllis erinaceus		
Spinther sp.		
Spio filicornis		
Spio theeli		
Spiochaetopterus typicus		
Spiophanes bombyx		
Spirorbis granulatus		
Sternaspis scutata		
Syllides longocirrata		
Syllides sp.		
Tachytrypane abranchiata		
Tachytrypane sp. A		
Tauberia gracilis		1
Terebellides stroemi		7
Tharyx ?acutus		155
Travisia sp.		
Trichobranchus glacialis		
Trochochaeta carica		
Trochochaeta multisetosa		
Typosyllis cornuta		
Typosyllis fasciata		
unidentified		11
TOTAL 48 spp.		973

		#/0.5m^2
Lumbriclymene minor		
Lumbrineris fragilis		
Lumbrineris impatiens		
Lumbrineris latreilli		
Lumbrineris minuta		1
Lumbrineris sp. A		
Lumbrineris sp. B		
Lumbrineris sp. X		
Lysilla loveni		
Lysippe labiata		2
Magelona longicornis		
Maldane sarsi		
Marenzelleria wireni		
Melaenis loveni		2
Melinna elisabethae		
Microclymene sp.		102
Micronephthys minuta		133
Minuspio cirrifera		162
Myriochele heeri		
Myriochele oculata		
Mystides borealis		1
Nemidia torelli		
Neosabellides sp.		
Nephtys caeca		
Nephtys ciliata		2
Nephtys discors		
Nephtys incisa		
Nephtys longosetosa		8
Nephtys paradoxa		
Nereimyra aphroditoides		28
Nereis zonata		
Nicolea zostericola		
Nicomache lumbricalis		
Nicon sp. A		
Nothria conchylega		
Notomastus latericeus		
Notoproctus oculatus		
Onuphis quadricuspis		
Ophelina acuminata		
Ophelina cylindricaudatus		6
Ophelina groenlandica		1
Ophelina sp. A		
Ophryotrocha sp.		23
Orbinia sp.		
Owenia collaris		
Owenia fusiformis		
Paramphitrite tetrabranchia		
Paranaitides wahlbergi		
Paraonis sp. A		
Parheteromastus sp. A		8
Petaloproctus tenuis		
Pherusa plumosa		
Pholoe minuta		6

		#/0.5m^2
Pionosyllis compacta		
Pista cristata		
Polycirrus medusa		
Polydora caulleryi		
Polydora quadrilobata		
Polydora socialis		2
Polyphysia crassa		
Praxillella gracilis		
Praxillella praetermissa		19
Prionospio steenstrupi		
Proclea graffii		
Pygospio elegans		1
Rhodine gracilior		
Sabella sp.		
Sabellastarte sp.		
Sabellides borealis		
Scalibregma inflatum		3
Schistomeringos caeca		47
Schistomeringos sp. A		
Scoloplos acutus		2
Scoloplos armiger		
Sigambra tentaculata		
Sphaerodoridium claparedii		
Sphaerodoridium sp. A		
Sphaerodoropsis biserialis		
Sphaerodoropsis minuta		1
Sphaerodoropsis sp. A		
Sphaerodoropsis sp. B		
Sphaerodorum gracilis		
Sphaerosyllis erinaceus		
Spinther sp.		
Spio filicornis		
Spio theeli		
Spiochaetopterus typicus		
Spiophanes bombyx		
Spirorbis granulatus		
Sternaspis scutata		
Syllides longocirrata		
Syllides sp.		
Tachytrypane abranchiata		
Tachytrypane sp. A		
Tauberia gracilis		1
Terebellides stroemi		7
Tharyx ?acutus		155
Travisia sp.		
Trichobranchus glacialis		
Trochochaeta carica		
Trochochaeta multisetosa		
Typosyllis cornuta		
Typosyllis fasciata		
unidentified		11
TOTAL 48 spp.		973

Appendix I (cont'd): Polychaete species data for Station BAB-20 (20m), Cruise OCS-5; accumulated from Smith-McIntyre Grab samples (1461, 1462, 1463, 1464 and 1466. The numbers represent totals per $0.5m^2$ of sea floor for the polychaetes retained on a 1.0 mm sieve.

		$\#/0.5m^2$
Aglaophamus malmgreni		
Allia abranchiata		
Allia nr *suecica*		50
Allia sp. B		
Allia sp. C		13
Amage auricula		
Ampharete acutifrons		
Ampharete arctica		
Ampharete goësi		
Ampharete lindstromi		16
Ampharete vega		
Ampharetidae - Genus A		24
Ampharetidae - Genus B		
Amphicteis sundevalli		
Anaitides citrina		
Anaitides groenlandica		4
Antinoella badia		
Antinoella sarsi		4
Apistobranchus tullbergi		90
Apomatus globifer		
Arcteobia anticostiensis		
Arenicola glacialis		
Aricidea quadrilobata		
Aricidea tetrabranchiata		
Artacama proboscidea		3
Autolytus alexandri		
Autolytus fallax		
Axionice flexuosa		
Axionice maculata		
Barantolla sp.		
Brada incrustata		
Brada inhabilis		
Brada nuda		
Brada villosa		
Branchiomma infarcta		156
Capitella capitata		
Chaetozone setosa		6
Chone duneri		20
Chone infundibuliformis		
Chone nr *murmanica*		
Cirratulus cirratus		11
Cistenides hyperborea		
Clymenura polaris		5
Cossura longocirrata		20
Cossura sp. A		31
Dexiospira spirillum		
Diplocirrus glaucus		
Diplocirrus hirsutus		8
Diplocirrus longisetosus		2
Dorvillea sp.		
Dysponetus sp. N		6
Eclysippe sp. A		
Enipo gracilis		
Enipo canadensis		
Ephesiella macrocirrus		
Eteone flava		
Eteone longa		3
Eteone spetsbergensis		
Eteone (Mysta) barbata		
Euchone analis		
Euchone elegans		
Euchone incolor		
Euchone papillosa		
Euchone sp.		2
Eucranta villosa		
Eunoe oerstedi		
Eusyllis blomstrandi		
Exogone dispar		1
Exogone naidina		
Exogone sp.		
Fabricinae - sp. O		
Fabricinae - sp. R		
Fabrisabella schaudinni		
Flabelligera affinis		
Gattyana cirrosa		
Glycera capitata		
Glycinde wireni		
Glyphanostomum pallescens		
Harmothoe imbricata		
Hesionidae gen et sp. nov.		44
Heteromastus filiformis		27
Jasmineira sp.		
Lagisca extenuata		
Lanassa nordenskjoldi		
Lanassa venusta		
Laonice cirrata		
Laonome kroyeri		
Laphania boecki		

		#/0.5m^2
Lumbriclymene minor		
Lumbrineris fragilis		
Lumbrineris impatiens		
Lumbrineris latreilli		
Lumbrineris minuta		1
Lumbrineris sp. A		
Lumbrineris sp. B		
Lumbrineris sp. X		
Lysilla loveni		
Lysippe labiata		4
Magelona longicornis		
Maldane sarsi		
Marenzelleria wireni		
Melaenis loveni		1
Melinna elisabethae		
Microclymene sp.		27
Micronephthys minuta		144
Minuspio cirrifera		21
Myriochele heeri		
Myriochele oculata		
Mystides borealis		
Nemidia torelli		
Neosabellides sp.		
Nephtys caeca		
Nephtys ciliata		6
Nephtys discors		
Nephtys incisa		
Nephtys longosetosa		1
Nephtys paradoxa		
Nereimyra aphroditoides		10
Nereis zonata		
Nicolea zostericola		
Nicomache lumbricalis		
Nicon sp. A		
Nothria conchylega		
Notomastus latericeus		
Notoproctus oculatus		
Onuphis quadricuspis		
Ophelina acuminata		
Ophelina cylindricaudatus		43
Ophelina groenlandica		5
Ophelina sp. A		
Ophryotrocha sp.		8
Orbinia sp.		
Owenia collaris		
Owenia fusiformis		
Paramphitrite tetrabranchia		
Paranaitides wahlbergi		
Paraonis sp. A		
Parheteromastus sp. A		28
Petaloproctus tenuis		
Pherusa plumosa		
Pholoe minuta		25

		#/0.5m^2
Pionosyllis compacta		
Pista cristata		
Polycirrus medusa		
Polydora caulleryi		
Polydora quadrilobata		
Polydora socialis		
Polyphysia crassa		
Praxillella gracilis		
Praxillella praetermissa		4
Prionospio steenstrupi		1
Proclea graffii		1
Pygospio elegans		
Rhodine gracilior		
Sabella sp.		
Sabellastarte sp.		
Sabellides borealis		
Scalibregma inflatum		6
Schistomeringos caeca		9
Schistomeringos sp. A		
Scoloplos acutus		13
Scoloplos armiger		3
Sigambra tentaculata		
Sphaerodoridium claparedii		
Sphaerodoridium sp. A		
Sphaerodoropsis biserialis		
Sphaerodoropsis minuta		
Sphaerodoropsis sp. A		
Sphaerodoropsis sp. B		
Sphaerodorum gracilis		
Sphaerosyllis erinaceus		
Spinther sp.		
Spio filicornis		
Spio theeli		
Spiochaetopterus typicus		
Spiophanes bombyx		
Spirorbis granulatus		
Sternaspis scutata		19
Syllides longocirrata		
Syllides sp.		
Tachytrypane abranchiata		
Tachytrypane sp. A		
Tauberia gracilis		17
Terebellides stroemi		19
Tharyx ?acutus		309
Travisia sp.		
Trichobranchus glacialis		
Trochochaeta carica		
Trochochaeta multisetosa		
Typosyllis cornuta		
Typosyllis fasciata		
unidentified		6
TOTAL 48 spp.		1277

		#/0.5m²
Lumbriclymene minor		
Lumbrineris fragilis		
Lumbrineris impatiens		
Lumbrineris latreilli		
Lumbrineris minuta		1
Lumbrineris sp. A		
Lumbrineris sp. B		
Lumbrineris sp. X		
Lysilla loveni		
Lysippe labiata		4
Magelona longicornis		
Maldane sarsi		
Marenzelleria wireni		
Melaenis loveni		1
Melinna elisabethae		
Microclymene sp.		27
Micronephthys minuta		144
Minuspio cirrifera		21
Myriochele heeri		
Myriochele oculata		
Mystides borealis		
Nemidia torelli		
Neosabellides sp.		
Nephtys caeca		
Nephtys ciliata		6
Nephtys discors		
Nephtys incisa		
Nephtys longosetosa		1
Nephtys paradoxa		
Nereimyra aphroditoides		10
Nereis zonata		
Nicolea zostericola		
Nicomache lumbricalis		
Nicon sp. A		
Nothria conchylega		
Notomastus latericeus		
Notoproctus oculatus		
Onuphis quadricuspis		
Ophelina acuminata		
Ophelina cylindricaudatus		43
Ophelina groenlandica		5
Ophelina sp. A		
Ophryotrocha sp.		8
Orbinia sp.		
Owenia collaris		
Owenia fusiformis		
Paramphitrite tetrabranchia		
Paranaitides wahlbergi		
Paraonis sp. A		
Parheteromastus sp. A		28
Petaloproctus tenuis		
Pherusa plumosa		
Pholoe minuta		25

		#/0.5m²
Pionosyllis compacta		
Pista cristata		
Polycirrus medusa		
Polydora caulleryi		
Polydora quadrilobata		
Polydora socialis		
Polyphysia crassa		
Praxillella gracilis		
Praxillella praetermissa		4
Prionospio steenstrupi		1
Proclea graffii		1
Pygospio elegans		
Rhodine gracilior		
Sabella sp.		
Sabellastarte sp.		
Sabellides borealis		
Scalibregma inflatum		6
Schistomeringos caeca		9
Schistomeringos sp. A		
Scoloplos acutus		13
Scoloplos armiger		3
Sigambra tentaculata		
Sphaerodoridium claparedii		
Sphaerodoridium sp. A		
Sphaerodoropsis biserialis		
Sphaerodoropsis minuta		
Sphaerodoropsis sp. A		
Sphaerodoropsis sp. B		
Sphaerodorum gracilis		
Sphaerosyllis erinaceus		
Spinther sp.		
Spio filicornis		
Spio theeli		
Spiochaetopterus typicus		
Spiophanes bombyx		
Spirorbis granulatus		
Sternaspis scutata		19
Syllides longocirrata		
Syllides sp.		
Tachytrypane abranchiata		
Tachytrypane sp. A		
Tauberia gracilis		17
Terebellides stroemi		19
Tharyx ?acutus		309
Travisia sp.		
Trichobranchus glacialis		
Trochochaeta carica		
Trochochaeta multisetosa		
Typosyllis cornuta		
Typosyllis fasciata		
unidentified		6
TOTAL 48 spp.		1277

Appendix I (cont'd): Polychaete species data for Station BAB-25 (25m), Cruise OCS-5; accumulated from Smith-McIntyre Grab samples 1455, 1456, 1457, 1459 and 1460. The numbers represent totals per $0.5m^2$ of sea floor for the polychaetes retained on a 1.0 mm sieve.

		$\#/0.5m^2$			$\#/0.5m^2$
Aglaophamus malmgreni			*Dexiospira spirillum*		
Allia abranchiata			*Diplocirrus glaucus*		
Allia nr *suecica*			*Diplocirrus hirsutus*		
Allia sp. B			*Diplocirrus longisetosus*		
Allia sp. C			*Dorvillea sp.*		
Amage auricula			*Dysponetus sp. N*		
Ampharete acutifrons					
Ampharete arctica			*Eclysippe sp. A*		
Ampharete goësi			*Enipo gracilis*		
Ampharete lindstromi			*Enipo canadensis*		
Ampharete vega			*Ephesiella macrocirrus*		
Ampharetidae - Genus A			*Eteone flava*		
Ampharetidae - Genus B			*Eteone longa*		3
Amphicteis sundevalli		1	*Eteone spetsbergensis*		
Anaitides citrina			*Eteone (Mysta) barbata*		
Anaitides groenlandica		4	*Euchone analis*		
Antinoella badia			*Euchone elegans*		
Antinoella sarsi		4	*Euchone incolor*		
Apistobranchus tullbergi		2	*Euchone papillosa*		
Apomatus globifer			*Euchone sp.*		
Arcteobia anticostiensis			*Eucranta villosa*		
Arenicola glacialis			*Eunoe oerstedi*		
Aricidea quadrilobata			*Eusyllis blomstrandi*		
Aricidea tetrabranchiata			*Exogone dispar*		
Artacama proboscidea			*Exogone naidina*		
Autolytus alexandri			*Exogone sp.*		
Autolytus fallax			*Fabricinae - sp. O*		
Axionice flexuosa			*Fabricinae - sp. R*		
Axionice maculata			*Fabrisabella schaudinni*		
			Flabelligera affinis		
Barantolla sp.					
Brada incrustata			*Gattyana cirrosa*		
Brada inhabilis			*Glycera capitata*		
Brada nuda			*Glycinde wireni*		
Brada villosa		5	*Glyphanostomum pallescens*		
Branchiomma infarcta			*Harmothoe imbricata*		
Capitella capitata		7	*Hesionidae gen et sp. nov.*		
Chaetozone setosa			*Heteromastus filiformis*		30
Chone duneri			*Jasmineira sp.*		
Chone infundibuliformis					
Chone nr *murmanica*			*Lagisca extenuata*		
Cirratulus cirratus			*Lanassa nordenskjoldi*		
Cistenides hyperborea			*Lanassa venusta*		
Clymenura polaris			*Laonice cirrata*		
Cossura longocirrata		6	*Laonome kroyeri*		
Cossura sp. A			*Laphania boecki*		

Lumbriclymene minor		
Lumbrineris fragilis		
Lumbrineris impatiens		
Lumbrineris latreilli		
Lumbrineris minuta		
Lumbrineris sp. A		
Lumbrineris sp. B		
Lumbrineris sp. X		
Lysilla loveni		
Lysippe labiata		
Magelona longicornis		
Maldane sarsi		
Marenzelleria wireni		
Melaenis loveni		
Melinna elisabethae		
Microclymene sp.		1
Micronephthys minuta		11
Minuspio cirrifera		17
Myriochele heeri		
Myriochele oculata		
Mystides borealis		
Nemidia torelli		
Neosabellides sp.		
Nephtys caeca		
Nephtys ciliata		2
Nephtys discors		
Nephtys incisa		1
Nephtys longosetosa		
Nephtys paradoxa		
Nereimyra aphroditoides		4
Nereis zonata		1
Nicolea zostericola		
Nicomache lumbricalis		
Nicon sp. A		
Nothria conchylega		
Notomastus latericeus		
Notoproctus oculatus		
Onuphis quadricuspis		
Ophelina acuminata		
Ophelina cylindricaudatus		14
Ophelina groenlandica		
Ophelina sp. A		
Ophryotrocha sp.		
Orbinia sp.		
Owenia collaris		
Owenia fusiformis		
Paramphitrite tetrabranchia		
Paranaitides wahlbergi		
Paraonis sp. A		
Parheteromastus sp. A		6
Petaloproctus tenuis		
Pherusa plumosa		
Pholoe minuta		3

Pionosyllis compacta		
Pista cristata		
Polycirrus medusa		
Polydora caulleryi		
Polydora quadrilobata		
Polydora socialis		
Polyphysia crassa		
Praxillella gracilis		
Praxillella praetermissa		
Prionospio steenstrupi		
Proclea graffii		
Pygospio elegans		
Rhodine gracilior		
Sabella sp.		
Sabellastarte sp.		
Sabellides borealis		
Scalibregma inflatum		
Schistomeringos caeca		3
Schistomeringos sp. A		
Scoloplos acutus		4
Scoloplos armiger		
Sigambra tentaculata		
Sphaerodoridium claparedii		
Sphaerodoridium sp. A		
Sphaerodoropsis biserialis		
Sphaerodoropsis minuta		
Sphaerodoropsis sp. A		
Sphaerodoropsis sp. B		
Sphaerodorum gracilis		
Sphaerosyllis erinaceus		
Spinther sp.		
Spio filicornis		
Spio theeli		
Spiochaetopterus typicus		
Spiophanes bombyx		
Spirorbis granulatus		
Sternaspis scutata		
Syllides longocirrata		
Syllides sp.		
Tachytrypane abranchiata		
Tachytrypane sp. A		
Tauberia gracilis		
Terebellides stroemi		1
Tharyx ?acutus		42
Travisia sp.		
Trichobranchus glacialis		
Trochochaeta carica		
Trochochaeta multisetosa		
Typosyllis cornuta		
Typosyllis fasciata		
unidentified		2
TOTAL 23 spp.		174

Lumbriclymene minor		
Lumbrineris fragilis		
Lumbrineris impatiens		
Lumbrineris latreilli		
Lumbrineris minuta		
Lumbrineris sp. A		
Lumbrineris sp. B		
Lumbrineris sp. X		
Lysilla loveni		
Lysippe labiata		
Magelona longicornis		
Maldane sarsi		
Marenzelleria wireni		
Melaenis loveni		
Melinna elisabethae		
Microclymene sp.		1
Micronephthys minuta		11
Minuspio cirrifera		17
Myriochele heeri		
Myriochele oculata		
Mystides borealis		
Nemidia torelli		
Neosabellides sp.		
Nephtys caeca		
Nephtys ciliata		2
Nephtys discors		
Nephtys incisa		1
Nephtys longosetosa		
Nephtys paradoxa		
Nereimyra aphroditoides		4
Nereis zonata		1
Nicolea zostericola		
Nicomache lumbricalis		
Nicon sp. A		
Nothria conchylega		
Notomastus latericeus		
Notoproctus oculatus		
Onuphis quadricuspis		
Ophelina acuminata		
Ophelina cylindricaudatus		14
Ophelina groenlandica		
Ophelina sp. A		
Ophryotrocha sp.		
Orbinia sp.		
Owenia collaris		
Owenia fusiformis		
Paramphitrite tetrabranchia		
Paranaitides wahlbergi		
Paraonis sp. A		
Parheteromastus sp. A		6
Petaloproctus tenuis		
Pherusa plumosa		
Pholoe minuta		3

Pionosyllis compacta		
Pista cristata		
Polycirrus medusa		
Polydora caulleryi		
Polydora quadrilobata		
Polydora socialis		
Polyphysia crassa		
Praxillella gracilis		
Praxillella praetermissa		
Prionospio steenstrupi		
Proclea graffii		
Pygospio elegans		
Rhodine gracilior		
Sabella sp.		
Sabellastarte sp.		
Sabellides borealis		
Scalibregma inflatum		
Schistomeringos caeca		3
Schistomeringos sp. A		
Scoloplos acutus		4
Scoloplos armiger		
Sigambra tentaculata		
Sphaerodoridium claparedii		
Sphaerodoridium sp. A		
Sphaerodoropsis biserialis		
Sphaerodoropsis minuta		
Sphaerodoropsis sp. A		
Sphaerodoropsis sp. B		
Sphaerodorum gracilis		
Sphaerosyllis erinaceus		
Spinther sp.		
Spio filicornis		
Spio theeli		
Spiochaetopterus typicus		
Spiophanes bombyx		
Spirorbis granulatus		
Sternaspis scutata		
Syllides longocirrata		
Syllides sp.		
Tachytrypane abranchiata		
Tachytrypane sp. A		
Tauberia gracilis		
Terebellides stroemi		1
Tharyx ?acutus		42
Travisia sp.		
Trichobranchus glacialis		
Trochochaeta carica		
Trochochaeta multisetosa		
Typosyllis cornuta		
Typosyllis fasciata		
unidentified		2
TOTAL 23 spp.		174

Appendix I (cont'd): Polychaete species data for Station PPB-25 (25m), Cruise OCS-6; accumulated from Smith-McIntyre Grab samples 1500, 1501, 1502, 1503 and 1504. The numbers represent totals per $0.5m^2$ of sea floor for the polychaetes retained on a 1.0 mm sieve.

		#/$0.5m^2$
Aglaophamus malmgreni		
Allia abranchiata		
Allia nr *suecica*		13
Allia sp. B		
Allia sp. C		
Amage auricula		
Ampharete acutifrons		
Ampharete arctica		
Ampharete goësi		
Ampharete lindstromi		1
Ampharete vega		
Ampharetidae - Genus A		
Ampharetidae - Genus B		
Amphicteis sundevalli		
Anaitides citrina		
Anaitides groenlandica		5
Antinoella badia		
Antinoella sarsi		1
Apistobranchus tullbergi		1
Apomatus globifer		
Arcteobia anticostiensis		
Arenicola glacialis		
Aricidea quadrilobata		
Aricidea tetrabranchiata		
Artacama proboscidea		
Autolytus alexandri		
Autolytus fallax		
Axionice flexuosa		
Axionice maculata		
Barantolla sp.		1
Brada incrustata		
Brada inhabilis		
Brada nuda		
Brada villosa		3
Branchiomma infarcta		
Capitella capitata		
Chaetozone setosa		4
Chone duneri		
Chone infundibuliformis		
Chone nr *murmanica*		
Cirratulus cirratus		
Cistenides hyperborea		4
Clymenura polaris		
Cossura longocirrata		7
Cossura sp. A		

		#/$0.5m^2$
Dexiospira spirillum		
Diplocirrus glaucus		
Diplocirrus hirsutus		
Diplocirrus longisetosus		
Dorvillea sp.		
Dysponetus sp. N		
Eclysippe sp. A		
Enipo gracilis		
Enipo canadensis		
Ephesiella macrocirrus		
Eteone flava		
Eteone longa		1
Eteone spetsbergensis		
Eteone (Mysta) barbata		
Euchone analis		
Euchone elegans		
Euchone incolor		
Euchone papillosa		
Euchone sp.		
Eucranta villosa		
Eunoe oerstedi		
Eusyllis blomstrandi		
Exogone dispar		
Exogone naidina		
Exogone sp.		
Fabricinae - sp. O		2
Fabricinae - sp. R		
Fabrisabella schaudinni		
Flabelligera affinis		
Gattyana cirrosa		
Glycera capitata		
Glycinde wireni		
Glyphanostomum pallescens		
Harmothoe imbricata		
Hesionidae gen et sp. nov.		
Heteromastus filiformis		7
Jasmineira sp.		
Lagisca extenuata		
Lanassa nordenskjoldi		
Lanassa venusta		
Laonice cirrata		
Laonome kroyeri		
Laphania boecki		

		#/0.5m^2
Lumbriclymene minor		
Lumbrineris fragilis		
Lumbrineris impatiens		
Lumbrineris latreilli		2
Lumbrineris minuta		11
Lumbrineris sp. A		
Lumbrineris sp. B		
Lumbrineris sp. X		5
Lysilla loveni		
Lysippe labiata		5
Magelona longicornis		3
Maldane sarsi		4
Marenzelleria wireni		
Melaenis loveni		1
Melinna elisabethae		
Microclymene sp.		
Micronephthys minuta		21
Minuspio cirrifera		2
Myriochele heeri		1
Myriochele oculata		
Mystides borealis		
Nemidia torelli		2
Neosabellides sp.		
Nephtys caeca		
Nephtys ciliata		11
Nephtys discors		
Nephtys incisa		
Nephtys longosetosa		
Nephtys paradoxa		
Nereimyra aphroditoides		
Nereis zonata		
Nicolea zostericola		
Nicomache lumbricalis		
Nicon sp. A		
Nothria conchylega		
Notomastus latericeus		
Notoproctus oculatus		
Onuphis quadricuspis		
Ophelina acuminata		1
Ophelina cylindricaudatus		13
Ophelina groenlandica		
Ophelina sp. A		
Ophryotrocha sp.		
Orbinia sp.		
Owenia collaris		
Owenia fusiformis		
Paramphitrite tetrabranchia		
Paranaitides wahlbergi		
Paraonis sp. A		6
Parheteromastus sp. A		
Petaloproctus tenuis		
Pherusa plumosa		
Pholoe minuta		2

		#/0.5m^2
Pionosyllis compacta		
Pista cristata		
Polycirrus medusa		
Polydora caulleryi		
Polydora quadrilobata		
Polydora socialis		
Polyphysia crassa		
Praxillella gracilis		
Praxillella praetermissa		
Prionospio steenstrupi		9
Proclea graffii		2
Pygospio elegans		
Rhodine gracilior		
Sabella sp.		
Sabellastarte sp.		
Sabellides borealis		
Scalibregma inflatum		2
Schistomeringos caeca		1
Schistomeringos sp. A		
Scoloplos acutus		10
Scoloplos armiger		
Sigambra tentaculata		
Sphaerodoridium claparedii		
Sphaerodoridium sp. A		
Sphaerodoropsis biserialis		
Sphaerodoropsis minuta		
Sphaerodoropsis sp. A		
Sphaerodoropsis sp. B		
Sphaerodorum gracilis		
Sphaerosyllis erinaceus		
Spinther sp.		
Spio filicornis		
Spio theeli		
Spiochaetopterus typicus		
Spiophanes bombyx		
Spirorbis granulatus		
Sternaspis scutata		30
Syllides longocirrata		
Syllides sp.		
Tachytrypane abranchiata		
Tachytrypane sp. A		
Tauberia gracilis		34
Terebellides stroemi		16
Tharyx ?acutus		99
Travisia sp.		
Trichobranchus glacialis		
Trochochaeta carica		
Trochochaeta multisetosa		
Typosyllis cornuta		
Typosyllis fasciata		
unidentified		2
TOTAL 38 spp.		345

		#/0.5m^2
Lumbriclymene minor		
Lumbrineris fragilis		
Lumbrineris impatiens		
Lumbrineris latreilli		2
Lumbrineris minuta		11
Lumbrineris sp. A		
Lumbrineris sp. B		
Lumbrineris sp. X		5
Lysilla loveni		
Lysippe labiata		5
Magelona longicornis		3
Maldane sarsi		4
Marenzelleria wireni		
Melaenis loveni		1
Melinna elisabethae		
Microclymene sp.		
Micronephthys minuta		21
Minuspio cirrifera		2
Myriochele heeri		1
Myriochele oculata		
Mystides borealis		
Nemidia torelli		2
Neosabellides sp.		
Nephtys caeca		
Nephtys ciliata		11
Nephtys discors		
Nephtys incisa		
Nephtys longosetosa		
Nephtys paradoxa		
Nereimyra aphroditoides		
Nereis zonata		
Nicolea zostericola		
Nicomache lumbricalis		
Nicon sp. A		
Nothria conchylega		
Notomastus latericeus		
Notoproctus oculatus		
Onuphis quadricuspis		
Ophelina acuminata		1
Ophelina cylindricaudatus		13
Ophelina groenlandica		
Ophelina sp. A		
Ophryotrocha sp.		
Orbinia sp.		
Owenia collaris		
Owenia fusiformis		
Paramphitrite tetrabranchia		
Paranaitides wahlbergi		
Paraonis sp. A		6
Parheteromastus sp. A		
Petaloproctus tenuis		
Pherusa plumosa		
Pholoe minuta		2

		#/0.5m^2
Pionosyllis compacta		
Pista cristata		
Polycirrus medusa		
Polydora caulleryi		
Polydora quadrilobata		
Polydora socialis		
Polyphysia crassa		
Praxillella gracilis		
Praxillella praetermissa		
Prionospio steenstrupi		9
Proclea graffii		2
Pygospio elegans		
Rhodine gracilior		
Sabella sp.		
Sabellastarte sp.		
Sabellides borealis		
Scalibregma inflatum		2
Schistomeringos caeca		1
Schistomeringos sp. A		
Scoloplos acutus		10
Scoloplos armiger		
Sigambra tentaculata		
Sphaerodoridium claparedii		
Sphaerodoridium sp. A		
Sphaerodoropsis biserialis		
Sphaerodoropsis minuta		
Sphaerodoropsis sp. A		
Sphaerodoropsis sp. B		
Sphaerodorum gracilis		
Sphaerosyllis erinaceus		
Spinther sp.		
Spio filicornis		
Spio theeli		
Spiochaetopterus typicus		
Spiophanes bombyx		
Spirorbis granulatus		
Sternaspis scutata		30
Syllides longocirrata		
Syllides sp.		
Tachytrypane abranchiata		
Tachytrypane sp. A		
Tauberia gracilis		34
Terebellides stroemi		16
Tharyx ?acutus		99
Travisia sp.		
Trichobranchus glacialis		
Trochochaeta carica		
Trochochaeta multisetosa		
Typosyllis cornuta		
Typosyllis fasciata		
unidentified		2
TOTAL 38 spp.		345

Appendix I (cont'd): Polychaete species data for Station PPB-55 (55m), Cruise OCS-6; accumulated from Smith-McIntyre Grab samples 1495, 1496, 1497, 1498 and 1499. The numbers represent totals per $0.5m^2$ of sea floor for the polychaetes retained on a 1.0 mm sieve.

		$\#/0.5m^2$			$\#/0.5m^2$
Aglaophamus malmgreni			*Dexiospira spirillum*		
Allia abranchiata			*Diplocirrus glaucus*		1
Allia nr *suecica*		20	*Diplocirrus hirsutus*		9
Allia sp. B			*Diplocirrus longisetosus*		2
Allia sp. C			*Dorvillea sp.*		
Amage auricula			*Dysponetus sp. N*		
Ampharete acutifrons		1	*Eunoe sp. 1*		1
Ampharete arctica			*Eclysippe sp. A*		
Ampharete goësi			*Enipo gracilis*		
Ampharete lindstromi		4	*Enipo canadensis*		
Ampharete vega			*Ephesiella macrocirrus*		
Ampharetidae - Genus A			*Eteone flava*		
Ampharetidae - Genus B			*Eteone longa*		4
Amphicteis sundevalli			*Eteone spetsbergensis*		
Anaitides citrina			*Eteone (Mysta) barbata*		
Anaitides groenlandica		3	*Euchone analis*		
Antinoella badia			*Euchone elegans*		1
Antinoella sarsi		11	*Euchone incolor*		1
Apistobranchus tullbergi		3	*Euchone papillosa*		
Apomatus globifer			*Euchone sp.*		
Arcteobia anticostiensis			*Eucranta villosa*		
Arenicola glacialis			*Eunoe oerstedi*		
Aricidea quadrilobata			*Eusyllis blomstrandi*		
Aricidea tetrabranchiata			*Exogone dispar*		
Artacama proboscidea			*Exogone naidina*		1
Autolytus alexandri			*Exogone sp.*		
Autolytus fallax			*Fabricinae - sp. O*		11
Axionice flexuosa			*Fabricinae - sp. R*		3
Axionice maculata			*Fabrisabella schaudinni*		
Anaitides ?maculata		1	*Flabelligera affinis*		
Barantolla sp.		20			
Brada incrustata			*Gattyana cirrosa*		1
Brada inhabilis			*Glycera capitata*		
Brada nuda			*Glycinde wireni*		1
Brada villosa			*Glyphanostomum pallescens*		
Branchiomma infarcta			*Harmothoe imbricata*		
Capitella capitata			*Hesionidae gen et sp. nov.*		
Chaetozone setosa		61	*Heteromastus filiformis*		18
Chone duneri		2	*Jasmineira sp.*		
Chone infundibuliformis					
Chone nr *murmanica*		11	*Lagisca extenuata*		
Cirratulus cirratus			*Lanassa nordenskjoldi*		
Cistenides hyperborea		1	*Lanassa venusta*		
Clymenura polaris		2	*Laonice cirrata*		
Cossura longocirrata		6	*Laonome kroyeri*		3
Cossura sp. A			*Laphania boecki*		2

		#/0.5m²
Lumbriclymene minor		
Lumbrineris fragilis		1
Lumbrineris impatiens		15
Lumbrineris latreilli		2
Lumbrineris minuta		
Lumbrineris sp. A		
Lumbrineris sp. B		1
Lumbrineris sp. X		20
Lysilla loveni		
Lysippe labiata		13
Magelona longicornis		
Maldane sarsi		22
Marenzelleria wireni		
Melaenis loveni		
Melinna elisabethae		4
Microclymene sp.		2
Micronephthys minuta		52
Minuspio cirrifera		
Myriochele heeri		6
Myriochele oculata		2
Mystides borealis		
Nemidia torelli		
Neosabellides sp.		
Nephtys caeca		
Nephtys ciliata		4
Nephtys discors		
Nephtys incisa		
Nephtys longosetosa		
Nephtys paradoxa		1
Nereimyra aphroditoides		1
Nereis zonata		
Nicolea zostericola		
Nicomache lumbricalis		
Nicon sp. A		
Nothria conchylega		1
Notomastus latericeus		
Notoproctus oculatus		
Onuphis quadricuspis		18
Ophelina acuminata		
Ophelina cylindricaudatus		
Ophelina groenlandica		6
Ophelina sp. A		
Ophryotrocha sp.		
Orbinia sp.		
Owenia collaris		
Owenia fusiformis		
Paramphitrite tetrabranchia		
Paranaitides wahlbergi		
Paraonis sp. A		2
Parheteromastus sp. A		2
Petaloproctus tenuis		1
Pherusa plumosa		
Pholoe minuta		43

		#/0.5m²
Pionosyllis compacta		
Pista cristata		
Polycirrus medusa		2
Polydora caulleryi		8
Polydora quadrilobata		
Polydora socialis		
Polyphysia crassa		
Praxillella gracilis		2
Praxillella praetermissa		
Prionospio steenstrupi		8
Proclea graffii		3
Pygospio elegans		
Rhodine gracilior		3
Sabella sp.		
Sabellastarte sp.		
Sabellides borealis		
Scalibregma inflatum		8
Schistomeringos caeca		1
Schistomeringos sp. A		
Scoloplos acutus		46
Scoloplos armiger		
Sigambra tentaculata		
Sphaerodoridium claparedii		
Sphaerodoridium sp. A		
Sphaerodoropsis biserialis		
Sphaerodoropsis minuta		
Sphaerodoropsis sp. A		
Sphaerodoropsis sp. B		
Sphaerodorum gracilis		
Sphaerosyllis erinaceus		4
Spinther sp.		
Spio filicornis		
Spio theeli		
Spiochaetopterus typicus		
Spiophanes bombyx		
Spirorbis granulatus		
Sternaspis scutata		
Syllides longocirrata		1
Syllides sp.		2
Tachytrypane abranchiata		
Tachytrypane sp. A		
Tauberia gracilis		1
Terebellides stroemi		49
Tharyx ?acutus		64
Travisia sp.		6
Trichobranchus glacialis		
Trochochaeta carica		4
Trochochaeta multisetosa		
Typosyllis cornuta		24
Typosyllis fasciata		
unidentified		7
TOTAL 69 spp.		667

		$\#/0.5m^2$
Lumbriclymene minor		
Lumbrineris fragilis		1
Lumbrineris impatiens		15
Lumbrineris latreilli		2
Lumbrineris minuta		
Lumbrineris sp. A		
Lumbrineris sp. B		1
Lumbrineris sp. X		20
Lysilla loveni		
Lysippe labiata		13
Magelona longicornis		
Maldane sarsi		22
Marenzelleria wireni		
Melaenis loveni		
Melinna elisabethae		4
Microclymene sp.		2
Micronephthys minuta		52
Minuspio cirrifera		
Myriochele heeri		6
Myriochele oculata		2
Mystides borealis		
Nemidia torelli		
Neosabellides sp.		
Nephtys caeca		
Nephtys ciliata		4
Nephtys discors		
Nephtys incisa		
Nephtys longosetosa		
Nephtys paradoxa		1
Nereimyra aphroditoides		1
Nereis zonata		
Nicolea zostericola		
Nicomache lumbricalis		
Nicon sp. A		
Nothria conchylega		1
Notomastus latericeus		
Notoproctus oculatus		
Onuphis quadricuspis		18
Ophelina acuminata		
Ophelina cylindricaudatus		
Ophelina groenlandica		6
Ophelina sp. A		
Ophryotrocha sp.		
Orbinia sp.		
Owenia collaris		
Owenia fusiformis		
Paramphitrite tetrabranchia		
Paranaitides wahlbergi		
Paraonis sp. A		2
Parheteromastus sp. A		2
Petaloproctus tenuis		1
Pherusa plumosa		
Pholoe minuta		43

		$\#/0.5m^2$
Pionosyllis compacta		
Pista cristata		
Polycirrus medusa		2
Polydora caulleryi		8
Polydora quadrilobata		
Polydora socialis		
Polyphysia crassa		
Praxillella gracilis		2
Praxillella praetermissa		
Prionospio steenstrupi		8
Proclea graffii		3
Pygospio elegans		
Rhodine gracilior		3
Sabella sp.		
Sabellastarte sp.		
Sabellides borealis		
Scalibregma inflatum		8
Schistomeringos caeca		1
Schistomeringos sp. A		
Scoloplos acutus		46
Scoloplos armiger		
Sigambra tentaculata		
Sphaerodoridium claparedii		
Sphaerodoridium sp. A		
Sphaerodoropsis biserialis		
Sphaerodoropsis minuta		
Sphaerodoropsis sp. A		
Sphaerodoropsis sp. B		
Sphaerodorum gracilis		
Sphaerosyllis erinaceus		4
Spinther sp.		
Spio filicornis		
Spio theeli		
Spiochaetopterus typicus		
Spiophanes bombyx		
Spirorbis granulatus		
Sternaspis scutata		
Syllides longocirrata		1
Syllides sp.		2
Tachytrypane abranchiata		
Tachytrypane sp. A		
Tauberia gracilis		1
Terebellides stroemi		49
Tharyx ?acutus		64
Travisia sp.		6
Trichobranchus glacialis		
Trochochaeta carica		4
Trochochaeta multisetosa		
Typosyllis cornuta		24
Typosyllis fasciata		
unidentified		7
TOTAL 69 spp.		667

Appendix I (cont'd): Polychaete species data for Station PPB-100 (100m), Cruise OCS-6; accumulated from Smith-McIntyre Grab samples 1490, 1491, 1492, 1493 and 1494. The numbers represent totals per $0.5m^2$ of sea floor for the polychaetes retained on a 1.0 mm sieve.

		$\#/0.5m^2$
Aglaophamus malmgreni		
Allia abranchiata		
Allia nr *suecica*		22
Allia sp. B		
Allia sp. C		
Amage auricula		
Ampharete acutifrons		
Ampharete arctica		
Ampharete goësi		
Ampharete lindstromi		5
Ampharete vega		
Ampharetidae - Genus A		
Ampharetidae - Genus B		
Amphicteis sundevalli		
Anaitides citrina		
Anaitides groenlandica		7
Antinoella badia		
Antinoella sarsi		5
Apistobranchus tullbergi		2
Apomatus globifer		
Arcteobia anticostiensis		2
Arenicola glacialis		
Aricidea quadrilobata		
Aricidea tetrabranchiata		
Artacama proboscidea		
Autolytus alexandri		
Autolytus fallax		
Axionice flexuosa		
Axionice maculata		1
Barantolla sp.		6
Brada incrustata		
Brada inhabilis		1
Brada nuda		
Brada villosa		
Branchiomma infarcta		
Capitella capitata		
Chaetozone setosa		133
Chone duneri		22
Chone infundibuliformis		
Chone nr *murmanica*		35
Cirratulus cirratus		
Cistenides hyperborea		
Clymenura polaris		7
Cossura longocirrata		1
Cossura sp. A		

		$\#/0.5m^2$
Dexiospira spirillum		
Diplocirrus glaucus		1
Diplocirrus hirsutus		3
Diplocirrus longisetosus		2
Dorvillea sp.		
Dysponetus sp. N		
Eclysippe sp. A		
Enipo gracilis		
Enipo canadensis		
Ephesiella macrocirrus		
Eteone flava		
Eteone longa		11
Eteone spetsbergensis		
Eteone (Mysta) barbata		
Euchone analis		2
Euchone elegans		7
Euchone incolor		3
Euchone papillosa		
Euchone sp.		
Eucranta villosa		
Eunoe oerstedi		
Eusyllis blomstrandi		
Exogone dispar		
Exogone naidina		
Exogone sp.		
Fabricinae - sp. O		4
Fabricinae - sp. R		21
Fabrisabella schaudinni		
Flabelligera affinis		
Gattyana cirrosa		1
Glycera capitata		
Glycinde wireni		
Glyphanostomum pallescens		
Harmothoe imbricata		
Hesionidae gen et sp. nov.		
Heteromastus filiformis		6
Jasmineira sp.		
Lagisca extenuata		
Lanassa nordenskjoldi		
Lanassa venusta		7
Laonice cirrata		
Laonome kroyeri		
Laphania boecki		1

		$\#/0.5m^2$
Lumbriclymene minor		
Lumbrineris fragilis		
Lumbrineris impatiens		103
Lumbrineris latreilli		15
Lumbrineris minuta		4
Lumbrineris sp. A		
Lumbrineris sp. B		1
Lumbrineris sp. X		34
Lysilla loveni		
Lysippe labiata		75
Magelona longicornis		
Maldane sarsi		7
Marenzelleria wireni		
Melaenis loveni		
Melinna elisabethae		18
Microclymene sp.		1
Micronephthys minuta		50
Minuspio cirrifera		
Myriochele heeri		48
Myriochele oculata		3
Mystides borealis		3
Nemidia torelli		
Neosabellides sp.		
Nephtys caeca		
Nephtys ciliata		2
Nephtys discors		
Nephtys incisa		
Nephtys longosetosa		
Nephtys paradoxa		10
Nereimyra aphroditoides		6
Nereis zonata		4
Nicolea zostericola		
Nicomache lumbricalis		
Nicon sp. A		
Nothria conchylega		3
Notomastus latericeus		
Notoproctus oculatus		
Onuphis quadricuspis		7
Ophelina acuminata		
Ophelina cylindricaudatus		
Ophelina groenlandica		6
Ophelina sp. A		
Ophryotrocha sp.		
Orbinia sp.		
Owenia collaris		2
Owenia fusiformis		
Paramphitrite tetrabranchia		1
Paranaitides wahlbergi		
Paraonis sp. A		2
Parheteromastus sp. A		2
Petaloproctus tenuis		12
Pherusa plumosa		1
Pholoe minuta		134

		$\#/0.5m^2$
Pionosyllis compacta		
Pista cristata		
Polycirrus medusa		4
Polydora caulleryi		9
Polydora quadrilobata		
Polydora socialis		
Polyphysia crassa		
Praxillella gracilis		1
Praxillella praetermissa		1
Prionospio steenstrupi		2
Proclea graffii		3
Pygospio elegans		
Rhodine gracilior		
Sabella sp.		
Sabellastarte sp.		
Sabellides borealis		
Scalibregma inflatum		10
Schistomeringos caeca		2
Schistomeringos sp. A		
Scoloplos acutus		34
Scoloplos armiger		
Sigambra tentaculata		
Sphaerodoridium claparedii		
Sphaerodoridium sp. A		3
Sphaerodoropsis biserialis		
Sphaerodoropsis minuta		
Sphaerodoropsis sp. A		
Sphaerodoropsis sp. B		
Sphaerodorum gracilis		7
Sphaerosyllis erinaceus		8
Spinther sp.		
Spio filicornis		
Spio theeli		
Spiochaetopterus typicus		5
Spiophanes bombyx		
Spirorbis granulatus		
Sternaspis scutata		
Syllides longocirrata		
Syllides sp.		
Tachytrypane abranchiata		
Tachytrypane sp. A		
Tauberia gracilis		
Terebellides stroemi		39
Tharyx ?acutus		33
Travisia sp.		18
Trichobranchus glacialis		
Trochochaeta carica		2
Trochochaeta multisetosa		
Typosyllis cornuta		23
Typosyllis fasciata		7
unidentified		12
TOTAL 73 spp.		1095

		#/0.5m^2
Lumbriclymene minor		
Lumbrineris fragilis		
Lumbrineris impatiens		103
Lumbrineris latreilli		15
Lumbrineris minuta		4
Lumbrineris sp. A		
Lumbrineris sp. B		1
Lumbrineris sp. X		34
Lysilla loveni		
Lysippe labiata		75
Magelona longicornis		
Maldane sarsi		7
Marenzelleria wireni		
Melaenis loveni		
Melinna elisabethae		18
Microclymene sp.		1
Micronephthys minuta		50
Minuspio cirrifera		
Myriochele heeri		48
Myriochele oculata		3
Mystides borealis		3
Nemidia torelli		
Neosabellides sp.		
Nephtys caeca		
Nephtys ciliata		2
Nephtys discors		
Nephtys incisa		
Nephtys longosetosa		
Nephtys paradoxa		10
Nereimyra aphroditoides		6
Nereis zonata		4
Nicolea zostericola		
Nicomache lumbricalis		
Nicon sp. A		
Nothria conchylega		3
Notomastus latericeus		
Notoproctus oculatus		
Onuphis quadricuspis		7
Ophelina acuminata		
Ophelina cylindricaudatus		
Ophelina groenlandica		6
Ophelina sp. A		
Ophryotrocha sp.		
Orbinia sp.		
Owenia collaris		2
Owenia fusiformis		
Paramphitrite tetrabranchia		1
Paranaitides wahlbergi		
Paraonis sp. A		2
Parheteromastus sp. A		2
Petaloproctus tenuis		12
Pherusa plumosa		1
Pholoe minuta		134

		#/0.5m^2
Pionosyllis compacta		
Pista cristata		
Polycirrus medusa		4
Polydora caulleryi		9
Polydora quadrilobata		
Polydora socialis		
Polyphysia crassa		
Praxillella gracilis		1
Praxillella praetermissa		1
Prionospio steenstrupi		2
Proclea graffii		3
Pygospio elegans		
Rhodine gracilior		
Sabella sp.		
Sabellastarte sp.		
Sabellides borealis		
Scalibregma inflatum		10
Schistomeringos caeca		2
Schistomeringos sp. A		
Scoloplos acutus		34
Scoloplos armiger		
Sigambra tentaculata		
Sphaerodoridium claparedii		
Sphaerodoridium sp. A		3
Sphaerodoropsis biserialis		
Sphaerodoropsis minuta		
Sphaerodoropsis sp. A		
Sphaerodoropsis sp. B		
Sphaerodorum gracilis		7
Sphaerosyllis erinaceus		8
Spinther sp.		
Spio filicornis		
Spio theeli		
Spiochaetopterus typicus		5
Spiophanes bombyx		
Spirorbis granulatus		
Sternaspis scutata		
Syllides longocirrata		
Syllides sp.		
Tachytrypane abranchiata		
Tachytrypane sp. A		
Tauberia gracilis		
Terebellides stroemi		39
Tharyx ?acutus		33
Travisia sp.		18
Trichobranchus glacialis		
Trochochaeta carica		2
Trochochaeta multisetosa		
Typosyllis cornuta		23
Typosyllis fasciata		7
unidentified		12
TOTAL 73 spp.		1095

Appendix I (cont'd): Polychaete species data for Station PPB-25 (25m), Cruise OCS-7; accumulated from Smith-McIntyre Grab samples 1558, 1562, 1565, 1566 and 1567. The numbers represent totals per $0.5m^2$ of sea floor for the polychaetes retained on a 1.0 mm sieve.

		$\#/0.5m^2$			$\#/0.5m^2$
Aglaophamus malmgreni		1	*Dexiospira spirillum*		
Allia abranchiata			*Diplocirrus glaucus*		
Allia nr *suecica*		21	*Diplocirrus hirsutus*		
Allia sp. B		31	*Diplocirrus longisetosus*		
Allia sp. C			*Dorvillea sp.*		
Amage auricula			*Dysponetus sp. N*		
Ampharete acutifrons					
Ampharete arctica			*Eclysippe sp. A*		
Ampharete goësi			*Enipo gracilis*		
Ampharete lindstromi			*Enipo canadensis*		
Ampharete vega			*Ephesiella macrocirrus*		
Ampharetidae - Genus A			*Eteone flava*		
Ampharetidae - Genus B			*Eteone longa*		
Amphicteis sundevalli			*Eteone spetsbergensis*		
Anaitides citrina			*Eteone (Mysta) barbata*		
Anaitides groenlandica			*Euchone analis*		
Antinoella badia			*Euchone elegans*		
Antinoella sarsi		2	*Euchone incolor*		
Apistobranchus tullbergi		35	*Euchone papillosa*		
Apomatus globifer			*Euchone sp.*		
Arcteobia anticostiensis			*Eucranta villosa*		
Arenicola glacialis			*Eunoe oerstedi*		
Aricidea quadrilobata			*Eusyllis blomstrandi*		
Aricidea tetrabranchiata			*Exogone dispar*		
Artacama proboscidea		12	*Exogone naidina*		
Autolytus alexandri			*Exogone sp.*		
Autolytus fallax			*Fabricinae - sp. O*		2
Axionice flexuosa			*Fabricinae - sp. R*		
Axionice maculata			*Fabrisabella schaudinni*		
			Flabelligera affinis		
Barantolla sp.					
Brada incrustata			*Gattyana cirrosa*		
Brada inhabilis			*Glycera capitata*		
Brada nuda			*Glycinde wireni*		
Brada villosa			*Glyphanostomum pallescens*		
Branchiomma infarcta			*Harmothoe imbricata*		
Capitella capitata		1	*Hesionidae gen et sp. nov.*		
Chaetozone setosa		3	*Heteromastus filiformis*		
Chone duneri			*Jasmineira sp.*		
Chone infundibuliformis					
Chone nr *murmanica*			*Lagisca extenuata*		
Cirratulus cirratus			*Lanassa nordenskjoldi*		
Cistenides hyperborea		3	*Lanassa venusta*		1
Clymenura polaris		1	*Laonice cirrata*		
Cossura longocirrata		22	*Laonome kroyeri*		2
Cossura sp. A			*Laphania boecki*		1

		#/0.5m^2
Lumbriclymene minor		
Lumbrineris fragilis		
Lumbrineris impatiens		
Lumbrineris latreilli		
Lumbrineris minuta		3
Lumbrineris sp. A		
Lumbrineris sp. B		
Lumbrineris sp. X		1
Lysilla loveni		
Lysippe labiata		
Magelona longicornis		
Maldane sarsi		
Marenzelleria wireni		
Melaenis loveni		
Melinna elisabethae		
Microclymene sp.		
Micronephthys minuta		58
Minuspio cirrifera		8
Myriochele heeri		
Myriochele oculata		
Mystides borealis		
Nemidia torelli		
Neosabellides sp.		
Nephtys caeca		
Nephtys ciliata		7
Nephtys discors		
Nephtys incisa		
Nephtys longosetosa		
Nephtys paradoxa		
Nereimyra aphroditoides		
Nereis zonata		
Nicolea zostericola		
Nicomache lumbricalis		
Nicon sp. A		
Nothria conchylega		
Notomastus latericeus		
Notoproctus oculatus		
Onuphis quadricuspis		
Ophelina acuminata		2
Ophelina cylindricaudatus		7
Ophelina groenlandica		
Ophelina sp. A		
Ophryotrocha sp.		
Orbinia sp.		
Owenia collaris		
Owenia fusiformis		
Paramphitrite tetrabranchia		2
Paranaitides wahlbergi		
Paraonis sp. A		2
Parheteromastus sp. A		
Petaloproctus tenuis		
Pherusa plumosa		
Pholoe minuta		1

		#/0.5m^2
Pionosyllis compacta		
Pista cristata		
Polycirrus medusa		
Polydora caulleryi		
Polydora quadrilobata		
Polydora socialis		
Polyphysia crassa		
Praxillella gracilis		
Praxillella praetermissa		
Prionospio steenstrupi		7
Proclea graffii		
Pygospio elegans		
Rhodine gracilior		
Sabella sp.		
Sabellastarte sp.		
Sabellides borealis		
Scalibregma inflatum		
Schistomeringos caeca		1
Schistomeringos sp. A		
Scoloplos acutus		2
Scoloplos armiger		
Sigambra tentaculata		
Sphaerodoridium claparedii		
Sphaerodoridium sp. A		
Sphaerodoropsis biserialis		1
Sphaerodoropsis minuta		
Sphaerodoropsis sp. A		
Sphaerodoropsis sp. B		
Sphaerodorum gracilis		10
Sphaerosyllis erinaceus		
Spinther sp.		
Spio filicornis		
Spio theeli		
Spiochaetopterus typicus		
Spiophanes bombyx		
Spirorbis granulatus		
Sternaspis scutata		46
Syllides longocirrata		
Syllides sp.		
Tachytrypane abranchiata		
Tachytrypane sp. A		
Tauberia gracilis		8
Terebellides stroemi		
Tharyx ?acutus		51
Travisia sp.		
Trichobranchus glacialis		
Trochochaeta carica		
Trochochaeta multisetosa		
Typosyllis cornuta		
Typosyllis fasciata		1
unidentified		1
TOTAL 34 spp.		357

		$\#/0.5m^2$
Lumbriclymene minor		
Lumbrineris fragilis		
Lumbrineris impatiens		
Lumbrineris latreilli		
Lumbrineris minuta		3
Lumbrineris sp. A		
Lumbrineris sp. B		
Lumbrineris sp. X		1
Lysilla loveni		
Lysippe labiata		
Magelona longicornis		
Maldane sarsi		
Marenzelleria wireni		
Melaenis loveni		
Melinna elisabethae		
Microclymene sp.		
Micronephthys minuta		58
Minuspio cirrifera		8
Myriochele heeri		
Myriochele oculata		
Mystides borealis		
Nemidia torelli		
Neosabellides sp.		
Nephtys caeca		
Nephtys ciliata		7
Nephtys discors		
Nephtys incisa		
Nephtys longosetosa		
Nephtys paradoxa		
Nereimyra aphroditoides		
Nereis zonata		
Nicolea zostericola		
Nicomache lumbricalis		
Nicon sp. A		
Nothria conchylega		
Notomastus latericeus		
Notoproctus oculatus		
Onuphis quadricuspis		
Ophelina acuminata		2
Ophelina cylindricaudatus		7
Ophelina groenlandica		
Ophelina sp. A		
Ophryotrocha sp.		
Orbinia sp.		
Owenia collaris		
Owenia fusiformis		
Paramphitrite tetrabranchia		2
Paranaitides wahlbergi		
Paraonis sp. A		2
Parheteromastus sp. A		
Petaloproctus tenuis		
Pherusa plumosa		
Pholoe minuta		1

		$\#/0.5m^2$
Pionosyllis compacta		
Pista cristata		
Polycirrus medusa		
Polydora caulleryi		
Polydora quadrilobata		
Polydora socialis		
Polyphysia crassa		
Praxillella gracilis		
Praxillella praetermissa		
Prionospio steenstrupi		7
Proclea graffii		
Pygospio elegans		
Rhodine gracilior		
Sabella sp.		
Sabellastarte sp.		
Sabellides borealis		
Scalibregma inflatum		
Schistomeringos caeca		1
Schistomeringos sp. A		
Scoloplos acutus		2
Scoloplos armiger		
Sigambra tentaculata		
Sphaerodoridium claparedii		
Sphaerodoridium sp. A		
Sphaerodoropsis biserialis		1
Sphaerodoropsis minuta		
Sphaerodoropsis sp. A		
Sphaerodoropsis sp. B		
Sphaerodorum gracilis		10
Sphaerosyllis erinaceus		
Spinther sp.		
Spio filicornis		
Spio theeli		
Spiochaetopterus typicus		
Spiophanes bombyx		
Spirorbis granulatus		
Sternaspis scutata		46
Syllides longocirrata		
Syllides sp.		
Tachytrypane abranchiata		
Tachytrypane sp. A		
Tauberia gracilis		8
Terebellides stroemi		
Tharyx ?acutus		51
Travisia sp.		
Trichobranchus glacialis		
Trochochaeta carica		
Trochochaeta multisetosa		
Typosyllis cornuta		
Typosyllis fasciata		1
unidentified		1
TOTAL 34 spp.		357

Appendix I (cont'd): Polychaete species data for Station PPB-55 (55m), Cruise OCS-7; accumulated from Smith-McIntyre Grab samples 1541, 1542, 1543, 1545 and 1546. The numbers represent totals per $0.5m^2$ of sea floor for the polychaetes retained on a 1.0 mm sieve.

		$\#/0.5m^2$
Aglaophamus malmgreni		
Allia abranchiata		
Allia nr *suecica*		39
Allia sp. B		
Allia sp. C		
Amage auricula		
Ampharete acutifrons		
Ampharete arctica		
Ampharete goësi		2
Ampharete lindstromi		27
Ampharete vega		
Ampharetidae - Genus A		
Ampharetidae - Genus B		
Amphicteis sundevalli		
Anaitides citrina		
Anaitides groenlandica		17
Antinoella badia		
Antinoella sarsi		13
Apistobranchus tullbergi		7
Apomatus globifer		
Arcteobia anticostiensis		
Arenicola glacialis		
Aricidea quadrilobata		
Aricidea tetrabranchiata		
Artacama proboscidea		
Autolytus alexandri		2
Autolytus fallax		
Axionice flexuosa		
Axionice maculata		1
Barantolla sp.		27
Brada incrustata		
Brada inhabilis		1
Brada nuda		
Brada villosa		
Branchiomma infarcta		
Capitella capitata		
Chaetozone setosa		45
Chone duneri		9
Chone infundibuliformis		
Chone nr *murmanica*		59
Cirratulus cirratus		
Cistenides hyperborea		1
Clymenura polaris		13
Cossura longocirrata		
Cossura sp. A		

		$\#/0.5m^2$
Dexiospira spirillum		
Diplocirrus glaucus		2
Diplocirrus hirsutus		15
Diplocirrus longisetosus		23
Dorvillea sp.		
Dysponetus sp. N		
		2
Eclysippe sp. A		
Enipo gracilis		
Enipo canadensis		
Ephesiella macrocirrus		
Eteone flava		
Eteone longa		4
Eteone spetsbergensis		
Eteone (Mysta) barbata		
Euchone analis		1
Euchone elegans		5
Euchone incolor		2
Euchone papillosa		
Euchone sp.		
Eucranta villosa		
Eunoe oerstedi		
Eusyllis blomstrandi		2
Exogone dispar		
Exogone naidina		2
Exogone sp.		
Fabricinae - sp. O		11
Fabricinae - sp. R		2
Fabrisabella schaudinni		
Flabelligera affinis		
Gattyana cirrosa		4
Glycera capitata		
Glycinde wireni		2
Glyphanostomum pallescens		
Harmothoe imbricata		
Hesionidae gen et sp. nov.		
Heteromastus filiformis		16
Jasmineira sp.		
Lagisca extenuata		
Lanassa nordenskjoldi		
Lanassa venusta		1
Laonice cirrata		
Laonome kroyeri		1
Laphania boecki		3

		#/0.5m²
Lumbriclymene minor		
Lumbrineris fragilis		2
Lumbrineris impatiens		25
Lumbrineris latreilli		1
Lumbrineris minuta		3
Lumbrineris sp. A		
Lumbrineris sp. B		
Lumbrineris sp. X		13
Lysilla loveni		4
Lysippe labiata		52
Magelona longicornis		
Maldane sarsi		13
Marenzelleria wireni		
Melaenis loveni		
Melinna elisabethae		4
Microclymene sp.		
Micronephthys minuta		49
Minuspio cirrifera		2
Myriochele heeri		37
Myriochele oculata		10
Mystides borealis		
Nemidia torelli		
Neosabellides sp.		
Nephtys caeca		
Nephtys ciliata		
Nephtys discors		
Nephtys incisa		
Nephtys longosetosa		
Nephtys paradoxa		6
Nereimyra aphroditoides		5
Nereis zonata		
Nicolea zostericola		
Nicomache lumbricalis		
Nicon sp. A		
Nothria conchylega		1
Notomastus latericeus		
Notoproctus oculatus		
Onuphis quadricuspis		25
Ophelina acuminata		
Ophelina cylindricaudatus		2
Ophelina groenlandica		19
Ophelina sp. A		
Ophryotrocha sp.		
Orbinia sp.		
Owenia collaris		2
Owenia fusiformis		
Paramphitrite tetrabranchia		1
Paranaitides wahlbergi		
Paraonis sp. A		7
Parheteromastus sp. A		1
Petaloproctus tenuis		
Pherusa plumosa		
Pholoe minuta		119

		#/0.5m²
Pionosyllis compacta		
Pista cristata		
Polycirrus medusa		6
Polydora caulleryi		73
Polydora quadrilobata		
Polydora socialis		2
Polyphysia crassa		
Praxillella gracilis		
Praxillella praetermissa		11
Prionospio steenstrupi		40
Proclea graffii		5
Pygospio elegans		
Rhodine gracilior		8
Sabella sp.		
Sabellastarte sp.		
Sabellides borealis		
Scalibregma inflatum		3
Schistomeringos caeca		15
Schistomeringos sp. A		
Scoloplos acutus		2
Scoloplos armiger		
Sigambra tentaculata		
Sphaerodoridium claparedii		
Sphaerodoridium sp. A		1
Sphaerodoropsis biserialis		
Sphaerodoropsis minuta		1
Sphaerodoropsis sp. A		
Sphaerodoropsis sp. B		
Sphaerodorum gracilis		4
Sphaerosyllis erinaceus		6
Spinther sp.		1
Spio filicornis		
Spio theeli		
Spiochaetopterus typicus		
Spiophanes bombyx		
Spirorbis granulatus		
Sternaspis scutata		
Syllides longocirrata		3
Syllides sp.		1
Tachytrypane abranchiata		
Tachytrypane sp. A		
Tauberia gracilis		
Terebellides stroemi		129
Tharyx ?acutus		22
Travisia sp.		5
Trichobranchus glacialis		
Trochochaeta carica		4
Trochochaeta multisetosa		
Typosyllis cornuta		7
Typosyllis fasciata		1
unidentified		6
TOTAL 80 spp.		1120

		#/0.5m²
Lumbriclymene minor		
Lumbrineris fragilis		2
Lumbrineris impatiens		25
Lumbrineris latreilli		1
Lumbrineris minuta		3
Lumbrineris sp. A		
Lumbrineris sp. B		
Lumbrineris sp. X		13
Lysilla loveni		4
Lysippe labiata		52
Magelona longicornis		
Maldane sarsi		13
Marenzelleria wireni		
Melaenis loveni		
Melinna elisabethae		4
Microclymene sp.		
Micronephthys minuta		49
Minuspio cirrifera		2
Myriochele heeri		37
Myriochele oculata		10
Mystides borealis		
Nemidia torelli		
Neosabellides sp.		
Nephtys caeca		
Nephtys ciliata		
Nephtys discors		
Nephtys incisa		
Nephtys longosetosa		
Nephtys paradoxa		6
Nereimyra aphroditoides		5
Nereis zonata		
Nicolea zostericola		
Nicomache lumbricalis		
Nicon sp. A		
Nothria conchylega		1
Notomastus latericeus		
Notoproctus oculatus		
Onuphis quadricuspis		25
Ophelina acuminata		
Ophelina cylindricaudatus		2
Ophelina groenlandica		19
Ophelina sp. A		
Ophryotrocha sp.		
Orbinia sp.		
Owenia collaris		2
Owenia fusiformis		
Paramphitrite tetrabranchia		1
Paranaitides wahlbergi		
Paraonis sp. A		7
Parheteromastus sp. A		1
Petaloproctus tenuis		
Pherusa plumosa		
Pholoe minuta		119

		#/0.5m²
Pionosyllis compacta		
Pista cristata		
Polycirrus medusa		6
Polydora caulleryi		73
Polydora quadrilobata		
Polydora socialis		2
Polyphysia crassa		
Praxillella gracilis		
Praxillella praetermissa		11
Prionospio steenstrupi		40
Proclea graffii		5
Pygospio elegans		
Rhodine gracilior		8
Sabella sp.		
Sabellastarte sp.		
Sabellides borealis		
Scalibregma inflatum		3
Schistomeringos caeca		15
Schistomeringos sp. A		
Scoloplos acutus		2
Scoloplos armiger		
Sigambra tentaculata		
Sphaerodoridium claparedii		
Sphaerodoridium sp. A		1
Sphaerodoropsis biserialis		
Sphaerodoropsis minuta		1
Sphaerodoropsis sp. A		
Sphaerodoropsis sp. B		
Sphaerodorum gracilis		4
Sphaerosyllis erinaceus		6
Spinther sp.		1
Spio filicornis		
Spio theeli		
Spiochaetopterus typicus		
Spiophanes bombyx		
Spirorbis granulatus		
Sternaspis scutata		
Syllides longocirrata		3
Syllides sp.		1
Tachytrypane abranchiata		
Tachytrypane sp. A		
Tauberia gracilis		
Terebellides stroemi		129
Tharyx ?acutus		22
Travisia sp.		5
Trichobranchus glacialis		
Trochochaeta carica		4
Trochochaeta multisetosa		
Typosyllis cornuta		7
Typosyllis fasciata		1
unidentified		6
TOTAL 80 spp.		1120

Appendix I (cont'd): Polychaete species data for Station PPB-100 (100m), Cruise OCS-7; accumulated from Smith-McIntyre Grab samples 1575, 1576, 1577, 1578 and 1579. The numbers represent totals per $0.5m^2$ of sea floor for the polychaetes retained on a 1.0 mm sieve.

		$\#/0.5m^2$			$\#/0.5m^2$
Aglaophamus malmgreni			*Dexiospira spirillum*		
Allia abranchiata			*Diplocirrus glaucus*		
Allia nr *suecica*		32	*Diplocirrus hirsutus*		
Allia sp. B			*Diplocirrus longisetosus*		
Allia sp. C			*Dorvillea sp.*		
Amage auricula			*Dysponetus sp. N*		
Ampharete acutifrons					
Ampharete arctica			*Eclysippe sp. A*		
Ampharete goësi			*Enipo gracilis*		
Ampharete lindstromi		3	*Enipo canadensis*		
Ampharete vega			*Ephesiella macrocirrus*		
Ampharetidae - Genus A			*Eteone flava*		
Ampharetidae - Genus B			*Eteone longa*		6
Amphicteis sundevalli			*Eteone spetsbergensis*		1
Anaitides citrina			*Eteone (Mysta) barbata*		1
Anaitides groenlandica		6	*Euchone analis*		
Antinoella badia			*Euchone elegans*		
Antinoella sarsi		2	*Euchone incolor*		
Apistobranchus tullbergi		15	*Euchone papillosa*		
Apomatus globifer			*Euchone sp.*		
Arcteobia anticostiensis			*Eucranta villosa*		
Arenicola glacialis			*Eunoe oerstedi*		1
Aricidea quadrilobata			*Eusyllis blomstrandi*		
Aricidea tetrabranchiata			*Exogone dispar*		
Artacama proboscidea		1	*Exogone naidina*		
Autolytus alexandri			*Exogone sp.*		
Autolytus fallax			*Fabricinae - sp. O*		4
Axionice flexuosa			*Fabricinae - sp. R*		
Axionice maculata			*Fabrisabella schaudinni*		
			Flabelligera affinis		
Barantolla sp.		91			
Brada incrustata			*Gattyana cirrosa*		
Brada inhabilis			*Glycera capitata*		
Brada nuda			*Glycinde wireni*		1
Brada villosa			*Glyphanostomum pallescens*		
Branchiomma infarcta			*Harmothoe imbricata*		
Capitella capitata			*Hesionidae gen et sp. nov.*		4
Chaetozone setosa		36	*Heteromastus filiformis*		58
Chone duneri			*Jasmineira sp.*		
Chone infundibuliformis					
Chone nr *murmanica*		11	*Lagisca extenuata*		1
Cirratulus cirratus			*Lanassa nordenskjoldi*		
Cistenides hyperborea			*Lanassa venusta*		
Clymenura polaris			*Laonice cirrata*		1
Cossura longocirrata		58	*Laonome kroyeri*		
Cossura sp. A			*Laphania boecki*		

		#/0.5m²
Lumbriclymene minor		
Lumbrineris fragilis		
Lumbrineris impatiens		19
Lumbrineris latreilli		9
Lumbrineris minuta		4
Lumbrineris sp. A		
Lumbrineris sp. B		1
Lumbrineris sp. X		84
Lysilla loveni		
Lysippe labiata		28
Magelona longicornis		
Maldane sarsi		10
Marenzelleria wireni		
Melaenis loveni		
Melinna elisabethae		
Microclymene sp.		24
Micronephthys minuta		186
Minuspio cirrifera		
Myriochele heeri		11
Myriochele oculata		1
Mystides borealis		
Nemidia torelli		2
Neosabellides sp.		
Nephtys caeca		
Nephtys ciliata		16
Nephtys discors		
Nephtys incisa		
Nephtys longosetosa		
Nephtys paradoxa		3
Nereimyra aphroditoides		3
Nereis zonata		
Nicolea zostericola		
Nicomache lumbricalis		2
Nicon sp. A		
Nothria conchylega		
Notomastus latericeus		
Notoproctus oculatus		
Onuphis quadricuspis		47
Ophelina acuminata		1
Ophelina cylindricaudatus		
Ophelina groenlandica		
Ophelina sp. A		
Ophryotrocha sp.		
Orbinia sp.		
Owenia collaris		2
Owenia fusiformis		
Paramphitrite tetrabranchia		
Paranaitides wahlbergi		
Paraonis sp. A		1
Parheteromastus sp. A		8
Petaloproctus tenuis		
Pherusa plumosa		1
Pholoe minuta		60

		#/0.5m²
Pionosyllis compacta		
Pista cristata		
Polycirrus medusa		
Polydora caulleryi		
Polydora quadrilobata		
Polydora socialis		1
Polyphysia crassa		
Praxillella gracilis		
Praxillella praetermissa		3
Prionospio steenstrupi		18
Proclea graffii		1
Pygospio elegans		
Rhodine gracilior		
Sabella sp.		
Sabellastarte sp.		
Sabellides borealis		
Scalibregma inflatum		
Schistomeringos caeca		5
Schistomeringos sp. A		
Scoloplos acutus		65
Scoloplos armiger		
Sigambra tentaculata		
Sphaerodoridium claparedii		
Sphaerodoridium sp. A		
Sphaerodoropsis biserialis		
Sphaerodoropsis minuta		
Sphaerodoropsis sp. A		
Sphaerodoropsis sp. B		
Sphaerodorum gracilis		9
Sphaerosyllis erinaceus		
Spinther sp.		
Spio filicornis		
Spio theeli		
Spiochaetopterus typicus		33
Spiophanes bombyx		
Spirorbis granulatus		
Sternaspis scutata		2
Syllides longocirrata		
Syllides sp.		2
Tachytrypane abranchiata		
Tachytrypane sp. A		
Tauberia gracilis		63
Terebellides stroemi		13
Tharyx ?acutus		129
Travisia sp.		7
Trichobranchus glacialis		
Trochochaeta carica		
Trochochaeta multisetosa		2
Typosyllis cornuta		1
Typosyllis fasciata		
unidentified		4
TOTAL 59 spp.		1214

		#/0.5m²
Lumbriclymene minor		
Lumbrineris fragilis		
Lumbrineris impatiens		19
Lumbrineris latreilli		9
Lumbrineris minuta		4
Lumbrineris sp. A		
Lumbrineris sp. B		1
Lumbrineris sp. X		84
Lysilla loveni		
Lysippe labiata		28
Magelona longicornis		
Maldane sarsi		10
Marenzelleria wireni		
Melaenis loveni		
Melinna elisabethae		
Microclymene sp.		24
Micronephthys minuta		186
Minuspio cirrifera		
Myriochele heeri		11
Myriochele oculata		1
Mystides borealis		
Nemidia torelli		2
Neosabellides sp.		
Nephtys caeca		
Nephtys ciliata		16
Nephtys discors		
Nephtys incisa		
Nephtys longosetosa		
Nephtys paradoxa		3
Nereimyra aphroditoides		3
Nereis zonata		
Nicolea zostericola		
Nicomache lumbricalis		2
Nicon sp. A		
Nothria conchylega		
Notomastus latericeus		
Notoproctus oculatus		
Onuphis quadricuspis		47
Ophelina acuminata		1
Ophelina cylindricaudatus		
Ophelina groenlandica		
Ophelina sp. A		
Ophryotrocha sp.		
Orbinia sp.		
Owenia collaris		2
Owenia fusiformis		
Paramphitrite tetrabranchia		
Paranaitides wahlbergi		
Paraonis sp. A		1
Parheteromastus sp. A		8
Petaloproctus tenuis		
Pherusa plumosa		1
Pholoe minuta		60

		#/0.5m²
Pionosyllis compacta		
Pista cristata		
Polycirrus medusa		
Polydora caulleryi		
Polydora quadrilobata		
Polydora socialis		1
Polyphysia crassa		
Praxillella gracilis		
Praxillella praetermissa		3
Prionospio steenstrupi		18
Proclea graffii		1
Pygospio elegans		
Rhodine gracilior		
Sabella sp.		
Sabellastarte sp.		
Sabellides borealis		
Scalibregma inflatum		
Schistomeringos caeca		5
Schistomeringos sp. A		
Scoloplos acutus		65
Scoloplos armiger		
Sigambra tentaculata		
Sphaerodoridium claparedii		
Sphaerodoridium sp. A		
Sphaerodoropsis biserialis		
Sphaerodoropsis minuta		
Sphaerodoropsis sp. A		
Sphaerodoropsis sp. B		
Sphaerodorum gracilis		9
Sphaerosyllis erinaceus		
Spinther sp.		
Spio filicornis		
Spio theeli		
Spiochaetopterus typicus		33
Spiophanes bombyx		
Spirorbis granulatus		
Sternaspis scutata		2
Syllides longocirrata		
Syllides sp.		2
Tachytrypane abranchiata		
Tachytrypane sp. A		
Tauberia gracilis		63
Terebellides stroemi		13
Tharyx ?acutus		129
Travisia sp.		7
Trichobranchus glacialis		
Trochochaeta carica		
Trochochaeta multisetosa		2
Typosyllis cornuta		1
Typosyllis fasciata		
unidentified		4
TOTAL 59 spp.		1214

Appendix I (cont'd): Polychaete species data for Station PPB-25 (25m), Cruise OCS-8; accumulated from Smith-McIntyre Grab samples 1695, 1696, 1697, 1698 and 1700. The numbers represent totals per $0.5m^2$ of sea floor for the polychaetes retained on a 1.0 mm sieve.

		$\#/0.5m^2$			$\#/0.5m^2$
Aglaophamus malmgreni			*Dexiospira spirillum*		
Allia abranchiata			*Diplocirrus glaucus*		
Allia nr *suecica*		10	*Diplocirrus hirsutus*		
Allia sp. B		7	*Diplocirrus longisetosus*		
Allia sp. C			*Dorvillea sp.*		
Amage auricula			*Dysponetus sp. N*		
Ampharete acutifrons					
Ampharete arctica			*Eclysippe sp. A*		
Ampharete goësi			*Enipo gracilis*		
Ampharete lindstromi			*Enipo canadensis*		
Ampharete vega			*Ephesiella macrocirrus*		
Ampharetidae - Genus A			*Eteone flava*		
Ampharetidae - Genus B			*Eteone longa*		
Amphicteis sundevalli			*Eteone spetsbergensis*		
Anaitides citrina			*Eteone (Mysta) barbata*		
Anaitides groenlandica		1	*Euchone analis*		
Antinoella badia			*Euchone elegans*		
Antinoella sarsi		1	*Euchone incolor*		
Apistobranchus tullbergi		6	*Euchone papillosa*		
Apomatus globifer			*Euchone sp.*		
Arcteobia anticostiensis			*Eucranta villosa*		
Arenicola glacialis			*Eunoe oerstedi*		
Aricidea quadrilobata			*Eusyllis blomstrandi*		
Aricidea tetrabranchiata			*Exogone dispar*		
Artacama proboscidea		4	*Exogone naidina*		
Autolytus alexandri			*Exogone sp.*		
Autolytus fallax			*Fabricinae - sp. O*		3
Axionice flexuosa			*Fabricinae - sp. R*		
Axionice maculata			*Fabrisabella schaudinni*		
			Flabelligera affinis		
Barantolla sp.		1			
Brada incrustata			*Gattyana cirrosa*		
Brada inhabilis			*Glycera capitata*		
Brada nuda			*Glycinde wireni*		
Brada villosa		5	*Glyphanostomum pallescens*		
Branchiomma infarcta			*Harmothoe imbricata*		
Capitella capitata		1	*Hesionidae gen et sp. nov.*		
Chaetozone setosa		3	*Heteromastus filiformis*		2
Chone duneri			*Jasmineira sp.*		
Chone infundibuliformis					
Chone nr *murmanica*			*Lagisca extenuata*		
Cirratulus cirratus			*Lanassa nordenskjoldi*		
Cistenides hyperborea		2	*Lanassa venusta*		
Clymenura polaris		1	*Laonice cirrata*		
Cossura longocirrata		2	*Laonome kroyeri*		
Cossura sp. A			*Laphania boecki*		

		#/0.5m²
Lumbriclymene minor		
Lumbrineris fragilis		
Lumbrineris impatiens		
Lumbrineris latreilli		
Lumbrineris minuta		2
Lumbrineris sp. A		
Lumbrineris sp. B		
Lumbrineris sp. X		2
Lysilla loveni		
Lysippe labiata		
Magelona longicornis		
Maldane sarsi		1
Marenzelleria wireni		
Melaenis loveni		
Melinna elisabethae		
Microclymene sp.		
Micronephthys minuta		25
Minuspio cirrifera		3
Myriochele heeri		
Myriochele oculata		
Mystides borealis		
Nemidia torelli		
Neosabellides sp.		
Nephtys caeca		
Nephtys ciliata		7
Nephtys discors		
Nephtys incisa		
Nephtys longosetosa		
Nephtys paradoxa		1
Nereimyra aphroditoides		
Nereis zonata		
Nicolea zostericola		
Nicomache lumbricalis		
Nicon sp. A		
Nothria conchylega		
Notomastus latericeus		
Notoproctus oculatus		
Onuphis quadricuspis		
Ophelina acuminata		
Ophelina cylindricaudatus		8
Ophelina groenlandica		
Ophelina sp. A		
Ophryotrocha sp.		
Orbinia sp.		
Owenia collaris		
Owenia fusiformis		
Paramphitrite tetrabranchia		
Paranaitides wahlbergi		
Paraonis sp. A		
Parheteromastus sp. A		1
Petaloproctus tenuis		
Pherusa plumosa		
Pholoe minuta		

		#/0.5m²
Pionosyllis compacta		
Pista cristata		
Polycirrus medusa		
Polydora caulleryi		
Polydora quadrilobata		
Polydora socialis		
Polyphysia crassa		
Praxillella gracilis		
Praxillella praetermissa		
Prionospio steenstrupi		8
Proclea graffii		
Pygospio elegans		
Rhodine gracilior		
Sabella sp.		
Sabellastarte sp.		
Sabellides borealis		
Scalibregma inflatum		
Schistomeringos caeca		
Schistomeringos sp. A		
Scoloplos acutus		3
Scoloplos armiger		
Sigambra tentaculata		
Sphaerodoridium claparedii		
Sphaerodoridium sp. A		
Sphaerodoropsis biserialis		
Sphaerodoropsis minuta		
Sphaerodoropsis sp. A		
Sphaerodoropsis sp. B		
Sphaerodorum gracilis		
Sphaerosyllis erinaceus		
Spinther sp.		
Spio filicornis		
Spio theeli		
Spiochaetopterus typicus		
Spiophanes bombyx		
Spirorbis granulatus		
Sternaspis scutata		35
Syllides longocirrata		1
Syllides sp.		
Tachytrypane abranchiata		
Tachytrypane sp. A		
Tauberia gracilis		
Terebellides stroemi		
Tharyx ?acutus		43
Travisia sp.		
Trichobranchus glacialis		
Trochochaeta carica		3
Trochochaeta multisetosa		
Typosyllis cornuta		
Typosyllis fasciata		
unidentified		
TOTAL 30 spp.		192

		#/0.5m²
Lumbriclymene minor		
Lumbrineris fragilis		
Lumbrineris impatiens		
Lumbrineris latreilli		
Lumbrineris minuta		2
Lumbrineris sp. A		
Lumbrineris sp. B		
Lumbrineris sp. X		2
Lysilla loveni		
Lysippe labiata		
Magelona longicornis		
Maldane sarsi		1
Marenzelleria wireni		
Melaenis loveni		
Melinna elisabethae		
Microclymene sp.		
Micronephthys minuta		25
Minuspio cirrifera		3
Myriochele heeri		
Myriochele oculata		
Mystides borealis		
Nemidia torelli		
Neosabellides sp.		
Nephtys caeca		
Nephtys ciliata		7
Nephtys discors		
Nephtys incisa		
Nephtys longosetosa		
Nephtys paradoxa		1
Nereimyra aphroditoides		
Nereis zonata		
Nicolea zostericola		
Nicomache lumbricalis		
Nicon sp. A		
Nothria conchylega		
Notomastus latericeus		
Notoproctus oculatus		
Onuphis quadricuspis		
Ophelina acuminata		
Ophelina cylindricaudatus		8
Ophelina groenlandica		
Ophelina sp. A		
Ophryotrocha sp.		
Orbinia sp.		
Owenia collaris		
Owenia fusiformis		
Paramphitrite tetrabranchia		
Paranaitides wahlbergi		
Paraonis sp. A		
Parheteromastus sp. A		1
Petaloproctus tenuis		
Pherusa plumosa		
Pholoe minuta		

		#/0.5m²
Pionosyllis compacta		
Pista cristata		
Polycirrus medusa		
Polydora caulleryi		
Polydora quadrilobata		
Polydora socialis		
Polyphysia crassa		
Praxillella gracilis		
Praxillella praetermissa		
Prionospio steenstrupi		8
Proclea graffii		
Pygospio elegans		
Rhodine gracilior		
Sabella sp.		
Sabellastarte sp.		
Sabellides borealis		
Scalibregma inflatum		
Schistomeringos caeca		
Schistomeringos sp. A		
Scoloplos acutus		3
Scoloplos armiger		
Sigambra tentaculata		
Sphaerodoridium claparedii		
Sphaerodoridium sp. A		
Sphaerodoropsis biserialis		
Sphaerodoropsis minuta		
Sphaerodoropsis sp. A		
Sphaerodoropsis sp. B		
Sphaerodorum gracilis		
Sphaerosyllis erinaceus		
Spinther sp.		
Spio filicornis		
Spio theeli		
Spiochaetopterus typicus		
Spiophanes bombyx		
Spirorbis granulatus		
Sternaspis scutata		35
Syllides longocirrata		1
Syllides sp.		
Tachytrypane abranchiata		
Tachytrypane sp. A		
Tauberia gracilis		
Terebellides stroemi		
Tharyx ?acutus		43
Travisia sp.		
Trichobranchus glacialis		
Trochochaeta carica		3
Trochochaeta multisetosa		
Typosyllis cornuta		
Typosyllis fasciata		
unidentified		
TOTAL 30 spp.		192

Appendix I (cont'd): Polychaete species data for Station PPB-55 (55m), Cruise OCS-8; accumulated from Smith-McIntyre Grab samples 1702, 1703, 1704, 1705 and 1706. The numbers represent totals per $0.5m^2$ of sea floor for the polychaetes retained on a 1.0 mm sieve.

		$\#/0.5m^2$
Aglaophamus malmgreni		
Allia abranchiata		
Allia nr *suecica*		23
Allia sp. B		
Allia sp. C		
Amage auricula		
Ampharete acutifrons		
Ampharete arctica		2
Ampharete goësi		
Ampharete lindstromi		6
Ampharete vega		
Ampharetidae - Genus A		
Ampharetidae - Genus B		
Amphicteis sundevalli		
Anaitides citrina		
Anaitides groenlandica		1
Antinoella badia		
Antinoella sarsi		2
Apistobranchus tullbergi		1
Apomatus globifer		1
Arcteobia anticostiensis		
Arenicola glacialis		
Aricidea quadrilobata		
Aricidea tetrabranchiata		
Artacama proboscidea		
Autolytus alexandri		
Autolytus fallax		
Axionice flexuosa		
Axionice maculata		
Barantolla sp.		30
Brada incrustata		
Brada inhabilis		
Brada nuda		
Brada villosa		
Branchiomma infarcta		
Capitella capitata		
Chaetozone setosa		27
Chone duneri		9
Chone infundibuliformis		
Chone nr *murmanica*		18
Cirratulus cirratus		
Cistenides hyperborea		
Clymenura polaris		9
Cossura longocirrata		
Cossura sp. A		

		$\#/0.5m^2$
Dexiospira spirillum		
Diplocirrus glaucus		1
Diplocirrus hirsutus		3
Diplocirrus longisetosus		18
Dorvillea sp.		
Dysponetus sp. N		
Eclysippe sp. A		
Enipo gracilis		
Enipo canadensis		
Ephesiella macrocirrus		
Eteone flava		1
Eteone longa		3
Eteone spetsbergensis		
Eteone (Mysta) barbata		1
Euchone analis		1
Euchone elegans		5
Euchone incolor		
Euchone papillosa		
Euchone sp.		
Eucranta villosa		
Eunoe oerstedi		
Eusyllis blomstrandi		
Exogone dispar		
Exogone naidina		
Exogone sp.		
Fabricinae - sp. O		2
Fabricinae - sp. R		7
Fabrisabella schaudinni		
Flabelligera affinis		
Gattyana cirrosa		8
Glycera capitata		
Glycinde wireni		2
Glyphanostomum pallescens		
Harmothoe imbricata		
Hesionidae gen et sp. nov.		
Heteromastus filiformis		2
Jasmineira sp.		
Lagisca extenuata		
Lanassa nordenskjoldi		
Lanassa venusta		
Laonice cirrata		1
Laonome kroyeri		
Laphania boecki		1

		#/0.5m²
Lumbriclymene minor		
Lumbrineris fragilis		1
Lumbrineris impatiens		13
Lumbrineris latreilli		1
Lumbrineris minuta		
Lumbrineris sp. A		
Lumbrineris sp. B		1
Lumbrineris sp. X		9
Lysilla loveni		1
Lysippe labiata		11
Magelona longicornis		
Maldane sarsi		2
Marenzelleria wireni		
Melaenis loveni		
Melinna elisabethae		9
Microclymene sp.		
Micronephthys minuta		13
Minuspio cirrifera		1
Myriochele heeri		14
Myriochele oculata		2
Mystides borealis		
Nemidia torelli		
Neosabellides sp.		
Nephtys caeca		
Nephtys ciliata		3
Nephtys discors		
Nephtys incisa		
Nephtys longosetosa		
Nephtys paradoxa		1
Nereimyra aphroditoides		6
Nereis zonata		1
Nicolea zostericola		
Nicomache lumbricalis		
Nicon sp. A		
Nothria conchylega		1
Notomastus latericeus		
Notoproctus oculatus		
Onuphis quadricuspis		5
Ophelina acuminata		
Ophelina cylindricaudatus		
Ophelina groenlandica		3
Ophelina sp. A		
Ophryotrocha sp.		
Orbinia sp.		
Owenia collaris		2
Owenia fusiformis		
Paramphitrite tetrabranchia		
Paranaitides wahlbergi		
Paraonis sp. A		
Parheteromastus sp. A		
Petaloproctus tenuis		2
Pherusa plumosa		
Pholoe minuta		75

		#/0.5m²
Pionosyllis compacta		
Pista cristata		
Polycirrus medusa		6
Polydora caulleryi		166
Polydora quadrilobata		
Polydora socialis		2
Polyphysia crassa		
Praxillella gracilis		
Praxillella praetermissa		
Prionospio steenstrupi		3
Proclea graffii		1
Pygospio elegans		
Rhodine gracilior		
Sabella sp.		1
Sabellastarte sp.		1
Sabellides borealis		
Scalibregma inflatum		2
Schistomeringos caeca		
Schistomeringos sp. A		
Scoloplos acutus		1
Scoloplos armiger		
Sigambra tentaculata		
Sphaerodoridium claparedii		
Sphaerodoridium sp. A		1
Sphaerodoropsis biserialis		
Sphaerodoropsis minuta		
Sphaerodoropsis sp. A		
Sphaerodoropsis sp. B		
Sphaerodorum gracilis		2
Sphaerosyllis erinaceus		
Spinther sp.		
Spio filicornis		
Spio theeli		
Spiochaetopterus typicus		1
Spiophanes bombyx		
Spirorbis granulatus		
Sternaspis scutata		
Syllides longocirrata		
Syllides sp.		1
Tachytrypane abranchiata		
Tachytrypane sp. A		
Tauberia gracilis		
Terebellides stroemi		85
Tharyx ?acutus		8
Travisia sp.		3
Trichobranchus glacialis		
Trochochaeta carica		2
Trochochaeta multisetosa		
Typosyllis cornuta		10
Typosyllis fasciata		1
unidentified		4
TOTAL 69 spp.		663

		#/0.5m^2
Lumbriclymene minor		
Lumbrineris fragilis		1
Lumbrineris impatiens		13
Lumbrineris latreilli		1
Lumbrineris minuta		
Lumbrineris sp. A		
Lumbrineris sp. B		1
Lumbrineris sp. X		9
Lysilla loveni		1
Lysippe labiata		11
Magelona longicornis		
Maldane sarsi		2
Marenzelleria wireni		
Melaenis loveni		
Melinna elisabethae		9
Microclymene sp.		
Micronephthys minuta		13
Minuspio cirrifera		1
Myriochele heeri		14
Myriochele oculata		2
Mystides borealis		
Nemidia torelli		
Neosabellides sp.		
Nephtys caeca		
Nephtys ciliata		3
Nephtys discors		
Nephtys incisa		
Nephtys longosetosa		
Nephtys paradoxa		1
Nereimyra aphroditoides		6
Nereis zonata		1
Nicolea zostericola		
Nicomache lumbricalis		
Nicon sp. A		
Nothria conchylega		1
Notomastus latericeus		
Notoproctus oculatus		
Onuphis quadricuspis		5
Ophelina acuminata		
Ophelina cylindricaudatus		
Ophelina groenlandica		3
Ophelina sp. A		
Ophryotrocha sp.		
Orbinia sp.		
Owenia collaris		2
Owenia fusiformis		
Paramphitrite tetrabranchia		
Paranaitides wahlbergi		
Paraonis sp. A		
Parheteromastus sp. A		
Petaloproctus tenuis		2
Pherusa plumosa		
Pholoe minuta		75

		#/0.5m^2
Pionosyllis compacta		
Pista cristata		
Polycirrus medusa		6
Polydora caulleryi		166
Polydora quadrilobata		
Polydora socialis		2
Polyphysia crassa		
Praxillella gracilis		
Praxillella praetermissa		
Prionospio steenstrupi		3
Proclea graffii		1
Pygospio elegans		
Rhodine gracilior		
Sabella sp.		1
Sabellastarte sp.		1
Sabellides borealis		
Scalibregma inflatum		2
Schistomeringos caeca		
Schistomeringos sp. A		
Scoloplos acutus		1
Scoloplos armiger		
Sigambra tentaculata		
Sphaerodoridium claparedii		
Sphaerodoridium sp. A		1
Sphaerodoropsis biserialis		
Sphaerodoropsis minuta		
Sphaerodoropsis sp. A		
Sphaerodoropsis sp. B		
Sphaerodorum gracilis		2
Sphaerosyllis erinaceus		
Spinther sp.		
Spio filicornis		
Spio theeli		
Spiochaetopterus typicus		1
Spiophanes bombyx		
Spirorbis granulatus		
Sternaspis scutata		
Syllides longocirrata		
Syllides sp.		1
Tachytrypane abranchiata		
Tachytrypane sp. A		
Tauberia gracilis		
Terebellides stroemi		85
Tharyx ?acutus		8
Travisia sp.		3
Trichobranchus glacialis		
Trochochaeta carica		2
Trochochaeta multisetosa		
Typosyllis cornuta		10
Typosyllis fasciata		1
unidentified		4
TOTAL 69 spp.		663

Appendix I (cont'd): Polychaete species data for Station PPB-100 (100m), Cruise OCS-8; accumulated from Smith-McIntyre Grab samples 1712, 1713, 1714, 1715 and 1716. The numbers represent totals per $0.5m^2$ of sea floor for the polychaetes retained on a 1.0 mm sieve.

		$\#/0.5m^2$
Aglaophamus malmgreni		
Allia abranchiata		
Allia nr *suecica*		20
Allia sp. B		
Allia sp. C		
Amage auricula		
Ampharete acutifrons		
Ampharete arctica		
Ampharete goësi		
Ampharete lindstromi		3
Ampharete vega		
Ampharetidae - Genus A		
Ampharetidae - Genus B		
Amphicteis sundevalli		
Anaitides citrina		
Anaitides groenlandica		3
Antinoella badia		
Antinoella sarsi		
Apistobranchus tullbergi		6
Apomatus globifer		
Arcteobia anticostiensis		
Arenicola glacialis		
Aricidea quadrilobata		
Aricidea tetrabranchiata		
Artacama proboscidea		
Autolytus alexandri		
Autolytus fallax		1
Axionice flexuosa		
Axionice maculata		
Barantolla sp.		63
Brada incrustata		
Brada inhabilis		
Brada nuda		
Brada villosa		
Branchiomma infarcta		
Capitella capitata		2
Chaetozone setosa		46
Chone duneri		3
Chone infundibuliformis		
Chone nr *murmanica*		36
Cirratulus cirratus		
Cistenides hyperborea		2
Clymenura polaris		5
Cossura longocirrata		1
Cossura sp. A		

		$\#/0.5m^2$
Dexiospira spirillum		
Diplocirrus glaucus		
Diplocirrus hirsutus		
Diplocirrus longisetosus		1
Dorvillea sp.		
Dysponetus sp. N		
Eclysippe sp. A		
Enipo gracilis		
Enipo canadensis		
Ephesiella macrocirrus		
Eteone flava		1
Eteone longa		3
Eteone spetsbergensis		
Eteone (Mysta) barbata		
Euchone analis		
Euchone elegans		
Euchone incolor		1
Euchone papillosa		
Euchone sp.		1
Eucranta villosa		
Eunoe oerstedi		
Eusyllis blomstrandi		1
Exogone dispar		
Exogone naidina		
Exogone sp.		
Fabricinae - sp. O		
Fabricinae - sp. R		6
Fabrisabella schaudinni		
Flabelligera affinis		
Gattyana cirrosa		
Glycera capitata		
Glycinde wireni		
Glyphanostomum pallescens		
Harmothoe imbricata		
Hesionidae gen et sp. nov.		
Heteromastus filiformis		20
Jasmineira sp.		
Lagisca extenuata		
Lanassa nordenskjoldi		
Lanassa venusta		
Laonice cirrata		1
Laonome kroyeri		1
Laphania boecki		3

		#/0.5m^2
Lumbriclymene minor		
Lumbrineris fragilis		
Lumbrineris impatiens		54
Lumbrineris latreilli		1
Lumbrineris minuta		
Lumbrineris sp. A		
Lumbrineris sp. B		1
Lumbrineris sp. X		40
Lysilla loveni		
Lysippe labiata		31
Magelona longicornis		
Maldane sarsi		12
Marenzelleria wireni		
Melaenis loveni		
Melinna elisabethae		1
Microclymene sp.		3
Micronephthys minuta		74
Minuspio cirrifera		
Myriochele heeri		28
Myriochele oculata		
Mystides borealis		
Nemidia torelli		
Neosabellides sp.		
Nephtys caeca		
Nephtys ciliata		13
Nephtys discors		
Nephtys incisa		
Nephtys longosetosa		
Nephtys paradoxa		1
Nereimyra aphroditoides		2
Nereis zonata		
Nicolea zostericola		
Nicomache lumbricalis		
Nicon sp. A		
Nothria conchylega		
Notomastus latericeus		1
Notoproctus oculatus		
Nicomache sp. (?minor)		1
Onuphis quadricuspis		29
Ophelina acuminata		
Ophelina cylindricaudatus		
Ophelina groenlandica		
Ophelina sp. A		
Ophryotrocha sp.		
Orbinia sp.		
Owenia collaris		5
Owenia fusiformis		
Paramphitrite tetrabranchia		
Paranaitides wahlbergi		
Paraonis sp. A		5
Parheteromastus sp. A		6
Petaloproctus tenuis		34
Pherusa plumosa		
Pholoe minuta		51

		#/0.5m^2
Pionosyllis compacta		
Pista cristata		
Polycirrus medusa		1
Polydora caulleryi		22
Polydora quadrilobata		
Polydora socialis		2
Polyphysia crassa		
Praxillella gracilis		
Praxillella praetermissa		
Prionospio steenstrupi		6
Proclea graffii		1
Pygospio elegans		
Rhodine gracilior		2
Sabella sp.		
Sabellastarte sp.		1
Sabellides borealis		
Scalibregma inflatum		1
Schistomeringos caeca		4
Schistomeringos sp. A		
Scoloplos acutus		34
Scoloplos armiger		
Sigambra tentaculata		
Sphaerodoridium claparedii		
Sphaerodoridium sp. A		
Sphaerodoropsis biserialis		
Sphaerodoropsis minuta		
Sphaerodoropsis sp. A		1
Sphaerodoropsis sp. B		
Sphaerodorum gracilis		8
Sphaerosyllis erinaceus		4
Spinther sp.		
Spio filicornis		
Spio theeli		
Spiochaetopterus typicus		10
Spiophanes bombyx		
Spirorbis granulatus		
Sternaspis scutata		
Syllides longocirrata		
Syllides sp.		
Tachytrypane abranchiata		
Tachytrypane sp. A		
Tauberia gracilis		4
Terebellides stroemi		14
Tharyx ?acutus		29
Travisia sp.		2
Trichobranchus glacialis		
Trochochaeta carica		10
Trochochaeta multisetosa		
Typosyllis cornuta		11
Typosyllis fasciata		6
unidentified		
TOTAL 66 spp.		796

		$\#/0.5m^2$
Lumbriclymene minor		
Lumbrineris fragilis		
Lumbrineris impatiens		54
Lumbrineris latreilli		1
Lumbrineris minuta		
Lumbrineris sp. A		
Lumbrineris sp. B		1
Lumbrineris sp. X		40
Lysilla loveni		
Lysippe labiata		31
Magelona longicornis		
Maldane sarsi		12
Marenzelleria wireni		
Melaenis loveni		
Melinna elisabethae		1
Microclymene sp.		3
Micronephthys minuta		74
Minuspio cirrifera		
Myriochele heeri		28
Myriochele oculata		
Mystides borealis		
Nemidia torelli		
Neosabellides sp.		
Nephtys caeca		
Nephtys ciliata		13
Nephtys discors		
Nephtys incisa		
Nephtys longosetosa		
Nephtys paradoxa		1
Nereimyra aphroditoides		2
Nereis zonata		
Nicolea zostericola		
Nicomache lumbricalis		
Nicon sp. A		
Nothria conchylega		
Notomastus latericeus		1
Notoproctus oculatus		
Nicomache sp. (?minor)		1
Onuphis quadricuspis		29
Ophelina acuminata		
Ophelina cylindricaudatus		
Ophelina groenlandica		
Ophelina sp. A		
Ophryotrocha sp.		
Orbinia sp.		
Owenia collaris		5
Owenia fusiformis		
Paramphitrite tetrabranchia		
Paranaitides wahlbergi		
Paraonis sp. A		5
Parheteromastus sp. A		6
Petaloproctus tenuis		34
Pherusa plumosa		
Pholoe minuta		51

		$\#/0.5m^2$
Pionosyllis compacta		
Pista cristata		
Polycirrus medusa		1
Polydora caulleryi		22
Polydora quadrilobata		
Polydora socialis		2
Polyphysia crassa		
Praxillella gracilis		
Praxillella praetermissa		
Prionospio steenstrupi		6
Proclea graffii		1
Pygospio elegans		
Rhodine gracilior		2
Sabella sp.		
Sabellastarte sp.		1
Sabellides borealis		
Scalibregma inflatum		1
Schistomeringos caeca		4
Schistomeringos sp. A		
Scoloplos acutus		34
Scoloplos armiger		
Sigambra tentaculata		
Sphaerodoridium claparedii		
Sphaerodoridium sp. A		
Sphaerodoropsis biserialis		
Sphaerodoropsis minuta		
Sphaerodoropsis sp. A		1
Sphaerodoropsis sp. B		
Sphaerodorum gracilis		8
Sphaerosyllis erinaceus		4
Spinther sp.		
Spio filicornis		
Spio theeli		
Spiochaetopterus typicus		10
Spiophanes bombyx		
Spirorbis granulatus		
Sternaspis scutata		
Syllides longocirrata		
Syllides sp.		
Tachytrypane abranchiata		
Tachytrypane sp. A		
Tauberia gracilis		4
Terebellides stroemi		14
Tharyx ?acutus		29
Travisia sp.		2
Trichobranchus glacialis		
Trochochaeta carica		10
Trochochaeta multisetosa		
Typosyllis cornuta		11
Typosyllis fasciata		6
unidentified		
TOTAL 66 spp.		796

Appendix I (cont'd): Polychaete species data for Station WBS-36/CH-75 (132-140m), Cruise WEBSEC-71; accumulated from Smith-McIntyre Grab samples 983, 984, 985, 986 and 987. The numbers represent totals per $0.5m^2$ of sea floor for the polychaetes retained on a 1.0 mm sieve.

		#/$0.5m^2$
Aglaophamus malmgreni		
Allia abranchiata		
Allia nr *suecica*		13
Allia sp. B		
Allia sp. C		
Amage auricula		
Ampharete acutifrons		11
Ampharete arctica		1
Ampharete goësi		
Ampharete lindstromi		
Ampharete vega		
Ampharetidae - Genus A		
Ampharetidae - Genus B		
Amphicteis sundevalli		
Anaitides citrina		
Anaitides groenlandica		2
Antinoella badia		
Antinoella sarsi		2
Apistobranchus tullbergi		
Apomatus globifer		
Arcteobia anticostiensis		1
Arenicola glacialis		
Aricidea quadrilobata		
Aricidea tetrabranchiata		
Artacama proboscidea		
Autolytus alexandri		1
Autolytus fallax		
Axionice flexuosa		
Axionice maculata		
Barantolla sp.		17
Brada incrustata		
Brada inhabilis		
Brada nuda		
Brada villosa		
Branchiomma infarcta		
Capitella capitata		
Chaetozone setosa		71
Chone duneri		
Chone infundibuliformis		
Chone nr *murmanica*		13
Cirratulus cirratus		
Cistenides hyperborea		2
Clymenura polaris		1
Cossura longocirrata		5
Cossura sp. A		

		#/$0.5m^2$
Dexiospira spirillum		
Diplocirrus glaucus		
Diplocirrus hirsutus		1
Diplocirrus longisetosus		2
Dorvillea sp.		
Dysponetus sp. N		
Eclysippe sp. A		
Enipo gracilis		4
Enipo canadensis		
Ephesiella macrocirrus		
Eteone flava		
Eteone longa		9
Eteone spetsbergensis		
Eteone (Mysta) barbata		
Euchone analis		
Euchone elegans		
Euchone incolor		
Euchone papillosa		18
Euchone sp.		
Eucranta villosa		
Eunoe oerstedi		
Eusyllis blomstrandi		
Exogone dispar		
Exogone naidina		
Exogone sp.		
Fabricinae - sp. O		
Fabricinae - sp. R		
Fabrisabella schaudinni		
Flabelligera affinis		
Gattyana cirrosa		1
Glycera capitata		
Glycinde wireni		3
Glyphanostomum pallescens		
Harmothoe imbricata		
Hesionidae gen et sp. nov.		
Heteromastus filiformis		14
Jasmineira sp.		
Lagisca extenuata		
Lanassa nordenskjoldi		
Lanassa venusta		
Laonice cirrata		1
Laonome kroyeri		
Laphania boecki		2

		#/0.5m^2
Lumbriclymene minor		
Lumbrineris fragilis		
Lumbrineris impatiens		8
Lumbrineris latreilli		
Lumbrineris minuta		162
Lumbrineris sp. A		
Lumbrineris sp. B		
Lumbrineris sp. X		
Lysilla loveni		
Lysippe labiata		186
Magelona longicornis		1
Maldane sarsi		7
Marenzelleria wireni		
Melaenis loveni		
Melinna elisabethae		5
Microclymene sp.		
Micronephthys minuta		121
Minuspio cirrifera		1
Myriochele heeri		53
Myriochele oculata		
Mystides borealis		
Nemidia torelli		
Neosabellides sp.		
Nephtys caeca		
Nephtys ciliata		5
Nephtys discors		
Nephtys incisa		
Nephtys longosetosa		
Nephtys paradoxa		
Nereimyra aphroditoides		
Nereis zonata		
Nicolea zostericola		
Nicomache lumbricalis		
Nicon sp. A		
Nothria conchylega		6
Notomastus latericeus		
Notoproctus oculatus		
Onuphis quadricuspis		26
Ophelina acuminata		
Ophelina cylindricaudatus		1
Ophelina groenlandica		
Ophelina sp. A		
Ophryotrocha sp.		
Orbinia sp.		
Owenia collaris		
Owenia fusiformis		5
Paramphitrite tetrabranchia		
Paranaitides wahlbergi		
Paraonis sp. A		2
Parheteromastus sp. A		4
Petaloproctus tenuis		1
Pherusa plumosa		
Pholoe minuta		37

		#/0.5m^2
Pionosyllis compacta		
Pista cristata		
Polycirrus medusa		
Polydora caulleryi		1
Polydora quadrilobata		
Polydora socialis		
Polyphysia crassa		
Praxillella gracilis		
Praxillella praetermissa		
Prionospio steenstrupi		
Proclea graffii		3
Pygospio elegans		
Rhodine gracilior		
Sabella sp.		
Sabellastarte sp.		
Sabellides borealis		
Scalibregma inflatum		2
Schistomeringos caeca		
Schistomeringos sp. A		
Scoloplos acutus		22
Scoloplos armiger		
Sigambra tentaculata		
Sphaerodoridium claparedii		
Sphaerodoridium sp. A		
Sphaerodoropsis biserialis		
Sphaerodoropsis minuta		
Sphaerodoropsis sp. A		
Sphaerodoropsis sp. B		
Sphaerodorum gracilis		2
Sphaerosyllis erinaceus		
Spinther sp.		
Spio filicornis		
Spio theeli		
Spiochaetopterus typicus		123
Spiophanes bombyx		
Spirorbis granulatus		1
Sternaspis scutata		1
Syllides longocirrata		
Syllides sp.		
Tachytrypane abranchiata		
Tachytrypane sp. A		
Tauberia gracilis		5
Terebellides stroemi		19
Tharyx ?acutus		172
Travisia sp.		
Trichobranchus glacialis		1
Trochochaeta carica		3
Trochochaeta multisetosa		
Typosyllis cornuta		17
Typosyllis fasciata		
unidentified		51
TOTAL 55 spp.		1249

		$\#/0.5m^2$
Lumbriclymene minor		
Lumbrineris fragilis		
Lumbrineris impatiens		8
Lumbrineris latreilli		
Lumbrineris minuta		162
Lumbrineris sp. A		
Lumbrineris sp. B		
Lumbrineris sp. X		
Lysilla loveni		
Lysippe labiata		186
Magelona longicornis		1
Maldane sarsi		7
Marenzelleria wireni		
Melaenis loveni		
Melinna elisabethae		5
Microclymene sp.		
Micronephthys minuta		121
Minuspio cirrifera		1
Myriochele heeri		53
Myriochele oculata		
Mystides borealis		
Nemidia torelli		
Neosabellides sp.		
Nephtys caeca		
Nephtys ciliata		5
Nephtys discors		
Nephtys incisa		
Nephtys longosetosa		
Nephtys paradoxa		
Nereimyra aphroditoides		
Nereis zonata		
Nicolea zostericola		
Nicomache lumbricalis		
Nicon sp. A		
Nothria conchylega		6
Notomastus latericeus		
Notoproctus oculatus		
Onuphis quadricuspis		26
Ophelina acuminata		
Ophelina cylindricaudatus		1
Ophelina groenlandica		
Ophelina sp. A		
Ophryotrocha sp.		
Orbinia sp.		
Owenia collaris		
Owenia fusiformis		5
Paramphitrite tetrabranchia		
Paranaitides wahlbergi		
Paraonis sp. A		2
Parheteromastus sp. A		4
Petaloproctus tenuis		1
Pherusa plumosa		
Pholoe minuta		37

		$\#/0.5m^2$
Pionosyllis compacta		
Pista cristata		
Polycirrus medusa		
Polydora caulleryi		1
Polydora quadrilobata		
Polydora socialis		
Polyphysia crassa		
Praxillella gracilis		
Praxillella praetermissa		
Prionospio steenstrupi		
Proclea graffii		3
Pygospio elegans		
Rhodine gracilior		
Sabella sp.		
Sabellastarte sp.		
Sabellides borealis		
Scalibregma inflatum		2
Schistomeringos caeca		
Schistomeringos sp. A		
Scoloplos acutus		22
Scoloplos armiger		
Sigambra tentaculata		
Sphaerodoridium claparedii		
Sphaerodoridium sp. A		
Sphaerodoropsis biserialis		
Sphaerodoropsis minuta		
Sphaerodoropsis sp. A		
Sphaerodoropsis sp. B		
Sphaerodorum gracilis		2
Sphaerosyllis erinaceus		
Spinther sp.		
Spio filicornis		
Spio theeli		
Spiochaetopterus typicus		123
Spiophanes bombyx		
Spirorbis granulatus		1
Sternaspis scutata		1
Syllides longocirrata		
Syllides sp.		
Tachytrypane abranchiata		
Tachytrypane sp. A		
Tauberia gracilis		5
Terebellides stroemi		19
Tharyx ?acutus		172
Travisia sp.		
Trichobranchus glacialis		1
Trochochaeta carica		3
Trochochaeta multisetosa		
Typosyllis cornuta		17
Typosyllis fasciata		
unidentified		51
TOTAL 55 spp.		1249

Appendix I (cont'd): Polychaete species data for Station WBS-41/CG-83 (169-232m), Cruise WEBSEC-71; accumulated from Smith-McIntyre Grab samples 1008, 1009, 1010, 1011 and 1012. The numbers represent totals per $0.5m^2$ of sea floor for the polychaetes retained on a 1.0 mm sieve.

		$\#/0.5m^2$
Aglaophamus malmgreni		
Allia abranchiata		
Allia nr *suecica*		168
Allia sp. B		
Allia sp. C		
Amage auricula		
Ampharete acutifrons		
Ampharete arctica		1
Ampharete goësi		
Ampharete lindstromi		
Ampharete vega		
Ampharetidae - Genus A		
Ampharetidae - Genus B		
Amphicteis sundevalli		
Anaitides citrina		
Anaitides groenlandica		2
Antinoella badia		1
Antinoella sarsi		4
Apistobranchus tullbergi		1
Apomatus globifer		
Arcteobia anticostiensis		
Arenicola glacialis		
Aricidea quadrilobata		
Aricidea tetrabranchiata		
Artacama proboscidea		5
Autolytus alexandri		
Autolytus fallax		
Axionice flexuosa		
Axionice maculata		
Barantolla sp.		11
Brada incrustata		
Brada inhabilis		
Brada nuda		
Brada villosa		
Branchiomma infarcta		
Capitella capitata		
Chaetozone setosa		86
Chone duneri		
Chone infundibuliformis		
Chone nr *murmanica*		
Cirratulus cirratus		
Cistenides hyperborea		1
Clymenura polaris		
Cossura longocirrata		100
Cossura sp. A		

		$\#/0.5m^2$
Dexiospira spirillum		
Diplocirrus glaucus		
Diplocirrus hirsutus		
Diplocirrus longisetosus		
Dorvillea sp.		
Dysponetus sp. N		
Eclysippe sp. A		
Enipo gracilis		
Enipo canadensis		
Ephesiella macrocirrus		
Eteone flava		
Eteone longa		18
Eteone spetsbergensis		
Eteone (Mysta) barbata		
Euchone analis		
Euchone elegans		
Euchone incolor		
Euchone papillosa		
Euchone sp.		
Eucranta villosa		
Eunoe oerstedi		
Eusyllis blomstrandi		
Exogone dispar		
Exogone naidina		
Exogone sp.		
Fabricinae - sp. O		
Fabricinae - sp. R		
Fabrisabella schaudinni		
Flabelligera affinis		
Gattyana cirrosa		
Glycera capitata		
Glycinde wireni		
Glyphanostomum pallescens		
Harmothoe imbricata		
Hesionidae gen et sp. nov.		
Heteromastus filiformis		4
Jasmineira sp.		
Lagisca extenuata		
Lanassa nordenskjoldi		
Lanassa venusta		
Laonice cirrata		
Laonome kroyeri		
Laphania boecki		4

		$\#/0.5m^2$
Lumbriclymene minor		
Lumbrineris fragilis		
Lumbrineris impatiens		
Lumbrineris latreilli		
Lumbrineris minuta		98
Lumbrineris sp. A		
Lumbrineris sp. B		
Lumbrineris sp. X		
Lysilla loveni		
Lysippe labiata		25
Magelona longicornis		
Maldane sarsi		3
Marenzelleria wireni		
Melaenis loveni		
Melinna elisabethae		
Microclymene sp.		
Micronephthys minuta		302
Minuspio cirrifera		1
Myriochele heeri		4
Myriochele oculata		
Mystides borealis		
Nemidia torelli		
Neosabellides sp.		
Nephtys caeca		
Nephtys ciliata		15
Nephtys discors		
Nephtys incisa		
Nephtys longosetosa		
Nephtys paradoxa		
Nereimyra aphroditoides		2
Nereis zonata		
Nicolea zostericola		
Nicomache lumbricalis		
Nicon sp. A		
Nothria conchylega		
Notomastus latericeus		
Notoproctus oculatus		
Onuphis quadricuspis		4
Ophelina acuminata		
Ophelina cylindricaudatus		
Ophelina groenlandica		
Ophelina sp. A		
Ophryotrocha sp.		
Orbinia sp.		
Owenia collaris		
Owenia fusiformis		2
Paramphitrite tetrabranchia		
Paranaitides wahlbergi		
Paraonis sp. A		
Parheteromastus sp. A		
Petaloproctus tenuis		
Pherusa plumosa		
Pholoe minuta		

		$\#/0.5m^2$
Pionosyllis compacta		
Pista cristata		
Polycirrus medusa		
Polydora caulleryi		
Polydora quadrilobata		
Polydora socialis		
Polyphysia crassa		
Praxillella gracilis		
Praxillella praetermissa		1
Prionospio steenstrupi		56
Proclea graffii		15
Pygospio elegans		
Rhodine gracilior		
Sabella sp.		
Sabellastarte sp.		
Sabellides borealis		
Scalibregma inflatum		
Schistomeringos caeca		
Schistomeringos sp. A		
Scoloplos acutus		180
Scoloplos armiger		
Sigambra tentaculata		
Sphaerodoridium claparedii		
Sphaerodoridium sp. A		1
Sphaerodoropsis biserialis		
Sphaerodoropsis minuta		
Sphaerodoropsis sp. A		
Sphaerodoropsis sp. B		
Sphaerodorum gracilis		
Sphaerosyllis erinaceus		
Spinther sp.		
Spio filicornis		
Spio theeli		
Spiochaetopterus typicus		11
Spiophanes bombyx		
Spirorbis granulatus		
Sternaspis scutata		2
Syllides longocirrata		
Syllides sp.		
Tachytrypane abranchiata		
Tachytrypane sp. A		
Tauberia gracilis		123
Terebellides stroemi		22
Tharyx ?acutus		407
Travisia sp.		
Trichobranchus glacialis		
Trochochaeta carica		
Trochochaeta multisetosa		
Typosyllis cornuta		
Typosyllis fasciata		
unidentified		11
TOTAL 34 spp.		1696

		$\#/0.5m^2$
Lumbriclymene minor		
Lumbrineris fragilis		
Lumbrineris impatiens		
Lumbrineris latreilli		
Lumbrineris minuta		98
Lumbrineris sp. A		
Lumbrineris sp. B		
Lumbrineris sp. X		
Lysilla loveni		
Lysippe labiata		25
Magelona longicornis		
Maldane sarsi		3
Marenzelleria wireni		
Melaenis loveni		
Melinna elisabethae		
Microclymene sp.		
Micronephthys minuta		302
Minuspio cirrifera		1
Myriochele heeri		4
Myriochele oculata		
Mystides borealis		
Nemidia torelli		
Neosabellides sp.		
Nephtys caeca		
Nephtys ciliata		15
Nephtys discors		
Nephtys incisa		
Nephtys longosetosa		
Nephtys paradoxa		
Nereimyra aphroditoides		2
Nereis zonata		
Nicolea zostericola		
Nicomache lumbricalis		
Nicon sp. A		
Nothria conchylega		
Notomastus latericeus		
Notoproctus oculatus		
Onuphis quadricuspis		4
Ophelina acuminata		
Ophelina cylindricaudatus		
Ophelina groenlandica		
Ophelina sp. A		
Ophryotrocha sp.		
Orbinia sp.		
Owenia collaris		
Owenia fusiformis		2
Paramphitrite tetrabranchia		
Paranaitides wahlbergi		
Paraonis sp. A		
Parheteromastus sp. A		
Petaloproctus tenuis		
Pherusa plumosa		
Pholoe minuta		

		$\#/0.5m^2$
Pionosyllis compacta		
Pista cristata		
Polycirrus medusa		
Polydora caulleryi		
Polydora quadrilobata		
Polydora socialis		
Polyphysia crassa		
Praxillella gracilis		
Praxillella praetermissa		1
Prionospio steenstrupi		56
Proclea graffii		15
Pygospio elegans		
Rhodine gracilior		
Sabella sp.		
Sabellastarte sp.		
Sabellides borealis		
Scalibregma inflatum		
Schistomeringos caeca		
Schistomeringos sp. A		
Scoloplos acutus		180
Scoloplos armiger		
Sigambra tentaculata		
Sphaerodoridium claparedii		
Sphaerodoridium sp. A		1
Sphaerodoropsis biserialis		
Sphaerodoropsis minuta		
Sphaerodoropsis sp. A		
Sphaerodoropsis sp. B		
Sphaerodorum gracilis		
Sphaerosyllis erinaceus		
Spinther sp.		
Spio filicornis		
Spio theeli		
Spiochaetopterus typicus		11
Spiophanes bombyx		
Spirorbis granulatus		
Sternaspis scutata		2
Syllides longocirrata		
Syllides sp.		
Tachytrypane abranchiata		
Tachytrypane sp. A		
Tauberia gracilis		123
Terebellides stroemi		22
Tharyx ?acutus		407
Travisia sp.		
Trichobranchus glacialis		
Trochochaeta carica		
Trochochaeta multisetosa		
Typosyllis cornuta		
Typosyllis fasciata		
unidentified		11
TOTAL 34 spp.		1696

Appendix I (cont'd): Polychaete species data for Station WBS-42/CG-84 (540-831m), Cruise WEBSEC-71; accumulated from Smith-McIntyre Grab samples 1013, 1014, 1015, 1016 and 1017. The numbers represent totals per $0.5m^2$ of sea floor for the polychaetes retained on a 1.0 mm sieve.

		#/$0.5m^2$
Aglaophamus malmgreni		
Allia abranchiata		
Allia nr *suecica*		14
Allia sp. B		
Allia sp. C		
Amage auricula		
Ampharete acutifrons		
Ampharete arctica		
Ampharete goësi		
Ampharete lindstromi		
Ampharete vega		
Ampharetidae - Genus A		
Ampharetidae - Genus B		
Amphicteis sundevalli		
Anaitides citrina		
Anaitides groenlandica		1
Antinoella badia		
Antinoella sarsi		1
Apistobranchus tullbergi		
Apomatus globifer		
Arcteobia anticostiensis		
Arenicola glacialis		
Aricidea quadrilobata		
Aricidea tetrabranchiata		
Artacama proboscidea		
Autolytus alexandri		
Autolytus fallax		
Axionice flexuosa		
Axionice maculata		
Barantolla sp.		24
Brada incrustata		
Brada inhabilis		
Brada nuda		
Brada villosa		
Branchiomma infarcta		
Capitella capitata		21
Chaetozone setosa		11
Chone duneri		
Chone infundibuliformis		
Chone nr *murmanica*		18
Cirratulus cirratus		
Cistenides hyperborea		
Clymenura polaris		1
Cossura longocirrata		29
Cossura sp. A		

		#/$0.5m^2$
Dexiospira spirillum		
Diplocirrus glaucus		
Diplocirrus hirsutus		
Diplocirrus longisetosus		
Dorvillea sp.		
Dysponetus sp. N		
Eclysippe sp. A		
Enipo gracilis		
Enipo canadensis		
Ephesiella macrocirrus		
Eteone flava		
Eteone longa		9
Eteone spetsbergensis		
Eteone (Mysta) barbata		
Euchone analis		
Euchone elegans		
Euchone incolor		
Euchone papillosa		
Euchone sp.		
Eucranta villosa		
Eunoe oerstedi		
Eusyllis blomstrandi		
Exogone dispar		
Exogone naidina		
Exogone sp.		
Fabricinae - sp. O		
Fabricinae - sp. R		
Fabrisabella schaudinni		
Flabelligera affinis		
Gattyana cirrosa		
Glycera capitata		
Glycinde wireni		
Glyphanostomum pallescens		
Harmothoe imbricata		
Hesionidae gen et sp. nov.		
Heteromastus filiformis		1
Jasmineira sp.		
Lagisca extenuata		
Lanassa nordenskjoldi		
Lanassa venusta		
Laonice cirrata		32
Laonome kroyeri		
Laphania boecki		

		$\#/0.5m^2$
Lumbriclymene minor		
Lumbrineris fragilis		
Lumbrineris impatiens		
Lumbrineris latreilli		
Lumbrineris minuta		75
Lumbrineris sp. A		
Lumbrineris sp. B		
Lumbrineris sp. X		
Lysilla loveni		
Lysippe labiata		
Magelona longicornis		
Maldane sarsi		390
Marenzelleria wireni		
Melaenis loveni		
Melinna elisabethae		
Microclymene sp.		
Micronephthys minuta		3
Minuspio cirrifera		852
Myriochele heeri		
Myriochele oculata		
Mystides borealis		
Nemidia torelli		
Neosabellides sp.		
Nephtys caeca		
Nephtys ciliata		1
Nephtys discors		
Nephtys incisa		
Nephtys longosetosa		
Nephtys paradoxa		
Nereimyra aphroditoides		
Nereis zonata		
Nicolea zostericola		
Nicomache lumbricalis		
Nicon sp. A		
Nothria conchylega		
Notomastus latericeus		
Notoproctus oculatus		
Onuphis quadricuspis		3
Ophelina acuminata		
Ophelina cylindricaudatus		8
Ophelina groenlandica		
Ophelina sp. A		
Ophryotrocha sp.		
Orbinia sp.		
Owenia collaris		
Owenia fusiformis		550
Paramphitrite tetrabranchia		
Paranaitides wahlbergi		
Paraonis sp. A		
Parheteromastus sp. A		
Petaloproctus tenuis		2
Pherusa plumosa		
Pholoe minuta		2

		$\#/0.5m^2$
Pionosyllis compacta		
Pista cristata		
Polycirrus medusa		
Polydora caulleryi		
Polydora quadrilobata		
Polydora socialis		
Polyphysia crassa		
Praxillella gracilis		
Praxillella praetermissa		
Prionospio steenstrupi		1
Proclea graffii		
Pygospio elegans		
Rhodine gracilior		
Sabella sp.		
Sabellastarte sp.		
Sabellides borealis		
Scalibregma inflatum		
Schistomeringos caeca		
Schistomeringos sp. A		
Scoloplos acutus		37
Scoloplos armiger		
Sigambra tentaculata		
Sphaerodoridium claparedii		
Sphaerodoridium sp. A		15
Sphaerodoropsis biserialis		
Sphaerodoropsis minuta		
Sphaerodoropsis sp. A		
Sphaerodoropsis sp. B		13
Sphaerodorum gracilis		
Sphaerosyllis erinaceus		
Spinther sp.		
Spio filicornis		
Spio theeli		
Spiochaetopterus typicus		7
Spiophanes bombyx		
Spirorbis granulatus		
Sternaspis scutata		
Syllides longocirrata		
Syllides sp.		
Tachytrypane abranchiata		
Tachytrypane sp. A		
Tauberia gracilis		35
Terebellides stroemi		
Tharyx ?acutus		
Travisia sp.		
Trichobranchus glacialis		
Trochochaeta carica		1
Trochochaeta multisetosa		
Typosyllis cornuta		
Typosyllis fasciata		
unidentified		36
TOTAL 29 spp.		2193

		#/0.5m²			#/0.5m²
Lumbriclymene minor			*Pionosyllis compacta*		
Lumbrineris fragilis			*Pista cristata*		
Lumbrineris impatiens			*Polycirrus medusa*		
Lumbrineris latreilli			*Polydora caulleryi*		
Lumbrineris minuta		75	*Polydora quadrilobata*		
Lumbrineris sp. A			*Polydora socialis*		
Lumbrineris sp. B			*Polyphysia crassa*		
Lumbrineris sp. X			*Praxillella gracilis*		
Lysilla loveni			*Praxillella praetermissa*		
Lysippe labiata			*Prionospio steenstrupi*		1
			Proclea graffii		
Magelona longicornis			*Pygospio elegans*		
Maldane sarsi		390			
Marenzelleria wireni			*Rhodine gracilior*		
Melaenis loveni			*Sabella sp.*		
Melinna elisabethae			*Sabellastarte sp.*		
Microclymene sp.			*Sabellides borealis*		
Micronephthys minuta		3	*Scalibregma inflatum*		
Minuspio cirrifera		852	*Schistomeringos caeca*		
Myriochele heeri			*Schistomeringos sp. A*		
Myriochele oculata			*Scoloplos acutus*		37
Mystides borealis			*Scoloplos armiger*		
Nemidia torelli			*Sigambra tentaculata*		
Neosabellides sp.			*Sphaerodoridium claparedii*		
Nephtys caeca			*Sphaerodoridium sp. A*		15
Nephtys ciliata		1	*Sphaerodoropsis biserialis*		
Nephtys discors			*Sphaerodoropsis minuta*		
Nephtys incisa			*Sphaerodoropsis sp. A*		
Nephtys longosetosa			*Sphaerodoropsis sp. B*		13
Nephtys paradoxa			*Sphaerodorum gracilis*		
Nereimyra aphroditoides			*Sphaerosyllis erinaceus*		
Nereis zonata			*Spinther sp.*		
Nicolea zostericola			*Spio filicornis*		
Nicomache lumbricalis			*Spio theeli*		
Nicon sp. A			*Spiochaetopterus typicus*		7
Nothria conchylega			*Spiophanes bombyx*		
Notomastus latericeus			*Spirorbis granulatus*		
Notoproctus oculatus			*Sternaspis scutata*		
			Syllides longocirrata		
Onuphis quadricuspis		3	*Syllides sp.*		
Ophelina acuminata					
Ophelina cylindricaudatus		8	*Tachytrypane abranchiata*		
Ophelina groenlandica			*Tachytrypane sp. A*		
Ophelina sp. A			*Tauberia gracilis*		35
Ophryotrocha sp.			*Terebellides stroemi*		
Orbinia sp.			*Tharyx acutus*		
Owenia collaris			*Travisia sp.*		
Owenia fusiformis		550	*Trichobranchus glacialis*		
Paramphitrite tetrabranchia			*Trochochaeta carica*		1
Paranaitides wahlbergi			*Trochochaeta multisetosa*		
Paraonis sp. A			*Typosyllis cornuta*		
Parheteromastus sp. A			*Typosyllis fasciata*		
Petaloproctus tenuis		2			
Pherusa plumosa					
Pholoe minuta		2	unidentified		36
			TOTAL 29 spp.		2193

Appendix I (cont'd): Polychaete species data for Station WBS-43/CG-85 (821-997m), Cruise WEBSEC-71; accumulated from Smith-McIntyre Grab samples 1018, 1019, 1020, 1021 and 1022. The numbers represent totals per $0.5m^2$ of sea floor for the polychaetes retained on a 1.0 mm sieve.

		$\#/0.5m^2$
Aglaophamus malmgreni		1
Allia abranchiata		
Allia nr *suecica*		17
Allia sp. B		
Allia sp. C		
Amage auricula		
Ampharete acutifrons		
Ampharete arctica		
Ampharete goësi		
Ampharete lindstromi		
Ampharete vega		
Ampharetidae - Genus A		
Ampharetidae - Genus B		
Amphicteis sundevalli		
Anaitides citrina		
Anaitides groenlandica		
Antinoella badia		
Antinoella sarsi		1
Apistobranchus tullbergi		
Apomatus globifer		
Arcteobia anticostiensis		
Arenicola glacialis		
Aricidea quadrilobata		
Aricidea tetrabranchiata		
Artacama proboscidea		
Autolytus alexandri		
Autolytus fallax		
Axionice flexuosa		
Axionice maculata		
Barantolla sp.		3
Brada incrustata		
Brada inhabilis		
Brada nuda		
Brada villosa		
Branchiomma infarcta		
Capitella capitata		12
Chaetozone setosa		2
Chone duneri		
Chone infundibuliformis		
Chone nr *murmanica*		1
Cirratulus cirratus		
Cistenides hyperborea		
Clymenura polaris		
Cossura longocirrata		2
Cossura sp. A		

		$\#/0.5m^2$
Dexiospira spirillum		
Diplocirrus glaucus		
Diplocirrus hirsutus		
Diplocirrus longisetosus		
Dorvillea sp.		
Dysponetus sp. N		
Eclysippe sp. A		
Enipo gracilis		
Enipo canadensis		
Ephesiella macrocirrus		
Eteone flava		
Eteone longa		1
Eteone spetsbergensis		
Eteone (Mysta) barbata		
Euchone analis		
Euchone elegans		
Euchone incolor		
Euchone papillosa		
Euchone sp.		
Eucranta villosa		
Eunoe oerstedi		
Eusyllis blomstrandi		
Exogone dispar		
Exogone naidina		
Exogone sp.		
Fabricinae - sp. O		
Fabricinae - sp. R		
Fabrisabella schaudinni		
Flabelligera affinis		
Gattyana cirrosa		
Glycera capitata		
Glycinde wireni		
Glyphanostomum pallescens		
Harmothoe imbricata		
Hesionidae gen et sp. nov.		
Heteromastus filiformis		1
Jasmineira sp.		
Lagisca extenuata		
Lanassa nordenskjoldi		
Lanassa venusta		
Laonice cirrata		28
Laonome kroyeri		
Laphania boecki		

		$\#/0.5m^2$
Lumbriclymene minor		
Lumbrineris fragilis		
Lumbrineris impatiens		
Lumbrineris latreilli		
Lumbrineris minuta		19
Lumbrineris sp. A		
Lumbrineris sp. B		
Lumbrineris sp. X		
Lysilla loveni		
Lysippe labiata		
Magelona longicornis		
Maldane sarsi		44
Marenzelleria wireni		
Melaenis loveni		
Melinna elisabethae		
Microclymene sp.		
Micronephthys minuta		1
Minuspio cirrifera		701
Myriochele heeri		
Myriochele oculata		
Mystides borealis		
Nemidia torelli		
Neosabellides sp.		
Nephtys caeca		
Nephtys ciliata		
Nephtys discors		
Nephtys incisa		
Nephtys longosetosa		
Nephtys paradoxa		
Nereimyra aphroditoides		
Nereis zonata		
Nicolea zostericola		
Nicomache lumbricalis		
Nicon sp. A		
Nothria conchylega		
Notomastus latericeus		
Notoproctus oculatus		
Onuphis quadricuspis		
Ophelina acuminata		
Ophelina cylindricaudatus		6
Ophelina groenlandica		
Ophelina sp. A		
Ophryotrocha sp.		
Orbinia sp.		
Owenia collaris		
Owenia fusiformis		56
Paramphitrite tetrabranchia		
Paranaitides wahlbergi		
Paraonis sp. A		
Parheteromastus sp. A		
Petaloproctus tenuis		
Pherusa plumosa		
Pholoe minuta		

		$\#/0.5m^2$
Pionosyllis compacta		
Pista cristata		
Polycirrus medusa		
Polydora caulleryi		
Polydora quadrilobata		
Polydora socialis		
Polyphysia crassa		
Praxillella gracilis		
Praxillella praetermissa		
Prionospio steenstrupi		
Proclea graffii		
Pygospio elegans		
Rhodine gracilior		
Sabella sp.		
Sabellastarte sp.		
Sabellides borealis		
Scalibregma inflatum		
Schistomeringos caeca		
Schistomeringos sp. A		
Scoloplos acutus		15
Scoloplos armiger		
Sigambra tentaculata		7
Sphaerodoridium claparedii		
Sphaerodoridium sp. A		
Sphaerodoropsis biserialis		
Sphaerodoropsis minuta		
Sphaerodoropsis sp. A		1
Sphaerodoropsis sp. B		1
Sphaerodorum gracilis		
Sphaerosyllis erinaceus		
Spinther sp.		
Spio filicornis		
Spio theeli		
Spiochaetopterus typicus		
Spiophanes bombyx		
Spirorbis granulatus		
Sternaspis scutata		
Syllides longocirrata		
Syllides sp.		
Tachytrypane abranchiata		
Tachytrypane sp. A		
Tauberia gracilis		36
Terebellides stroemi		1
Tharyx ?acutus		
Travisia sp.		
Trichobranchus glacialis		
Trochochaeta carica		
Trochochaeta multisetosa		
Typosyllis cornuta		
Typosyllis fasciata		
unidentified		20
TOTAL 23 spp.		977

		#/0.5m²
Lumbriclymene minor		
Lumbrineris fragilis		
Lumbrineris impatiens		
Lumbrineris latreilli		
Lumbrineris minuta		19
Lumbrineris sp. A		
Lumbrineris sp. B		
Lumbrineris sp. X		
Lysilla loveni		
Lysippe labiata		
Magelona longicornis		
Maldane sarsi		44
Marenzelleria wireni		
Melaenis loveni		
Melinna elisabethae		
Microclymene sp.		
Micronephthys minuta		1
Minuspio cirrifera		701
Myriochele heeri		
Myriochele oculata		
Mystides borealis		
Nemidia torelli		
Neosabellides sp.		
Nephtys caeca		
Nephtys ciliata		
Nephtys discors		
Nephtys incisa		
Nephtys longosetosa		
Nephtys paradoxa		
Nereimyra aphroditoides		
Nereis zonata		
Nicolea zostericola		
Nicomache lumbricalis		
Nicon sp. A		
Nothria conchylega		
Notomastus latericeus		
Notoproctus oculatus		
Onuphis quadricuspis		
Ophelina acuminata		
Ophelina cylindricaudatus		6
Ophelina groenlandica		
Ophelina sp. A		
Ophryotrocha sp.		
Orbinia sp.		
Owenia collaris		
Owenia fusiformis		56
Paramphitrite tetrabranchia		
Paranaitides wahlbergi		
Paraonis sp. A		
Parheteromastus sp. A		
Petaloproctus tenuis		
Pherusa plumosa		
Pholoe minuta		

		#/0.5m²
Pionosyllis compacta		
Pista cristata		
Polycirrus medusa		
Polydora caulleryi		
Polydora quadrilobata		
Polydora socialis		
Polyphysia crassa		
Praxillella gracilis		
Praxillella praetermissa		
Prionospio steenstrupi		
Proclea graffii		
Pygospio elegans		
Rhodine gracilior		
Sabella sp.		
Sabellastarte sp.		
Sabellides borealis		
Scalibregma inflatum		
Schistomeringos caeca		
Schistomeringos sp. A		
Scoloplos acutus		15
Scoloplos armiger		
Sigambra tentaculata		7
Sphaerodoridium claparedii		
Sphaerodoridium sp. A		
Sphaerodoropsis biserialis		
Sphaerodoropsis minuta		
Sphaerodoropsis sp. A		1
Sphaerodoropsis sp. B		1
Sphaerodorum gracilis		
Sphaerosyllis erinaceus		
Spinther sp.		
Spio filicornis		
Spio theeli		
Spiochaetopterus typicus		
Spiophanes bombyx		
Spirorbis granulatus		
Sternaspis scutata		
Syllides longocirrata		
Syllides sp.		
Tachytrypane abranchiata		
Tachytrypane sp. A		
Tauberia gracilis		36
Terebellides stroemi		1
Tharyx ?acutus		
Travisia sp.		
Trichobranchus glacialis		
Trochochaeta carica		
Trochochaeta multisetosa		
Typosyllis cornuta		
Typosyllis fasciata		
unidentified		20
TOTAL 23 spp.		977

Appendix I (cont'd): Polychaete species data for Station WBS-44/CG-86 (2139-2400m) Cruise WEBSEC-71; accumulated from Smith-McIntyre Grab samples 1023, 1024, 1025 and 1026. The numbers represent totals per $0.4m^2$ of sea floor for the polychaetes retained on a 1.0 mm sieve.

		$\#/0.4m^2$
Aglaophamus malmgreni		
Allia abranchiata		
Allia nr *suecica*		3
Allia sp. B		
Allia sp. C		
Amage auricula		
Ampharete acutifrons		
Ampharete arctica		
Ampharete goësi		
Ampharete lindstromi		
Ampharete vega		
Ampharetidae - Genus A		
Ampharetidae - Genus B		
Amphicteis sundevalli		
Anaitides citrina		
Anaitides groenlandica		
Antinoella badia		1
Antinoella sarsi		
Apistobranchus tullbergi		
Apomatus globifer		
Arcteobia anticostiensis		
Arenicola glacialis		
Aricidea quadrilobata		
Aricidea tetrabranchiata		
Artacama proboscidea		
Autolytus alexandri		
Autolytus fallax		
Axionice flexuosa		
Axionice maculata		
Barantolla sp.		
Brada incrustata		
Brada inhabilis		
Brada nuda		
Brada villosa		
Branchiomma infarcta		
Capitella capitata		3
Chaetozone setosa		
Chone duneri		
Chone infundibuliformis		
Chone nr *murmanica*		
Cirratulus cirratus		
Cistenides hyperborea		
Clymenura polaris		
Cossura longocirrata		1
Cossura sp. A		2

		$\#/0.4m^2$
Dexiospira spirillum		
Diplocirrus glaucus		
Diplocirrus hirsutus		
Diplocirrus longisetosus		
Dorvillea sp.		
Dysponetus sp. N		
Eclysippe sp. A		
Enipo gracilis		
Enipo canadensis		
Ephesiella macrocirrus		
Eteone flava		
Eteone longa		
Eteone spetsbergensis		
Eteone (Mysta) barbata		
Euchone analis		
Euchone elegans		
Euchone incolor		
Euchone papillosa		
Euchone sp.		
Eucranta villosa		
Eunoe oerstedi		
Eusyllis blomstrandi		
Exogone dispar		
Exogone naidina		
Exogone sp.		
Fabricinae - sp. O		
Fabricinae - sp. R		
Fabrisabella schaudinni		
Flabelligera affinis		
Gattyana cirrosa		
Glycera capitata		
Glycinde wireni		
Glyphanostomum pallescens		
Harmothoe imbricata		
Hesionidae gen et sp. nov.		
Heteromastus filiformis		
Jasmineira sp.		
Lagisca extenuata		
Lanassa nordenskjoldi		
Lanassa venusta		
Laonice cirrata		7
Laonome kroyeri		
Laphania boecki		

		#/0.4m^2
Lumbriclymene minor		
Lumbrineris fragilis		
Lumbrineris impatiens		
Lumbrineris latreilli		
Lumbrineris minuta		21
Lumbrineris sp. A		
Lumbrineris sp. B		
Lumbrineris sp. X		
Lysilla loveni		
Lysippe labiata		
Magelona longicornis		
Maldane sarsi		11
Marenzelleria wireni		
Melaenis loveni		
Melinna elisabethae		
Microclymene sp.		
Micronephthys minuta		1
Minuspio cirrifera		313
Myriochele heeri		
Myriochele oculata		
Mystides borealis		
Nemidia torelli		
Neosabellides sp.		
Nephtys caeca		
Nephtys ciliata		
Nephtys discors		
Nephtys incisa		
Nephtys longosetosa		
Nephtys paradoxa		
Nereimyra aphroditoides		
Nereis zonata		
Nicolea zostericola		
Nicomache lumbricalis		
Nicon sp. A		
Nothria conchylega		
Notomastus latericeus		
Notoproctus oculatus		
Onuphis quadricuspis		
Ophelina acuminata		
Ophelina cylindricaudatus		3
Ophelina groenlandica		
Ophelina sp. A		1
Ophryotrocha sp.		
Orbinia sp.		
Owenia collaris		
Owenia fusiformis		6
Paramphitrite tetrabranchia		
Paranaitides wahlbergi		
Paraonis sp. A		
Parheteromastus sp. A		
Petaloproctus tenuis		
Pherusa plumosa		
Pholoe minuta		

		#/0.4m^2
Pionosyllis compacta		
Pista cristata		
Polycirrus medusa		
Polydora caulleryi		
Polydora quadrilobata		
Polydora socialis		
Polyphysia crassa		
Praxillella gracilis		
Praxillella praetermissa		
Prionospio steenstrupi		
Proclea graffii		
Pygospio elegans		
Rhodine gracilior		
Sabella sp.		
Sabellastarte sp.		
Sabellides borealis		
Scalibregma inflatum		
Schistomeringos caeca		
Schistomeringos sp. A		
Scoloplos acutus		2
Scoloplos armiger		
Sigambra tentaculata		16
Sphaerodoridium claparedii		
Sphaerodoridium sp. A		
Sphaerodoropsis biserialis		
Sphaerodoropsis minuta		
Sphaerodoropsis sp. A		
Sphaerodoropsis sp. B		
Sphaerodorum gracilis		
Sphaerosyllis erinaceus		
Spinther sp.		
Spio filicornis		
Spio theeli		
Spiochaetopterus typicus		
Spiophanes bombyx		
Spirorbis granulatus		
Sternaspis scutata		
Syllides longocirrata		
Syllides sp.		
Tachytrypane abranchiata		3
Tachytrypane sp. A		
Tauberia gracilis		11
Terebellides stroemi		
Tharyx ?acutus		38
Travisia sp.		
Trichobranchus glacialis		
Trochochaeta carica		
Trochochaeta multisetosa		
Typosyllis cornuta		
Typosyllis fasciata		
unidentified		1
TOTAL 18 spp.		444

		$\#/0.4m^2$
Lumbriclymene minor		
Lumbrineris fragilis		
Lumbrineris impatiens		
Lumbrineris latreilli		
Lumbrineris minuta		21
Lumbrineris sp. A		
Lumbrineris sp. B		
Lumbrineris sp. X		
Lysilla loveni		
Lysippe labiata		
Magelona longicornis		
Maldane sarsi		11
Marenzelleria wireni		
Melaenis loveni		
Melinna elisabethae		
Microclymene sp.		
Micronephthys minuta		1
Minuspio cirrifera		313
Myriochele heeri		
Myriochele oculata		
Mystides borealis		
Nemidia torelli		
Neosabellides sp.		
Nephtys caeca		
Nephtys ciliata		
Nephtys discors		
Nephtys incisa		
Nephtys longosetosa		
Nephtys paradoxa		
Nereimyra aphroditoides		
Nereis zonata		
Nicolea zostericola		
Nicomache lumbricalis		
Nicon sp. A		
Nothria conchylega		
Notomastus latericeus		
Notoproctus oculatus		
Onuphis quadricuspis		
Ophelina acuminata		
Ophelina cylindricaudatus		3
Ophelina groenlandica		
Ophelina sp. A		1
Ophryotrocha sp.		
Orbinia sp.		
Owenia collaris		
Owenia fusiformis		6
Paramphitrite tetrabranchia		
Paranaitides wahlbergi		
Paraonis sp. A		
Parheteromastus sp. A		
Petaloproctus tenuis		
Pherusa plumosa		
Pholoe minuta		

		$\#/0.4m^2$
Pionosyllis compacta		
Pista cristata		
Polycirrus medusa		
Polydora caulleryi		
Polydora quadrilobata		
Polydora socialis		
Polyphysia crassa		
Praxillella gracilis		
Praxillella praetermissa		
Prionospio steenstrupi		
Proclea graffii		
Pygospio elegans		
Rhodine gracilior		
Sabella sp.		
Sabellastarte sp.		
Sabellides borealis		
Scalibregma inflatum		
Schistomeringos caeca		
Schistomeringos sp. A		
Scoloplos acutus		2
Scoloplos armiger		
Sigambra tentaculata		16
Sphaerodoridium claparedii		
Sphaerodoridium sp. A		
Sphaerodoropsis biserialis		
Sphaerodoropsis minuta		
Sphaerodoropsis sp. A		
Sphaerodoropsis sp. B		
Sphaerodorum gracilis		
Sphaerosyllis erinaceus		
Spinther sp.		
Spio filicornis		
Spio theeli		
Spiochaetopterus typicus		
Spiophanes bombyx		
Spirorbis granulatus		
Sternaspis scutata		
Syllides longocirrata		
Syllides sp.		
Tachytrypane abranchiata		3
Tachytrypane sp. A		
Tauberia gracilis		11
Terebellides stroemi		
Tharyx ?acutus		38
Travisia sp.		
Trichobranchus glacialis		
Trochochaeta carica		
Trochochaeta multisetosa		
Typosyllis cornuta		
Typosyllis fasciata		
unidentified		1
TOTAL 18 spp.		444

Appendix 2. Bivalve species data for stations between 25 and 100 meters deep on the Pitt Point Transect taken on cruises OCS-1 through OCS-4, and OCS-6 through OCS-8.

Appendix 2. Bivalve species data.

RELATIVE ABUNDANCE REPORT FOR CRUISE - OCS-1

	STATIONS										
	PP025		PP055		PP100						TOTAL
TAXA	NO.	%	NO.	%	NO.	%	NO.	%	NO.	%	NO.	%
NUCULANA RADIATA	1	.77	2	1.44	0	0.00	0	0.00	0	0.00	3	.89
PORTLANDIA ARCTICA	85	65.38	0	0.00	0	0.00	0	0.00	0	0.00	85	25.15
PORTLANDIA LENTICULA	3	2.31	0	0.00	0	0.00	0	0.00	0	0.00	3	.89
NUCULA BELLOTII	10	7.69	10	7.19	24	34.78	0	0.00	0	0.00	44	13.02
CYCLOPECTEN (CYCLOPECTEN) GREENLANDICUS	4	3.08	7	5.04	0	0.00	0	0.00	0	0.00	11	3.25
MACOMA CALCAREA	6	4.62	0	0.00	0	0.00	0	0.00	0	0.00	6	1.78
MACOMA MOESTA	1	.77	0	0.00	0	0.00	0	0.00	0	0.00	1	.30
LIOCYMA FLUCTUOSA	6	4.62	0	0.00	0	0.00	0	0.00	0	0.00	6	1.78
ARCTINULA GREELANDICA	4	3.08	7	5.04	0	0.00	0	0.00	0	0.00	11	3.25
PORTLANDIA FRIGIDA	1	.77	31	22.30	0	0.00	0	0.00	0	0.00	32	9.47
MUSCULUS NIGER	1	.77	0	0.00	0	0.00	0	0.00	0	0.00	1	.30
MACOMA SP.	4	3.08	0	0.00	0	0.00	0	0.00	0	0.00	4	1.18
NUCULANA PERNULA	2	1.54	0	0.00	0	0.00	0	0.00	0	0.00	2	.59
THYASIRA GOULDII	1	.77	5	3.60	13	18.84	0	0.00	0	0.00	19	5.62
PANDORA GLACIALIS	1	.77	1	.72	0	0.00	0	0.00	0	0.00	2	.59
ASTARTE CRENATA	0	0.00	3	2.15	0	0.00	0	0.00	0	0.00	3	.89
ASTARTE MONTAGUI	0	0.00	49	35.25	19	27.54	0	0.00	0	0.00	68	20.12
CYCLOCARDIA CREBRICOSTATA	0	0.00	1	.72	0	0.00	0	0.00	0	0.00	1	.30
LYONSIA ARENOSA	0	0.00	2	1.44	0	0.00	0	0.00	0	0.00	2	.59
MACOMA LOVENI	0	0.00	6	4.32	2	2.90	0	0.00	0	0.00	8	2.37
MUSCULUS DISCORS	0	0.00	2	1.44	0	0.00	0	0.00	0	0.00	2	.59
HIATELLA ARCTICA	0	0.00	1	.72	0	0.00	0	0.00	0	0.00	1	.30
ASTARTE ESQUIMALTI	0	0.00	9	6.47	0	0.00	0	0.00	0	0.00	9	2.66
NUCULANA MINUTA	0	0.00	1	.72	1	1.45	0	0.00	0	0.00	2	.59
ASTARTE SP.	0	0.00	1	.72	0	0.00	0	0.00	0	0.00	1	.30
DACRYDIUM VITREUM	0	0.00	1	.72	0	0.00	0	0.00	0	0.00	1	.30
MYSELLA TUMIDA	0	0.00	0	0.00	7	10.14	0	0.00	0	0.00	7	2.07
MYSELLA PLANATA	0	0.00	0	0.00	1	1.45	0	0.00	0	0.00	1	.30
PERIPLOMA ALASKANA	0	0.00	0	0.00	1	1.45	0	0.00	0	0.00	1	.30
PERIPLOMA ALEUTICA	0	0.00	0	0.00	1	1.45	0	0.00	0	0.00	1	.30

Appendix 2. (cont'd)

RELATIVE ABUNDANCE REPORT FOR CRUISE - 0?S-2

	STATIONS											
	PP025		PP040		PP055		PP070		PP100		TOTAL	
TAXA	NO.	%	NO.	%	NO.	%	NO.	%	NO.	%	NO.	%
PORTLANDIA ARCTICA	59	66.29	0	0.00	0	0.00	0	0.00	0	0.00	59	9.87
NUCULA BELLOTII	10	11.24	3	21.43	13	7.18	21	12.28	37	25.87	84	14.05
MACOMA MOESTA	1	1.12	1	7.14	0	0.00	0	0.00	0	0.00	2	.33
THYASIRA GOULDII	14	15.73	6	42.85	0	0.00	0	0.00	2	1.40	22	3.68
PERIPLOMA ALEUTICA	1	1.12	0	0.00	0	0.00	0	0.00	0	0.00	1	.17
MACOMA CALCAREA	4	4.49	0	0.00	1	.55	0	0.00	0	0.00	5	.84
NUCULANA RADIATA	0	0.00	1	7.14	5	2.76	4	2.34	0	0.00	10	1.67
PORTLANDIA FRIGIDA	0	0.00	1	7.14	36	19.89	27	15.79	4	2.80	68	11.37
YOLDIA HYPERBOREA	0	0.00	1	7.14	0	0.00	0	0.00	1	.70	2	.33
THRACIA DEVEXA	0	0.00	1	7.14	0	0.00	1	.58	0	0.00	2	.33
MUSCULUS NIGER	0	0.00	0	0.00	2	1.10	8	4.68	0	0.00	10	1.67
ASTARTE BOREALIS	0	0.00	0	0.00	6	3.31	0	0.00	11	7.69	17	2.84
ASTARTE CRENATA	0	0.00	0	0.00	5	2.76	2	1.17	1	.70	8	1.34
ASTARTE MONTAGUI	0	0.00	0	0.00	50	27.62	56	32.75	57	39.86	163	27.26
MACOMA LOVENI	0	0.00	0	0.00	4	2.21	9	5.26	4	2.80	17	2.84
LIOCYMA FLUCTUOSA	0	0.00	0	0.00	13	7.18	2	1.17	3	2.10	18	3.01
ARCTINULA GREENLANDICA	0	0.00	0	0.00	16	8.84	7	4.09	2	1.40	25	4.18
NUCULANA MINUTA	0	0.00	0	0.00	6	3.31	4	2.34	1	.70	11	1.84
SERRIPES GROENLANDICUS	0	0.00	0	0.00	1	.55	0	0.00	0	0.00	1	.17
PANDORA GLACIALIS	0	0.00	0	0.00	2	1.10	4	2.34	0	0.00	6	1.00
CLINOCARDIUM CILIATUM	0	0.00	0	0.00	3	1.66	4	2.34	0	0.00	7	1.17
CYCLOCARDIA CREBRICOSTATA	0	0.00	0	0.00	4	2.21	2	1.17	2	1.40	8	1.34
ASTARTE ESQUIMALTI	0	0.00	0	0.00	7	3.87	0	0.00	1	.70	8	1.34
ASTARTE SP.	0	0.00	0	0.00	3	1.66	6	3.51	1	.70	10	1.67
MACOMA SP.	0	0.00	0	0.00	1	.55	0	0.00	2	1.40	3	.50
MACOMA INFLATA	0	0.00	0	0.00	2	1.10	0	0.00	0	0.00	2	.33
YOLDIA MYALIS	0	0.00	0	0.00	1	.55	0	0.00	0	0.00	1	.17
LYONSIA ARENOSA	0	0.00	0	0.00	0	0.00	5	2.92	1	.70	6	1.00
DACRYDIUM VITREUM	0	0.00	0	0.00	0	0.00	3	1.75	2	1.40	5	.84
NUCULANA PERNULA	0	0.00	0	0.00	0	0.00	3	1.75	3	2.10	6	1.00
THRACIA MYOPSIS	0	0.00	0	0.00	0	0.00	1	.58	0	0.00	1	.17
HIATELLA ARCTICA	0	0.00	0	0.00	0	0.00	2	1.17	1	.70	3	.50
MYSELLA PLANATA	0	0.00	0	0.00	0	0.00	0	0.00	2	1.40	2	.33
AXINOPSIDA ORBICULATA	0	0.00	0	0.00	0	0.00	0	0.00	2	1.40	2	.33
PORTLANDIA SP.	0	0.00	0	0.00	0	0.00	0	0.00	1	.70	1	.17
MYSELLA TUMIDA	0	0.00	0	0.00	0	0.00	0	0.00	2	1.40	2	.33

Appendix 2. (cont'd)

RELATIVE ABUNDANCE REPORT FOR CRUISE - OCS-3

	STATIONS											
	PP025		PP040		PP055		PP070		PP100		TOTAL	
TAXA	NO.	%	NO.	%	NO.	%	NO.	%	NO.	%	NO.	%
PORTLANDIA ARCTICA	15	48.39	0	0.00	1	.30	0	0.00	0	0.00	16	2.11
PORTLANDIA LENTICULA	1	3.23	0	0.00	0	0.00	0	0.00	0	0.00	1	.13
NUCULA BELLOTII	4	12.90	6	20.00	20	6.06	3	2.65	37	14.45	70	9.21
THRACIA MYOPSIS	3	9.68	0	0.00	1	.30	2	1.77	2	.78	8	1.05
NUCULANA PERNULA	1	3.23	0	0.00	3	.91	2	1.77	8	3.13	14	1.84
AXINOPSIDA ORBICULATA	3	9.68	1	3.33	2	.61	0	0.00	2	.78	8	1.05
THYASIRA GOULDII	2	6.45	1	3.33	0	0.00	0	0.00	8	3.13	11	1.45
PANDORA GLACIALIS	1	3.23	0	0.00	5	1.52	2	1.77	0	0.00	8	1.05
CYRTODARIA KURRIANA	1	3.23	0	0.00	0	0.00	0	0.00	0	0.00	1	.13
NUCULANA RADIATA	0	0.00	1	3.33	3	.91	0	0.00	1	.39	5	.66
PORTLANDIA FRIGIDA	0	0.00	1	3.33	41	12.42	30	26.55	10	3.91	82	10.79
ASTARTE BOREALIS	0	0.00	12	40.00	4	1.21	0	0.00	15	5.86	31	4.08
MACOMA MOESTA	0	0.00	1	3.33	0	0.00	0	0.00	0	0.00	1	.13
PORTLANDIA SP. (B)	0	0.00	1	3.33	0	0.00	0	0.00	0	0.00	1	.13
ASTARTE SP.	0	0.00	1	3.33	1	.30	1	.88	11	4.30	14	1.84
ASTARTE MONTAGUI	0	0.00	3	10.00	126	38.18	49	43.36	75	29.30	253	33.29
YOLDIA HYPERBOREA	0	0.00	1	3.33	0	0.00	0	0.00	0	0.00	1	.13
LIOCYMA FLUCTUOSA	0	0.00	1	3.33	3	.91	1	.88	5	1.95	10	1.32
ASTARTE CRENATA	0	0.00	0	0.00	23	6.97	5	4.42	20	7.81	48	6.32
MUSCULUS NIGER	0	0.00	0	0.00	1	.30	0	0.00	4	1.56	5	.66
CLINOCARDIUM CILIATUM	0	0.00	0	0.00	1	.30	0	0.00	0	0.00	1	.13
CYCLOCARDIA CREBRICOSTATA	0	0.00	0	0.00	19	5.76	3	2.65	21	8.20	43	5.66
MACOMA LOVENI	0	0.00	0	0.00	11	3.33	5	4.42	11	4.30	27	3.55
NUCULANA MINUTA	0	0.00	0	0.00	9	2.73	2	1.77	3	1.17	14	1.84
MUSCULUS DISCORS	0	0.00	0	0.00	3	.91	4	3.54	4	1.56	11	1.45
MYA PSEUDOARENARIA	0	0.00	0	0.00	1	.30	0	0.00	0	0.00	1	.13
ARCTINULA GREENLANDICA	0	0.00	0	0.00	33	10.00	0	0.00	1	.39	34	4.47
MACOMA SP.	0	0.00	0	0.00	4	1.21	1	.88	2	.78	7	.92
BATHYARCA GLACIALIS	0	0.00	0	0.00	1	.30	0	0.00	0	0.00	1	.13
NUCULANA SP.	0	0.00	0	0.00	7	2.12	0	0.00	0	0.00	7	.92
MUSCULUS CORRUGATUS	0	0.00	0	0.00	2	.61	2	1.77	1	.39	5	.66
LYONSIA ARENOSA	0	0.00	0	0.00	4	1.21	0	0.00	2	.78	6	.79
DACRYDIUM VITREUM	0	0.00	0	0.00	1	.30	0	0.00	2	.78	3	.39
THRACIA DEVEXA	0	0.00	0	0.00	0	0.00	1	.88	0	0.00	1	.13
SERRIPES GROENLANDICUS	0	0.00	0	0.00	0	0.00	0	0.00	1	.39	1	.13
HIATELLA ARCTICA	0	0.00	0	0.00	0	0.00	0	0.00	2	.78	2	.26
MUSCULUS SP.	0	0.00	0	0.00	0	0.00	0	0.00	2	.78	2	.26
MYSELLA PLANATA	0	0.00	0	0.00	0	0.00	0	0.00	1	.39	1	.13
MONTACUTA DAWSONI	0	0.00	0	0.00	0	0.00	0	0.00	1	.39	1	.13
BOREACOLA VADOSA	0	0.00	0	0.00	0	0.00	0	0.00	4	1.56	4	.53

Appendix 2. (cont'd)

RELATIVE ABUNDANCE REPORT FOR CRUISE - OCS-4

	STATIONS											
	PP025		PP040		PP055		PP070		PP100		TOTAL	
TAXA	NO.	%	NO.	%	NO.	%	NO.	%	NO.	%	NO.	%
NUCULANA RADIATA	4	1.11	0	0.00	16	3.86	0	0.00	1	.72	21	1.83
PORTLANDIA ARCTICA	307	85.28	0	0.00	0	0.00	0	0.00	0	0.00	307	26.70
PORTLANDIA LENTICULA	3	.83	0	0.00	2	.48	0	0.00	0	0.00	5	.43
NUCULA BELLOTII	18	5.00	10	19.23	53	12.80	14	7.57	16	11.51	111	9.65
PANDORA GLACIALIS	7	1.94	0	0.00	0	0.00	0	0.00	1	.72	8	.70
MACOMA CALCAREA	12	3.33	2	3.85	18	4.35	0	0.00	0	0.00	32	2.78
ARCTINULA GREENLANDICA	2	.56	0	0.00	11	2.66	1	.54	4	2.88	18	1.57
HIATELLA ARCTICA	1	.28	1	1.92	4	.97	0	0.00	1	.72	7	.61
MACOMA MOESTA	1	.28	3	5.77	5	1.21	0	0.00	0	0.00	9	.78
LIOCYMA FLUCTUOSA	1	.28	3	5.77	19	4.59	7	3.78	7	5.04	37	3.22
MUSCULUS CORRUGATUS	1	.28	0	0.00	0	0.00	0	0.00	0	0.00	1	.09
MUSCULUS DISCORS	1	.28	0	0.00	4	.97	5	2.70	13	9.35	23	2.00
AXINOPSIDA ORBICULATA	1	.28	1	1.92	0	0.00	0	0.00	0	0.00	2	.17
DACRYOUIM VITREUM	1	.28	0	0.00	2	.48	1	.54	4	2.88	8	.70
NUCULANA PERNULA	0	0.00	1	1.92	4	.97	3	1.62	1	.72	9	.78
ASTARTE MONTAGUI	0	0.00	12	23.08	146	35.27	96	51.89	40	28.78	294	25.57
MACOMA LOVENI	0	0.00	1	1.92	9	2.17	1	.54	6	4.32	17	1.48
MACOMA SP.	0	0.00	8	15.38	5	1.21	1	.54	0	0.00	14	1.22
THYASIRA GOULDII	0	0.00	1	1.92	33	7.97	4	2.16	3	2.16	41	3.57
ASTARTE SP.	0	0.00	3	5.77	3	.72	1	.54	0	0.00	7	.61
YOLDIA HYPERBOREA	0	0.00	2	3.85	2	.48	0	0.00	0	0.00	4	.35
ASTARTE BOREALIS	0	0.00	2	3.85	20	4.83	2	1.08	5	3.60	29	2.52
CYCLOCARDIA CREBRICOSTATA	0	0.00	2	3.85	17	4.11	2	1.08	1	.72	22	1.91
NUCULANA MINUTA	0	0.00	0	0.00	6	1.45	12	6.49	7	5.04	25	2.17
PORTLANDIA FRIGIDA	0	0.00	0	0.00	13	3.14	15	8.11	14	10.07	42	3.65
THRACIA DEVEXA	0	0.00	0	0.00	9	2.17	1	.54	2	1.44	12	1.04
BOREACOLA VADOSA	0	0.00	0	0.00	3	.72	0	0.00	0	0.00	3	.26
LYONSIA ARENOSA	0	0.00	0	0.00	2	.48	0	0.00	0	0.00	2	.17
MYSELLA PLANATA	0	0.00	0	0.00	2	.48	0	0.00	0	0.00	2	.17
MACOMA INFLATA	0	0.00	0	0.00	2	.48	0	0.00	0	0.00	2	.17
ASTARTE CRENATA	0	0.00	0	0.00	1	.24	17	9.19	8	5.76	26	2.26
MYSELLA SP.	0	0.00	0	0.00	1	.24	0	0.00	0	0.00	1	.09
CLINOCARDIUM CILIATUM	0	0.00	0	0.00	1	.24	0	0.00	0	0.00	1	.09
NUCULANA SP.	0	0.00	0	0.00	1	.24	1	.54	0	0.00	2	.17
THRACIA MYOPSIS	0	0.00	0	0.00	0	0.00	1	.54	2	1.44	3	.26
CYCLOCARDIA CRASSIDENS	0	0.00	0	0.00	0	0.00	0	0.00	2	1.44	2	.17
PORTLANDIA SP. (B)	0	0.00	0	0.00	0	0.00	0	0.00	1	.72	1	.09

Appendix 2. (cont'd)

FELATIVE ABUNDANCE REPORT FOR CRUISE - OCS-6

	STATIONS											
	PP025		PP055		PP070		PP100				TOTAL	
TAXA	NO.	%	NO.	%	NO.	%	NO.	%	NO.	%	NO.	%
YOLDIA HYPERBOREA	2	12.50	0	0.00	0	0.00	0	0.00	0	0.00	2	.88
NUCULA BELLOTII	5	31.25	5	6.94	6	11.11	10	11.63	0	0.00	26	11.40
ASTARTE BOREALIS	3	18.75	4	5.55	0	0.00	2	2.33	0	0.00	9	3.95
ASTARTE MONTAGUI	2	12.50	33	45.83	27	50.00	35	40.70	0	0.00	97	42.54
LIOCYMA FLUCTUOSA	2	12.50	1	1.39	1	1.85	0	0.00	0	0.00	4	1.75
ASTARTE SP.	1	6.25	0	0.00	0	0.00	0	0.00	0	0.00	1	.44
THYASIRA GOULDII	1	6.25	3	4.17	1	1.85	2	2.33	0	0.00	7	3.07
PORTLANDIA FRIGIDA	0	0.00	4	5.56	8	14.81	7	8.14	0	0.00	19	8.33
MUSCULUS DISCORS	0	0.00	2	2.78	2	3.70	1	1.16	0	0.00	5	2.19
CYCLOCARDIA CREBRICOSTATA	0	0.00	4	5.55	2	3.70	6	6.98	0	0.00	12	5.26
DACRYDUIM VITREUM	0	0.00	1	1.39	0	0.00	0	0.00	0	0.00	1	.44
ARCTINULA GREENLANDICA	0	0.00	8	11.11	2	3.70	0	0.00	0	0.00	10	4.39
NUCULANA MINUTA	0	0.00	1	1.39	0	0.00	2	2.33	0	0.00	3	1.32
ASTARTE CRENATA	0	0.00	3	4.17	0	0.00	10	11.63	0	0.00	13	5.70
MACOMA LOVENI	0	0.00	1	1.39	1	1.85	2	2.33	0	0.00	4	1.75
NUCULANA PERNULA	0	0.00	1	1.39	4	7.41	0	0.00	0	0.00	5	2.19
PORTLANDIA SP. (B)	0	0.00	1	1.39	0	0.00	3	3.49	0	0.00	4	1.75
AXINOPSIDA ORBICULATA	0	0.00	0	0.00	0	0.00	3	3.49	0	0.00	3	1.32
LYONSIA ARENOSA	0	0.00	0	0.00	0	0.00	2	2.33	0	0.00	2	.88
MYSELLA TUMIDA	0	0.00	0	0.00	0	0.00	1	1.16	0	0.00	1	.44

Appendix 2. (cont'd)

RELATIVE ABUNDANCE REPORT FOR CRUISE - OCS-7

	STATIONS											
	PP025		PP040		PP055		PP070		PP100		TOTAL	
TAXA	NO.	%	NO.	%	NO.	%	NO.	%	NO.	%	NO.	%
PORTLANDIA ARCTICA	166	86.46	0	0.00	1	.40	0	0.00	0	0.00	167	22.15
PORTLANDIA LENTICULA	2	1.04	0	0.00	0	0.00	0	0.00	0	0.00	2	.27
NUCULA BELLOTII	4	2.08	7	17.95	19	7.57	18	10.78	35	33.33	83	11.01
PANDORA GLACIALIS	2	1.04	0	0.00	2	.80	3	1.80	0	0.00	7	.93
MACOMA CALCAREA	15	7.81	0	0.00	3	1.20	0	0.00	0	0.00	18	2.39
MACOMA MOESTA	1	.52	1	2.55	0	0.00	0	0.00	0	0.00	2	.27
MUSCULUS NIGER	1	.52	0	0.00	0	0.00	0	0.00	0	0.00	1	.13
LIOCYMA VIRIDIS	1	.52	0	0.00	0	0.00	0	0.00	0	0.00	1	.13
PORTLANDIA FRIGIDA	0	0.00	2	5.13	49	19.52	21	12.57	0	0.00	72	9.55
ASTARTE MONTAGUI	0	0.00	12	30.77	73	29.08	55	32.93	35	33.33	175	23.21
THYASIRA GOULDII	0	0.00	6	15.38	0	0.00	0	0.00	3	2.86	9	1.19
LIOCYMA FLUCTUOSA	0	0.00	3	7.69	0	0.00	3	1.80	0	0.00	6	.80
NUCULANA RADIATA	0	0.00	1	2.55	14	5.58	5	2.99	0	0.00	20	2.65
CYCLOCARDIA CREBRICOSTATA	0	0.00	3	7.69	38	15.14	16	9.58	0	0.00	57	7.56
YOLDIA HYPERBOREA	0	0.00	2	5.13	0	0.00	0	0.00	0	0.00	2	.27
ASTARTE BOREALIS	0	0.00	1	2.55	0	0.00	0	0.00	6	5.71	7	.93
MACOMA LOVENI	0	0.00	1	2.56	2	.80	6	3.59	1	.95	10	1.33
ASTARTE CRENATA	0	0.00	0	0.00	8	3.19	10	5.99	0	0.00	18	2.39
AXINOPSIDA ORBICULATA	0	0.00	0	0.00	2	.80	7	4.19	0	0.00	9	1.19
ARCTINULA GREENLANDICA	0	0.00	0	0.00	6	2.39	4	2.40	0	0.00	10	1.33
ASTARTE SP.	0	0.00	0	0.00	3	1.20	0	0.00	0	0.00	3	.40
MUSCULUS SP.	0	0.00	0	0.00	3	1.20	0	0.00	0	0.00	3	.40
MACOMA SP.	0	0.00	0	0.00	11	4.38	0	0.00	0	0.00	11	1.46
NUCULANA MINUTA	0	0.00	0	0.00	2	.80	5	2.99	0	0.00	7	.93
MUSCULUS DISCORS	0	0.00	0	0.00	5	1.99	0	0.00	0	0.00	5	.66
LYONSIA ARENOSA	0	0.00	0	0.00	1	.40	1	.60	0	0.00	2	.27
THRACIA MYOPSIS	0	0.00	0	0.00	2	.80	0	0.00	0	0.00	2	.27
THRACIA SP.	0	0.00	0	0.00	1	.40	0	0.00	0	0.00	1	.13
DACRYDUIM VITREUM	0	0.00	0	0.00	2	.80	0	0.00	0	0.00	2	.27
SERRIPES GROENLANDICUS	0	0.00	0	0.00	3	1.20	1	.60	0	0.00	4	.53
PORTLANDIA SP.	0	0.00	0	0.00	1	.40	0	0.00	0	0.00	1	.13
MUSCULUS CORRUGATUS	0	0.00	0	0.00	0	0.00	5	2.99	0	0.00	5	.66
HIATELLA ARCTICA	0	0.00	0	0.00	0	0.00	1	.60	0	0.00	1	.13
THRACIA DEVEXA	0	0.00	0	0.00	0	0.00	2	1.20	0	0.00	2	.27
NUCULANA SP.	0	0.00	0	0.00	0	0.00	2	1.20	0	0.00	2	.27
BATHYARCA GLACIALIS	0	0.00	0	0.00	0	0.00	1	.60	0	0.00	1	.13
CLINOCARDIUM CILIATUM	0	0.00	0	0.00	0	0.00	1	.60	0	0.00	1	.13
MYSELLA TUMIDA	0	0.00	0	0.00	0	0.00	0	0.00	2	1.90	2	.27
MACOMA INFLATA	0	0.00	0	0.00	0	0.00	0	0.00	1	.95	1	.13
MYSELLA PLANATA	0	0.00	0	0.00	0	0.00	0	0.00	4	3.81	4	.53
MONTACUTA SP. (A)	0	0.00	0	0.00	0	0.00	0	0.00	14	13.33	14	1.86
PERIPLOMA ALEUTICA	0	0.00	0	0.00	0	0.00	0	0.00	3	2.86	3	.40
MACOMA SP. (E)	0	0.00	0	0.00	0	0.00	0	0.00	1	.95	1	.13

Appendix 2. (cont'd)

RELATIVE ABUNDANCE REPORT FOR CRUISE - OCS-8

	STATIONS											
	PP025		PP055		PP100						TOTAL	
TAXA	NO.	%	NO.	%	NO.	%	NO.	%	NO.	%	NO.	%
NUCULANA RADIATA	9	6.21	3	2.45	0	0.00	0	0.00	0	0.00	12	3.34
PORTLANDIA ARCTICA	114	78.62	0	0.00	0	0.00	0	0.00	0	0.00	114	31.75
MUSCULUS DISCORS	1	.69	7	5.74	3	3.26	0	0.00	0	0.00	11	3.06
PANDORA GLACIALIS	2	1.38	1	.82	0	0.00	0	0.00	0	0.00	3	.84
MACOMA CALCAREA	3	2.07	0	0.00	0	0.00	0	0.00	0	0.00	3	.84
THRACIA MYOPSIS	1	.69	1	.82	0	0.00	0	0.00	0	0.00	2	.56
LIOCYMA FLUCTUOSA	3	2.07	3	2.45	0	0.00	0	0.00	0	0.00	6	1.67
ARCTINULA GREENLANDICA	1	.69	1	.82	0	0.00	0	0.00	0	0.00	2	.56
NUCULA BELLOTII	4	2.76	8	6.56	29	31.52	0	0.00	0	0.00	41	11.42
LYONSIA ARENOSA	1	.69	3	2.45	0	0.00	0	0.00	0	0.00	4	1.11
AXINOPSIDA ORBICULATA	2	1.38	0	0.00	0	0.00	0	0.00	0	0.00	2	.56
PORTLANDIA SP.	1	.69	0	0.00	0	0.00	0	0.00	0	0.00	1	.28
PORTLANDIA FRIGIDA	1	.69	26	21.31	1	1.09	0	0.00	0	0.00	28	7.80
MACOMA MOESTA	2	1.38	0	0.00	0	0.00	0	0.00	0	0.00	2	.56
NUCULANA PERNULA	0	0.00	3	2.46	0	0.00	0	0.00	0	0.00	3	.84
ASTARTE BOREALIS	0	0.00	5	4.10	11	11.96	0	0.00	0	0.00	16	4.46
ASTARTE CRENATA	0	0.00	3	2.45	3	3.26	0	0.00	0	0.00	6	1.67
ASTARTE MONTAGUI	0	0.00	41	33.61	26	28.26	0	0.00	0	0.00	67	18.66
CYCLOCARDIA CREBRICOSTATA	0	0.00	9	7.38	3	3.26	0	0.00	0	0.00	12	3.34
MACOMA LOVENI	0	0.00	1	.82	2	2.17	0	0.00	0	0.00	3	.84
MACOMA SP.	0	0.00	1	.82	4	4.35	0	0.00	0	0.00	5	1.39
NUCULANA MINUTA	0	0.00	2	1.64	0	0.00	0	0.00	0	0.00	2	.56
NUCULANA SP.	0	0.00	4	3.28	2	2.17	0	0.00	0	0.00	6	1.67
THYASIRA GOULDII	0	0.00	0	0.00	4	4.35	0	0.00	0	0.00	4	1.11
MYSELLA TUMIDA	0	0.00	0	0.00	1	1.09	0	0.00	0	0.00	1	.28
ASTARTE SP.	0	0.00	0	0.00	3	3.26	0	0.00	0	0.00	3	.84

Appendix 3. Amphipod species data for stations between 25 and 100 meters deep on the Pitt Point Transect taken on cruises OCS-1 through OCS-4, and OCS-6.

Appendix 3. Amphipod species data.

RELATIVE ABUNDANCE REPORT FOR CRUISE - OCS-1

	STATIONS										TOTAL	
	PP025		PP055		PP100							
TAXA	NO.	%	NO.	%	NO.	%	NO.	%	NO.	%	NO.	%
HAPLOOPS TUBICOLA	4	19.05	0	0.00	0	0.00	0	0.00	0	0.00	4	.60
GOESIA DEPRESSA	1	4.76	19	3.96	0	0.00	0	0.00	0	0.00	20	3.02
ACEROIDES LATIPES	3	14.29	1	.21	0	0.00	0	0.00	0	0.00	4	.60
HAPLOOPS SIBIRICA	1	4.76	3	.63	25	15.53	0	0.00	0	0.00	29	4.38
TRYPHOSELLA SARSI	1	4.76	0	0.00	0	0.00	0	0.00	0	0.00	1	.15
ARRHIS PHYLLONYX	3	14.29	1	.21	0	0.00	0	0.00	0	0.00	4	.60
BYBLIS ARCTICUS	5	23.81	17	3.54	1	.62	0	0.00	0	0.00	23	3.47
METOPA SPINICOXA	1	4.76	1	.21	1	.62	0	0.00	0	0.00	3	.45
AMPELISCA ESCHRICHTI	1	4.76	9	1.88	0	0.00	0	0.00	0	0.00	10	1.51
MONOCULODES TUBERCULATUS	1	4.76	1	.21	0	0.00	0	0.00	0	0.00	2	.30
AMPELISCA BIRULAI	0	0.00	6	1.25	0	0.00	0	0.00	0	0.00	6	.91
HAPLOOPS LAEVIS	0	0.00	5	1.04	0	0.00	0	0.00	0	0.00	5	.76
PHOTIS REINHARDI	0	0.00	20	4.17	0	0.00	0	0.00	0	0.00	20	3.02
PODOCEROPSIS LINDAHLI	0	0.00	12	2.50	0	0.00	0	0.00	0	0.00	12	1.81
PROTOMEDEIA FASCIATA	0	0.00	10	2.08	2	1.24	0	0.00	0	0.00	12	1.81
UNCIOLA LEUCOPIS	0	0.00	39	8.13	17	10.56	0	0.00	0	0.00	56	8.46
GUERNEA NORDENSKJOLDI	0	0.00	16	3.33	15	9.32	0	0.00	0	0.00	31	4.68
MELITA DENTATA	0	0.00	3	.63	0	0.00	0	0.00	0	0.00	3	.45
BATHYMEDON OBTUSIFRONS	0	0.00	2	.42	13	8.07	0	0.00	0	0.00	15	2.27
WESTWOODILLA MEGALOPS	0	0.00	9	1.88	0	0.00	0	0.00	0	0.00	9	1.36
PARDALISCELLA LAVROVI	0	0.00	1	.21	2	1.24	0	0.00	0	0.00	3	.45
HARPINIA SERRATA	0	0.00	27	5.63	20	12.42	0	0.00	0	0.00	47	7.10
PARAPHOXUS OCULATUS	0	0.00	17	3.54	17	10.56	0	0.00	0	0.00	34	5.14
PARADULICHIA TYPICA	0	0.00	2	.42	0	0.00	0	0.00	0	0.00	2	.30
METOPELLA NASUTA	0	0.00	6	1.25	0	0.00	0	0.00	0	0.00	6	.91
TIRON SPINIFERUM	0	0.00	35	7.29	1	.62	0	0.00	0	0.00	36	5.44
APHERUSA GLACIALIS	0	0.00	2	.42	3	1.86	0	0.00	0	0.00	5	.76
ODIUS KELLERI	0	0.00	1	.21	0	0.00	0	0.00	0	0.00	1	.15
PHOTIS VINOGRADOVA	0	0.00	163	33.96	0	0.00	0	0.00	0	0.00	163	24.62
ISCHYROCERUS COMMENSALIS	0	0.00	7	1.45	0	0.00	0	0.00	0	0.00	7	1.06
PLEUSYMTES KARIANUS	0	0.00	1	.21	0	0.00	0	0.00	0	0.00	1	.15
COROPHIUM CLARENCENSE	0	0.00	3	.63	0	0.00	0	0.00	0	0.00	3	.45
MONOCULODES TESSELATUS	0	0.00	1	.21	0	0.00	0	0.00	0	0.00	1	.15
HARPINIA KOBJAKOVAE	0	0.00	1	.21	1	.62	0	0.00	0	0.00	2	.30
HAPLOOPS SETOSA	0	0.00	35	7.29	0	0.00	0	0.00	0	0.00	35	5.29
MAERA DANAE	0	0.00	1	.21	0	0.00	0	0.00	0	0.00	1	.15
ANONYX NUGAX	0	0.00	1	.21	14	8.70	0	0.00	0	0.00	15	2.27
MONOCULODES BOREALIS	0	0.00	1	.21	0	0.00	0	0.00	0	0.00	1	.15
RHACHOTROPIS ACULEATA	0	0.00	1	.21	0	0.00	0	0.00	0	0.00	1	.15
PONTOPOREIA FEMORATA	0	0.00	0	0.00	5	3.11	0	0.00	0	0.00	5	.76
HIPPOMEDON ABYSSI	0	0.00	0	0.00	18	11.18	0	0.00	0	0.00	18	2.72
MONOCULODES LATIMANUS	0	0.00	0	0.00	3	1.86	0	0.00	0	0.00	3	.45
MONOCULODES SCHNEIDERI	0	0.00	0	0.00	1	.62	0	0.00	0	0.00	1	.15
PARDALISCA CUSPIDATA	0	0.00	0	0.00	1	.62	0	0.00	0	0.00	1	.15
MONOCULODES DIAMESUS	0	0.00	0	0.00	1	.62	0	0.00	0	0.00	1	.15

Appendix 3. (cont'd)

RELATIVE ABUNDANCE REPORT FOR CRUISE - OCS-2

	STATIONS											
	PP025		PP040		PP055		PP070		PP100		TOTAL	
TAXA	NO.	%	NO.	%	NO.	%	NO.	%	NO.	%	NO.	%
ROZINANTE FRAGILIS	8	25.81	1	2.00	1	.20	6	.63	5	.68	21	.93
ACEROIDES LATIPES	9	29.03	4	8.00	4	.81	11	1.16	4	.54	32	1.42
ONISIMUS LITORALIS	4	12.90	0	0.00	0	0.00	0	0.00	4	.54	8	.35
HAPLOOPS SIBIRICA	1	3.23	0	0.00	0	0.00	0	0.00	0	0.00	1	.04
MONOCULODES CARINATUS	2	6.45	0	0.00	0	0.00	0	0.00	0	0.00	2	.09
MONOCULODES PACKARDI	5	16.13	1	2.00	0	0.00	0	0.00	13	1.77	19	.84
MONOCULODES BOREALIS	1	3.23	0	0.00	0	0.00	0	0.00	0	0.00	1	.04
METOPA TENUIMANA	1	3.23	0	0.00	0	0.00	0	0.00	0	0.00	1	.04
AMPELISCA ESCHRICHTI	0	0.00	6	12.00	17	3.44	3	.32	2	.27	28	1.24
HAPLOOPS LAEVIS	0	0.00	2	4.00	1	.20	0	0.00	0	0.00	3	.13
ARGISSA HAMATIPES	0	0.00	1	2.00	2	.40	3	.32	2	.27	8	.35
PROTOMEDEIA FASCIATA	0	0.00	2	4.00	4	.81	38	3.99	21	2.86	65	2.87
HARPINIA KOBJAKOVAE	0	0.00	8	16.00	2	.40	0	0.00	3	.41	13	.57
MONOCULOPSIS LONGICORNIS	0	0.00	5	10.00	0	0.00	1	.11	0	0.00	6	.27
BYBLIS ARCTICUS	0	0.00	14	28.00	8	1.62	3	.32	3	.41	28	1.24
PARAPHOXUS OCULATUS	0	0.00	1	2.00	43	8.70	10	1.05	21	2.86	75	3.32
MAERA DANAE	0	0.00	1	2.00	3	.61	0	0.00	1	.14	5	.22
HAPLOOPS TUBICOLA	0	0.00	3	6.00	25	5.06	16	1.68	3	.41	47	2.08
GOESIA DEPRESSA	0	0.00	1	2.00	19	3.85	20	2.10	9	1.23	49	2.17
PODOCEROPSIS LINDAHLI	0	0.00	0	0.00	10	2.02	12	1.26	4	.54	26	1.15
UNCIOLA LEUCOPIS	0	0.00	0	0.00	182	36.84	356	37.39	204	27.79	742	32.82
GUERNEA NORDENSKJOLDI	0	0.00	0	0.00	12	2.43	31	3.26	51	6.95	94	4.16
WESTWOODILLA MEGALOPS	0	0.00	0	0.00	3	.61	11	1.16	6	.82	20	.88
HARPINIA SERRATA	0	0.00	0	0.00	10	2.02	23	2.42	125	17.03	158	6.99
TIRON SPINIFERUM	0	0.00	0	0.00	15	3.04	23	2.42	0	0.00	38	1.68
ODIUS KELLERI	0	0.00	0	0.00	1	.20	1	.11	0	0.00	2	.09
MONOCULODES DIAMESUS	0	0.00	0	0.00	1	.20	1	.11	3	.41	5	.22
PHOTIS VINOGRADOVA	0	0.00	0	0.00	98	19.84	163	17.12	53	7.22	314	13.89
BATHYMEDON OBTUSIFRONS	0	0.00	0	0.00	2	.40	6	.63	15	2.04	23	1.02
MONOCULODES LATIMANUS	0	0.00	0	0.00	1	.20	0	0.00	0	0.00	1	.04
HAPLOOPS SETOSA	0	0.00	0	0.00	14	2.83	1	.11	1	.14	16	.71
PHOTIS REINHARDI	0	0.00	0	0.00	8	1.62	45	4.73	46	6.27	99	4.38
AMPELISCA BIRULAI	0	0.00	0	0.00	5	1.01	22	2.31	0	0.00	27	1.19
PLEUSYMTES KARIANUS	0	0.00	0	0.00	1	.20	1	.11	2	.27	4	.18
ANONYX NUGAX	0	0.00	0	0.00	2	.40	3	.32	19	2.59	24	1.06
ERICTHONIUS MEGALOPS	0	0.00	0	0.00	0	0.00	18	1.89	0	0.00	18	.80
RHACHOTROPIS INFLATA	0	0.00	0	0.00	0	0.00	1	.11	0	0.00	1	.04
MELITA DENTATA	0	0.00	0	0.00	0	0.00	5	.53	0	0.00	5	.22
ISCHYROCERUS LATIPES	0	0.00	0	0.00	0	0.00	7	.74	0	0.00	7	.31
ORCHOMENE MINUTA	0	0.00	0	0.00	0	0.00	1	.11	0	0.00	1	.04
APHERUSA GLACIALIS	0	0.00	0	0.00	0	0.00	1	.11	0	0.00	1	.04
MELITA FORMOSA	0	0.00	0	0.00	0	0.00	2	.21	0	0.00	2	.09
ISCHYROCERUS COMMENSALIS	0	0.00	0	0.00	0	0.00	24	2.52	16	2.18	40	1.77
COROPHIUM CLARENCENSE	0	0.00	0	0.00	0	0.00	22	2.31	0	0.00	22	.97
ATYLUS BRUGGENI	0	0.00	0	0.00	0	0.00	1	.11	0	0.00	1	.04
METOPELLA LONGIMANA	0	0.00	0	0.00	0	0.00	2	.21	0	0.00	2	.09
HIPPOMEDON TENAX	0	0.00	0	0.00	0	0.00	55	5.78	0	0.00	55	2.43
MONOCULODES TUBERCULATUS	0	0.00	0	0.00	0	0.00	2	.21	0	0.00	2	.09
GITANA ROSTRATA	0	0.00	0	0.00	0	0.00	1	.11	0	0.00	1	.04
PERIOCULODES LONGIMANUS	0	0.00	0	0.00	0	0.00	0	0.00	2	.27	2	.09
PONTOPOREIA FEMORATA	0	0.00	0	0.00	0	0.00	0	0.00	24	3.27	24	1.06
HIPPOMEDON ABYSSI	0	0.00	0	0.00	0	0.00	0	0.00	62	8.45	62	2.74
SYRRHOE CRENULATA	0	0.00	0	0.00	0	0.00	0	0.00	1	.14	1	.04
ISCHYROCERUS MEGALOPS	0	0.00	0	0.00	0	0.00	0	0.00	4	.54	4	.18
ARRHIS LUTHKEI	0	0.00	0	0.00	0	0.00	0	0.00	5	.68	5	.22

Appendix 3. (cont'd)

RELATIVE ABUNDANCE REPORT FOR CRUISE - OCS-3

	STATIONS											
	PP025		PP040		PP055		PP070		PP100		TOTAL	
TAXA	NO.	%	NO.	%	NO.	%	NO.	%	NO.	%	NO.	%
GOESIA DEPRESSA	1	6.25	0	0.00	12	1.53	13	1.73	15	1.89	41	1.72
HIPPOMEDON ABYSSI	1	6.25	0	0.00	0	0.00	0	0.00	13	1.64	14	.59
HARPINIA KOBJAKOVAE	1	6.25	13	34.21	0	0.00	0	0.00	1	.13	15	.63
HAPLOOPS SIBIRICA	1	6.25	0	0.00	1	.13	0	0.00	0	0.00	2	.08
BYBLIS ARCTICUS	3	18.75	3	7.89	85	10.87	5	.66	4	.50	100	4.19
PONTOPOREIA FEMORATA	1	6.25	0	0.00	0	0.00	1	.13	10	1.26	12	.50
ACEROIDES LATIPES	3	18.75	5	13.16	1	.13	2	.27	1	.13	12	.50
ROZINANTE FRAGILIS	1	6.25	0	0.00	0	0.00	0	0.00	0	0.00	1	.04
AMPELISCA ESCHRICHTI	1	6.25	4	10.53	4	.51	1	.13	1	.13	11	.46
ONISIMUS LITORALIS	1	6.25	0	0.00	1	.13	0	0.00	0	0.00	2	.08
HAPLOOPS LAEVIS	2	12.50	0	0.00	2	.26	1	.13	0	0.00	5	.21
ISCHYROCERUS CHAMISSOI	0	0.00	1	2.63	0	0.00	0	0.00	0	0.00	1	.04
ANONYX NUGAX	0	0.00	1	2.63	6	.77	2	.27	3	.38	12	.50
ARRHIS PHYLLONYX	0	0.00	1	2.63	0	0.00	0	0.00	0	0.00	1	.04
ARRHINOPSIS LONGICORNIS	0	0.00	3	7.89	0	0.00	2	.27	2	.25	7	.29
HARPINIA SERRATA	0	0.00	1	2.63	52	6.65	23	3.05	34	4.28	110	4.61
HAPLOOPS TUBICOLA	0	0.00	1	2.63	0	0.00	3	.40	2	.25	6	.25
ARGISSA HAMATIPES	0	0.00	1	2.63	9	1.15	2	.27	1	.13	13	.55
UNCIOLA LEUCOPIS	0	0.00	1	2.63	37	4.73	159	21.12	222	27.92	419	17.58
BATHYMEDON OBTUSIFRONS	0	0.00	1	2.63	2	.26	4	.53	16	2.01	23	.96
FLEUSYMTES KARIANUS	0	0.00	1	2.63	1	.13	1	.13	1	.13	4	.17
PODOCEROPSIS INAEQUISTYLIS	0	0.00	1	2.63	7	.90	13	1.73	88	11.07	109	4.57
AMPELISCA BIRULAI	0	0.00	0	0.00	13	1.66	48	6.37	1	.13	62	2.60
GUERNEA NORDENSKJOLDI	0	0.00	0	0.00	38	4.86	28	3.72	121	15.22	187	7.84
WESTWOODILLA MEGALOPS	0	0.00	0	0.00	21	2.69	6	.80	5	.63	32	1.34
PARAPHOXUS OCULATUS	0	0.00	0	0.00	45	5.75	5	.66	8	1.01	58	2.43
TIRON SPINIFERUM	0	0.00	0	0.00	132	16.88	93	12.35	38	4.78	263	11.03
COROPHIUM CLARENCENSE	0	0.00	0	0.00	8	1.02	10	1.33	2	.25	20	.84
PHOTIS VINOGRADOVA	0	0.00	0	0.00	210	26.85	108	14.34	36	4.53	354	14.85
PHOTIS REINHARDI	0	0.00	0	0.00	40	5.12	22	2.92	58	7.30	120	5.03
FODOCEROPSIS LINDAHLI	0	0.00	0	0.00	14	1.79	86	11.42	38	4.78	138	5.79
PROTOMEDEIA FASCIATA	0	0.00	0	0.00	13	1.66	27	3.59	32	4.03	72	3.02
HAPLOOPS SETOSA	0	0.00	0	0.00	6	.77	1	.13	0	0.00	7	.29
LEMBOS ARCTICUS	0	0.00	0	0.00	7	.90	41	5.44	1	.13	49	2.06
PARDALISCELLA LAVROVI	0	0.00	0	0.00	1	.13	0	0.00	0	0.00	1	.04
MAERA DANAE	0	0.00	0	0.00	10	1.28	11	1.46	0	0.00	21	.88
MONOCULODES TUBERCULATUS	0	0.00	0	0.00	1	.13	4	.53	0	0.00	5	.21
FHACHOTROPIS ACULEATA	0	0.00	0	0.00	1	.13	0	0.00	0	0.00	1	.04
BOECKOSIMUS PLAUTUS	0	0.00	0	0.00	1	.13	0	0.00	0	0.00	1	.04
MONOCULODES DIANESUS	0	0.00	0	0.00	1	.13	2	.27	7	.88	10	.42
MELITA DENTATA	0	0.00	0	0.00	0	0.00	12	1.59	0	0.00	12	.50
ERICTHONIUS MEGALOPS	0	0.00	0	0.00	0	0.00	12	1.59	3	.38	15	.63
AMPELISCA MACROCEPHALA MACROCEPHALA	0	0.00	0	0.00	0	0.00	2	.27	0	0.00	2	.08
ISCHYROCERUS COMMENSALIS	0	0.00	0	0.00	0	0.00	2	.27	0	0.00	2	.08
ISCHYROCERUS MEGALOPS	0	0.00	0	0.00	0	0.00	1	.13	19	2.39	20	.84
PARADULICHIA TYPICA	0	0.00	0	0.00	0	0.00	0	0.00	1	.13	1	.04
ODIUS KELLERI	0	0.00	0	0.00	0	0.00	0	0.00	2	.25	2	.08
CULICHIA FALCATA	0	0.00	0	0.00	0	0.00	0	0.00	2	.25	2	.08
ISCHYROCERUS MEGACHEIR	0	0.00	0	0.00	0	0.00	0	0.00	7	.88	7	.29

Appendix 3. (cont'd)

RELATIVE ABUNDANCE REPORT FOR CRUISE - OCS-4

	STATIONS											
	PP025		PP040		PP055		PP070		PP100		TOTAL	
TAXA	NO.	%	NO.	%	NO.	%	NO.	%	NO.	%	NO.	%
HAPLOOPS LAEVIS	5	18.52	4	1.32	29	12.08	1	.27	3	.48	42	2.69
MAERA DANAE	1	3.70	0	0.00	0	0.00	0	0.00	9	1.45	10	.64
BYBLIS ARCTICUS	5	18.52	51	16.83	58	24.17	46	12.40	6	.97	166	10.64
ACEROIDES LATIPES	7	25.93	16	5.28	11	4.58	0	0.00	0	0.00	34	2.18
HAPLOOPS TUBICOLA	5	18.52	3	.99	5	2.08	7	1.89	1	.16	21	1.35
PODOCEROPSIS INAEQUISTYLIS	2	7.41	0	0.00	1	.42	11	2.96	22	3.55	36	2.31
HIPPOMEDON ABYSSI	2	7.41	0	0.00	0	0.00	0	0.00	0	0.00	2	.13
AMPELISCA ESCHRICHTI	0	0.00	7	2.31	5	2.08	0	0.00	0	0.00	12	.77
PROTOMEDEIA FASCIATA	0	0.00	84	27.72	6	2.50	5	1.35	10	1.62	105	6.73
UNCIOLA LEUCOPIS	0	0.00	12	3.96	14	5.83	6	1.62	84	13.57	116	7.44
MELITA DENTATA	0	0.00	3	.99	0	0.00	69	18.60	4	.65	76	4.87
BATHYMEDON OBTUSIFRONS	0	0.00	8	2.64	6	2.50	3	.81	1	.16	18	1.15
MONOCULODES BOREALIS	0	0.00	2	.66	0	0.00	0	0.00	0	0.00	2	.13
WESTWOODILLA MEGALOPS	0	0.00	6	1.98	12	5.00	14	3.77	12	1.94	44	2.82
HARPINIA SERRATA	0	0.00	46	15.18	53	22.08	0	0.00	41	6.62	140	8.97
ARRHINOPSIS LONGICORNIS	0	0.00	2	.66	1	.42	0	0.00	0	0.00	3	.19
COROPHIUM CLARENCENSE	0	0.00	4	1.32	0	0.00	0	0.00	1	.16	5	.32
AMPELISCA BIRULAI	0	0.00	5	1.65	2	.83	1	.27	2	.32	10	.64
BOECKOSIMUS PLAUTUS	0	0.00	2	.66	0	0.00	0	0.00	0	0.00	2	.13
PARDALISCELLA LAVROVI	0	0.00	1	.33	1	.42	0	0.00	2	.32	4	.26
PARAPHOXUS OCULATUS	0	0.00	20	6.60	11	4.58	23	6.20	9	1.45	63	4.04
PARADULICHIA TYPICA	0	0.00	1	.33	0	0.00	0	0.00	0	0.00	1	.06
MONOCULODES DIAMESUS	0	0.00	2	.66	2	.83	3	.81	4	.65	11	.71
PHOTIS VINOGRADOVA	0	0.00	11	3.63	8	3.33	9	2.43	68	10.99	96	6.15
ARGISSA HAMATIPES	0	0.00	2	.66	6	2.50	1	.27	3	.48	12	.77
GOESIA DEPRESSA	0	0.00	3	.99	1	.42	5	1.35	4	.65	13	.83
HARPINIA KOBJAKOVAE	0	0.00	4	1.32	2	.83	0	0.00	0	0.00	6	.38
AMPELISCA MACROCEPHALA MACROCEPHALA	0	0.00	2	.66	0	0.00	0	0.00	2	.32	4	.26
RHACHOTROPIS ACULEATA	0	0.00	1	.33	0	0.00	0	0.00	0	0.00	1	.06
PERIOCULODES LONGIMANUS	0	0.00	1	.33	0	0.00	0	0.00	0	0.00	1	.06
ARRHIS PHYLLONYX	0	0.00	0	0.00	1	.42	0	0.00	0	0.00	1	.06
MONOCULODES LATIMANUS	0	0.00	0	0.00	1	.42	0	0.00	0	0.00	1	.06
GUERNEA NORDENSKJOLDI	0	0.00	0	0.00	4	1.67	37	9.97	32	5.17	73	4.68
PODOCEROPSIS LINDAHLI	0	0.00	0	0.00	0	0.00	65	17.52	74	11.95	139	8.91
ANONYX NUGAX	0	0.00	0	0.00	0	0.00	6	1.62	1	.16	7	.45
TIRON SPINIFERUM	0	0.00	0	0.00	0	0.00	33	8.89	194	31.34	227	14.55
COIUS KELLERI	0	0.00	0	0.00	0	0.00	1	.27	0	0.00	1	.06
GITANA ABYSSICOLA	0	0.00	0	0.00	0	0.00	2	.54	0	0.00	2	.13
LEMBOS ARCTICUS	0	0.00	0	0.00	0	0.00	1	.27	0	0.00	1	.06
PHOTIS REINHARDI	0	0.00	0	0.00	0	0.00	5	1.35	17	2.75	22	1.41
HAPLOOPS SIBIRICA	0	0.00	0	0.00	0	0.00	6	1.62	0	0.00	6	.38
RHACHOTROPIS OCULATA	0	0.00	0	0.00	0	0.00	2	.54	0	0.00	2	.13
STENOPLEUSTES MALMGRENI	0	0.00	0	0.00	0	0.00	3	.81	1	.16	4	.26
ACANTHONOTOZOMA SERRATUM	0	0.00	0	0.00	0	0.00	1	.27	0	0.00	1	.06
ISCHYROCERUS COMMENSALIS	0	0.00	0	0.00	0	0.00	1	.27	0	0.00	1	.06
MONOCULODES PACKARDI	0	0.00	0	0.00	0	0.00	2	.54	1	.16	3	.19
HAPLOOPS SETOSA	0	0.00	0	0.00	0	0.00	1	.27	0	0.00	1	.06
ARISTIAS TUMIDUS	0	0.00	0	0.00	0	0.00	1	.27	0	0.00	1	.06
ERICTHONIUS MEGALOPS	0	0.00	0	0.00	0	0.00	0	0.00	3	.48	3	.19
ONISIMUS LITORALIS	0	0.00	0	0.00	0	0.00	0	0.00	1	.16	1	.06
PLEUSYMTES KARIANUS	0	0.00	0	0.00	0	0.00	0	0.00	2	.32	2	.13
BOECKOSIMUS NORMANI	0	0.00	0	0.00	0	0.00	0	0.00	2	.32	2	.13
SYRRHOE CRENULATA	0	0.00	0	0.00	0	0.00	0	0.00	1	.16	1	.06
ISCHYROCERUS MEGALOPS	0	0.00	0	0.00	0	0.00	0	0.00	1	.16	1	.06
OPISA ESCHRICTI	0	0.00	0	0.00	0	0.00	0	0.00	1	.16	1	.06

Appendix 3. (cont'd)

RELATIVE ABUNDANCE REPORT FOR CRUISE - OCS-6

TAXA	PP025 NO.	PP025 %	PP055 NO.	PP055 %	PP070 NO.	PP070 %	PP100 NO.	PP100 %	NO.	%	TOTAL NO.	TOTAL %
AMPELISCA ESCHRICHTI	13	35.14	3	1.23	6	1.13	2	.29	0	0.00	24	1.59
HAPLOOPS LAEVIS	1	2.70	3	1.23	2	.38	0	0.00	0	0.00	6	.40
HAPLOOPS TUBICOLA	3	8.11	1	.41	1	.19	1	.14	0	0.00	6	.40
ANONYX NUGAX	1	2.70	6	2.47	1	.19	4	.58	0	0.00	12	.80
HARPINIA KOBJAKOVAE	6	16.22	1	.41	1	.19	0	0.00	0	0.00	8	.53
BYBLIS ARCTICUS	2	5.41	37	15.23	6	1.13	1	.14	0	0.00	46	3.06
ROZINANTE FRAGILIS	7	18.92	0	0.00	4	.75	1	.14	0	0.00	12	.80
FLEUSYMTES KARIANUS	1	2.70	0	0.00	2	.38	1	.14	0	0.00	4	.27
ONISIMUS LITORALIS	2	5.41	3	1.23	7	1.31	61	8.82	0	0.00	73	4.85
BATHYMEDON OBTUSIFRONS	1	2.70	0	0.00	2	.38	26	3.76	0	0.00	29	1.93
AMPELISCA BIRULAI	0	0.00	5	2.06	2	.38	1	.14	0	0.00	8	.53
PODOCEROPSIS LINDAHLI	0	0.00	8	3.29	15	2.81	54	7.80	0	0.00	77	5.12
UNCIOLA LEUCOPIS	0	0.00	27	11.11	262	49.16	155	22.40	0	0.00	444	29.50
GUERNEA NORDENSKJOLDI	0	0.00	6	2.47	1	.19	17	2.46	0	0.00	24	1.59
MELITA DENTATA	0	0.00	2	.82	6	1.13	2	.29	0	0.00	10	.66
ACEROIDES LATIPES	0	0.00	4	1.65	4	.75	1	.14	0	0.00	9	.60
PARDALISCELLA LAVROVI	0	0.00	2	.82	0	0.00	0	0.00	0	0.00	2	.13
HARPINIA SERRATA	0	0.00	38	15.64	23	4.32	27	3.90	0	0.00	88	5.85
PARAPHOXUS OCULATUS	0	0.00	27	11.11	9	1.69	6	.87	0	0.00	42	2.79
TIRON SPINIFERUM	0	0.00	13	5.35	19	3.56	53	7.66	0	0.00	85	5.65
PHOTIS VINOGRADOVA	0	0.00	34	13.99	106	19.89	62	8.96	0	0.00	202	13.42
ARGISSA HAMATIPES	0	0.00	1	.41	2	.38	0	0.00	0	0.00	3	.20
GOESIA DEPRESSA	0	0.00	6	2.47	11	2.06	8	1.16	0	0.00	25	1.66
PROTOMEDEIA FASCIATA	0	0.00	3	1.23	4	.75	24	3.47	0	0.00	31	2.06
MONOCULODES TUBERCULATUS	0	0.00	1	.41	1	.19	2	.29	0	0.00	4	.27
ARRHINOPSIS LONGICORNIS	0	0.00	1	.41	2	.38	0	0.00	0	0.00	3	.20
HAPLOOPS SIBIRICA	0	0.00	8	3.29	0	0.00	0	0.00	0	0.00	8	.53
LEMBOS ARCTICUS	0	0.00	1	.41	18	3.38	3	.43	0	0.00	22	1.46
PONTOPOREIA FEMORATA	0	0.00	1	.41	0	0.00	2	.29	0	0.00	3	.20
C CROPHIUM CLARENCENSE	0	0.00	1	.41	1	.19	3	.43	0	0.00	5	.33
PHOTIS REINHARDI	0	0.00	0	0.00	4	.75	41	5.92	0	0.00	45	2.99
MONOCULODES DIAMESUS	0	0.00	0	0.00	1	.19	4	.58	0	0.00	5	.33
PODOCEROPSIS INAEQUISTYLIS	0	0.00	0	0.00	2	.38	35	5.06	0	0.00	37	2.46
AMPELISCA LATIPES	0	0.00	0	0.00	1	.19	0	0.00	0	0.00	1	.07
MAERA DANAE	0	0.00	0	0.00	1	.19	3	.43	0	0.00	4	.27
MONOCULODES LATIMANUS	0	0.00	0	0.00	1	.19	1	.14	0	0.00	2	.13
WESTWOODILLA MEGALOPS	0	0.00	0	0.00	4	.75	4	.58	0	0.00	8	.53
MONOCULOPSIS LONGICORNIS	0	0.00	0	0.00	1	.19	7	1.01	0	0.00	8	.53
HAPLOOPS SETOSA	0	0.00	0	0.00	0	0.00	1	.14	0	0.00	1	.07
ISCHYROCERUS COMMENSALIS	0	0.00	0	0.00	0	0.00	2	.29	0	0.00	2	.13
HIPPOMEDON ABYSSI	0	0.00	0	0.00	0	0.00	14	2.02	0	0.00	14	.93
ISCHYROCERUS MEGACHEIR	0	0.00	0	0.00	0	0.00	59	8.53	0	0.00	59	3.92
PARDALISCA CUSPIDATA	0	0.00	0	0.00	0	0.00	1	.14	0	0.00	1	.07
FLEUSTES MEDIUS	0	0.00	0	0.00	0	0.00	2	.29	0	0.00	2	.13
RHACHOTROPIS ACULEATA	0	0.00	0	0.00	0	0.00	1	.14	0	0.00	1	.07

Appendix 4. Arctic bibliography - Publications based on the research accomplished through RU #006.

Appendix 4. Arctic bibliography - Andrew G. Carey, Jr.

I. General - WEBSEC

Carey, A.G., Jr, R.E. Ruff, J.G. Castillo, and J.J. Dickinson. 1974. Benthic ecology of the western Beaufort Sea continental margin: preliminary results. In: The coast and shelf of the Beaufort Sea, pp. 665-680. Reed, J.C. and J.E. Slater (eds.). ARctic Institute of North America, ARlington, VA.

Carey, A.G., Jr. and R.E. Ruff. 1977. Ecological studies of the benthos in the western Beaufort Sea with special reference to bivalve molluscs. In: Polar Oceans, pp. 505-530. M.J. Dunbar (ed.). Arctic Institute of North America, Calgary, Alberta.

II. OCSEAP

A. Publications - RU #006

Bilyard, G.R. and A.G. Carey, Jr. 1979. Distribution of western Beaufort Sea polychaetous annelids. Marine Biology, 54:329-339.

Bilyard, G.R. and A.G. Carey, Jr. 1980. Zoogeography of western Beaufort Sea Polychaeta (Annelida). Sarsia, 65:19-26.

Montagna, P.A. and A.G. Carey, Jr. 1978. Distributional notes on Harpactico (Crustacea: Copepoda) collected from the Beaufort Sea (Arctic Ocean). Astarte, 11:117-122.

Montagna, P.A. 1979. Cervinia langi n. sp. and Pseudocervinia magna (Copepoda: Harpacticoida) from the Beaufort Sea (Alaska, USA). Trans. Amer. Micros. Soc., 98:77-88.

Montagna, P.A. 1980. Two new bathyal species of Pseudotachidius (Copepoda: Harpacticoida) from the Beaufort Sea (Alaska, USA). J. Natural History, 14:567-578.

Montagna, P.A. 1981. A new species and a new genus of Cerviniidae (Copepoda Harpacticoida) from the Beaufort Sea, with a revision of the family. Proc. Biol. Soc. Wash., 93:1204-1219.

B. Manuscript - Submitted

Carey, A.G., Jr. and P.A. Montagna. An arctic sea ice faunal assemblage: a first approach to the description and the source of the underice meiofauna. Marine Ecology - Progress Series.

C. Publications based wholly or in part on RU #006 research

Bernard, F.R. 1979. Bivalve molluscs of the western Beaufort Sea. Contrib Sci. Natur. Hist. Mus. Los Angeles County, 313:1-80.

Laubitz, D.R. 1977. A revision of the genera Dulichia krøyer and Paradulichia boeck (Amphipoda: Podoceridae) Can. J. Zool. 55:942-982.

Mathews, D. 1973. A baseline for Beaufort. Exxon USA 12:3-7.

McAllister, D.E. 1975. A new species of Arctic Eelpout, *Lycodes sagittarius*, from the Beaufort Sea, Alaska and the Kara Sea, U.S.S.R. (Pisces, Zoarcidae). Nat. Mus. Canada Pub. in Biol. Oceanogr., No. 9.

DISTRIBUTION AND ABUNDANCE OF DECAPOD CRUSTACEAN LARVAE IN THE S.E. BERING SEA WITH EMPHASIS ON COMMERCIAL SPECIES

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An Annual Report to: OCSEAP - Office of Marine Pollution Assessment

Contract Number: NA81-RAC-00059

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ACKNOWLEDGMENTS

We are indebted to many individuals for the assistance they have generously offered this research effort. Dr. Murray Hayes helped to arrange sampling aboard National Marine Fisheries Service vessels and was instrumental in securing funds for initiation of these studies (Nat'l. Mar. Fish. Serv. Grant 80-ABH-00045). Drs. Art Kendall and Ted Cooney loaned us scores of zooplankton samples collected during past cruises. The scientists of the PROBES program (NSF grant DPP76-23340) have been generous in offering shipboard time for our collections and access to the oceanographic data collected during PROBES cruises. Dr. Sharon Smith and her co-workers, in particular, are to be thanked for sharing their collecting gear and innumerable samples with us. Dr. T. Saunders English, Terry Butler, Gayle Herron, Kendra Daly, and Paul Walline have all been generous with their expertise. Drs. Steve Zimmerman and Dean Dale have patiently helped us with the many details involved in working with OCSEAP. Randy Whitman and Linda Crew conscientiously performed their many tasks in the laboratory. Finally, the masters and crews of the research vessels T.G. Thompson, Alaska, Chapman and Discoverer have cheerfully assisted these studies in many ways. To all, may we express our sincere gratitude.

1.0 GENERAL INTRODUCTION

1.1 Justification of the Study

The southeastern Bering Sea is characterized by rich water column productivity of both phytoplankton and zooplankton (McRoy and Goering 1974; Goering and Iverson 1978; Cooney 1981) which, in turn, supports an extensive and productive benthic community over much of the shelf (Feder and Jewett 1981; McDonald et al. 1981; Jewett and Feder 1981). Some of the most abundant epifaunal organisms quantified in these studies are several species of crab that constitute the most lucrative invertebrate fisheries in the United States (Otto 1981). Distribution of these species, particularly gravid females and sensitive larvae and juveniles, in relation to areas of future oil and gas development of the St. George Basin and North Aleutian Shelf (NAS), make them particularly vulnerable to oil mishaps that could have ultimate repercussions on the general benthic community and commercial fishery (Manen and Curl 1981).

The Bureau of Land Management (BLM) has established six outer continental shelf planning units in the Bering Sea. Three of these units have been through tract selection stages and include the St. George Basin and the North Aleutian Shelf which together encompass virtually all of the S.E. Bering Sea crab fisheries grounds. A summary of the timing of major milestones associated with lease sales in these units is given by Hood and Calder (1981), and indicates a final environmental impact statement (EIS) on St. George Basin is due in late spring of 1982, and may be followed by sales in late winter 1982.

Crabs in the S.E. Bering Sea constitute one of the most valuable United States invertebrate fisheries. Two principle groups, king (*Paralithodes camtschatica*) and Tanner (*Chionoecetes bairdi* and *C. opilio*) crabs comprised 35.4% and 23%, respectively, of total U.S. crab landings in 1980. Their respective dollars values were 60% and 7.4% of total ex-vessel U.S. crab revenues of $291,350,000 (NOAA 1981; Pacific Packers 1981; Sections 3.0 and 4.0 of this report give extensive literature reviews of general biology and fishery information on king and Tanner crab).

Forthcoming development of petroleum and gas reserves in the reproductive and fishing grounds of commercially important crustacea led to the study outlined in this report. While extensive literature exists on the distribution and abundance of juvenile and adult decapod crustacea in the S.E. Bering Sea (Otto 1981a; provided by NMFS as part of the commercial fisheries survey), little data on the general ecology, distribution, and abundance of their pelagic larvae is published. Larvae are considered extremely susceptible to oil pollution because:

1. This life-history stage is pelagic, usually in the upper 20 m of the water column and, for some species and stages, largely in the neuston. Given the tendency of the various molecular fractions of petroleum to either dissolve or form colloids and particles in water and disperse as a surface film or sink slowly, (Shaw 1977; McAuliffe 1977) crustacean larvae are more likely to be exposed to oil on a broader scale than are their benthic parents.

2. Larval crustaceans are more sensitive to any group of pollutants (including oil) than are juvenile or adult stages (Johnson 1977).

3. Larvae grow rapidly in the water column and molt up to five times in three to four months, whereas adults molt only once annually. Molting is the physiological event in crustacean life cycles most sensitive to ambient perturbations such as oil pollution. During an oil mishap, larvae will be exposed for a greater portion of their abbreviated molt cycle than will adults.

4. Recruitment of legal crabs to a fishery may be largely dependent on the larval survival of a given year-class (McKelvey et al. 1980; Somerton 1981). Annual variations of high or low abundance indicate differential mortality caused by physical and biological factors that vary in intensity and effect year to year. Extensive oil pollution in critical seasons could increase larval mortality in years when natural causes are relatively benign, or act synergistically with severe natural events to decimate larval cohorts and, in turn, curtail the fishery years later.

1.2 Progress in the First Year

The data bases of this program include zooplankton samples from past NOAA/OCS cruises (years 1976, 1977, 1979) and PROBES studies financed by the National Science Foundation and administered by the

University of Alaska (1978, 1979, 1980; see Section 2.0 for information on sample years). After purchasing equipment and supplies and organizing a laboratory, two primary tasks were accomplished prior to beginning analyses of samples. The first was an extensive literature review of the life history, ecology, larval and adult distributions, and larval morphology for decapod species that inhabit the S.E. Bering Sea; this information is presented in Secions 3.0 to 7.0. The second task was procuring sample-sets to sort for larval decapods. Samples were gathered from NMFS in Seattle, the University of Alaska, Fairbanks, and onboard ship in the S. E. Bering Sea, 1980.

Beginning in March 1981 sorting of samples began and all decapod larvae identified to lowest possible taxa (Section 2.0, Table 2.1) and enumerated. Concommitantly with sample analyses, a program was begun to establish the computer protocol needed to statistically analyze the extensive data generated and file it according to NODC format. In addition to composing efficient forms for entering larval decapod data, it has been necessary to locate and interface past NODC files bearing pertinent information for the years and cruises from which our samples were taken with the new decapod data-sets. This too has been initiated for PROBES samples, and computer interfacing of data from both sources continues. We also have begun gathering data on factors not contained in standard data sets of either NOAA/OCS or PROBES files (eg. location and extent of female stocks, commercial landings, predator abundance, ice cover, mean annual bottom and surface temperatures for numerous areas of the S.E. Bering Sea) to use as independent variables in analyses of larval decapod distribution and abundance.

A great deal of work has been completed this year. All samples from NOAA years 1976 and 1979 and from PROBES 1978 and 1980 have been sorted and decapod information stored on computer files. We face our largest sample sets in the 1981 collections made by PROBES and NOAA survey vessels Alaska and Discoverer in addition to past 1977 PROBES samples, and expect to process most of this material in 1982. Certainly an equally important concern in this second year is completion of computer-aided syntheses of larval decapod distribution and abundance using the voluminous data available on biological and physical factors and processes in the S. E. Bering Sea (see Hood and Calder 1981, Vol.1 and 2 for the extent of such information). These syntheses will serve as frameworks for discussions of possible perturbations from oil and gas development on crustaceans, both as commercial resources and important members of benthic communities.

1.3 Format of this Report

This contract was established to provide information on larval decapods to those considering ramifications of oil and gas development and to aid them in devising management policy to mitigate possible impacts. The sections of this report describe firstly the general methods and materials used in the program (Section 2.0). Next are several sections (3.0-7.0) that review pertinent literature on the biology and fishery (if applicable) of major decapod groups and present results obtained thus far. The commercial king and Tanner crabs are discussed in Sections 3.0 and 4.0, respectively, followed by other crabs (5.0), shrimp (6.0) and hermit crabs (7.0). While the latter three groups are not commercially important (an exception is the horsehair crab, *Erimacrus isenbeckii*), they may be of major ecological importance as predators and prey within the benthic community and must not be overlooked in predictions of oil impact.

Since this is a first annual report, the discussions of timing of hatch, distribution and abundance, molt frequency, success or failure of year-classes (as suggested by our sample-sets) are somewhat tentative but hopefully will be corroborated by analyses in 1982. Nevertheless, results gathered thus far are considered in a general discussion of oil impact in Section 8.0, with emphasis given to pollution originating in the St. George Basin.

2.0 MATERIALS AND METHODS

2.1 Sample Sources and Station Locations

Zooplankton samples used for enumeration of decapod larvae were obtained from several sources employing different collecting devices. Several series of samples were retrieved from storage and loaned to us by the principal investigators of past zooplankton studies in the southeastern Bering Sea. These samples had not previously been examined specifically for decapod larvae. In addition to these past samples, participation in the 1980 PROBES cruise enabled purposeful collections for decapods, including a large number of depth-stratified samples shared by the PROBES zooplankton working group. Table 2.1 lists pertinent cruise and station information for the zooplankton samples analyzed to date in this study. The locations of these staions for each year and cruise are illustrated in Figs. 2.1-2.12.

2.2 Sample Collection

Collecting devices used for these samples included Bongo nets on a 60 cm (diameter) Bongo frame, a MOCNESS (Multiple Opening/Closing Nets and Environmental Sampling System, Wiebe et al. 1976), a NORPAC net (Motoda et al. 1957) and an MTD net (Motoda, 1969). The mesh size on the nets deployed with each piece of gear varied with the type of gear, the investigator, and the prevailing plankton conditions.

During OCS and NMFS cruises, Bongo frames were deployed with one 333 μm and one 505 μm mesh net attached. The net sample analyzed in this study depended exclusively upon the availability of samples from storage, and included collections from both mesh sizes. Bongo nets used

Table 2.1. Sources of zooplankton samples reported in this study.

Year	Temporal coverage of zooplankton samples	Cruise	Sponsoring agency	Vessel	Collecting gear* employed	Number of zoo-plankton stations	Total number of samples
1976	26 April - 31 May	MF-76A	NOAA	Miller Freeman	Bon	27	30
1977	16-30 April - 1-17 May	RP-4-MF-77B	NOAA	Miller Freeman	Bon/Neu	80	112
1978	11 February - 16 March	MF-78-1	NOAA	Miller Freeman	Bon	21	29
	11 April - 29 June	TT - 131	Probes	T. G. Thompson	Bon	186	225
1979	1-27 June	3MF-79	NOAA	Miller Freeman	Bon	32	36
1980	6 April - 8 June	TT - 149	Probes	T. G. Thompson	Bon/Moc	68	317
	4-5 October	Ax 9	Probes	Acona	NOR/MTD	4	21

*Bon: Bongo; Neu: Neuston; MOC: MOCNESS: Nor: NORPAC; MTD: Motoda.

Figs. 2.1 - 2.12. Station locations for zooplankton samples examined for decapod larvae and reported here. Sponsoring agency/programs, year, cruise number, and dates as follows:

2.1. NOAA 1976. Cruise MF-76A, 26 April - 31 May. Three stations west of 172°W not shown.

2.2. NOAA 1977. Cruise RP-4-MF-77B, 16-30 April.

2.3. NOAA 1977. Cruise RP-4-MF-77B, 1-17 May.

2.4. NOAA 1978. Cruise MF 78-1, 11 February - 16 March. Six stations west of 172°W not shown.

2.5. NOAA 1979. Cruise 3 MF-79, 1-27 June.

2.6. PROBES 1978. Cruise TT 131 (University of Washington), Leg 1 11-28 April.

2.7. PROBES 1978. Cruise TT 131 (University of Washington), Leg 3 27 May - 11 June.

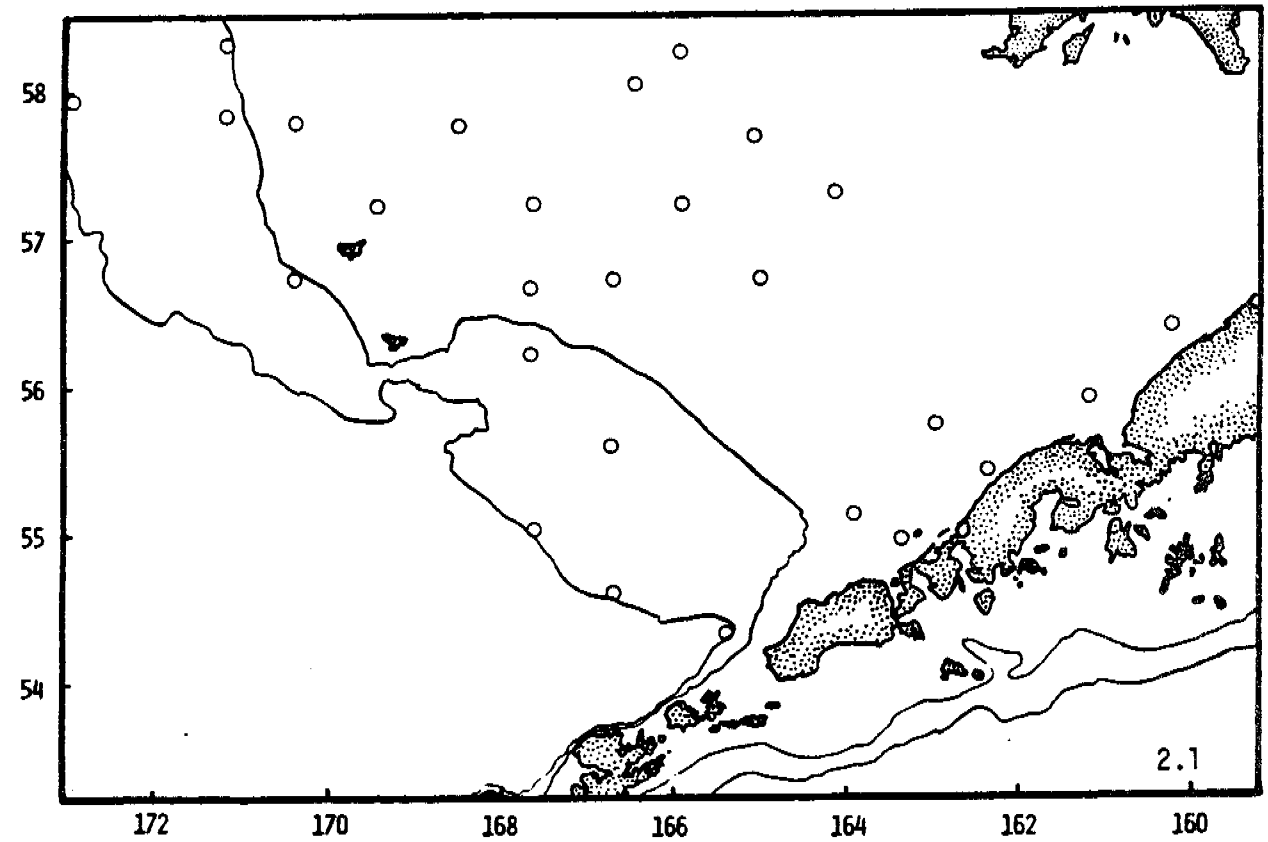
2.8. PROBES 1978. Cruise TT 131 (University of Washington), Leg 4 17-29 June.

2.9. PROBES 1980. Cruise TT 149 (University of Washington), Leg 2 6-21 April.

2.10. PROBES 1980. Cruise TT 149 (University of Washington), Leg 3 27 April - 18 May.

2.11. PROBES 1980. Cruise TT 149 (University of Washington), Leg 4 22 May - 8 June.

2.12. PROBES 1980. Cruise AX 9 (University of Alaska) Samples collected 4 and 5 October.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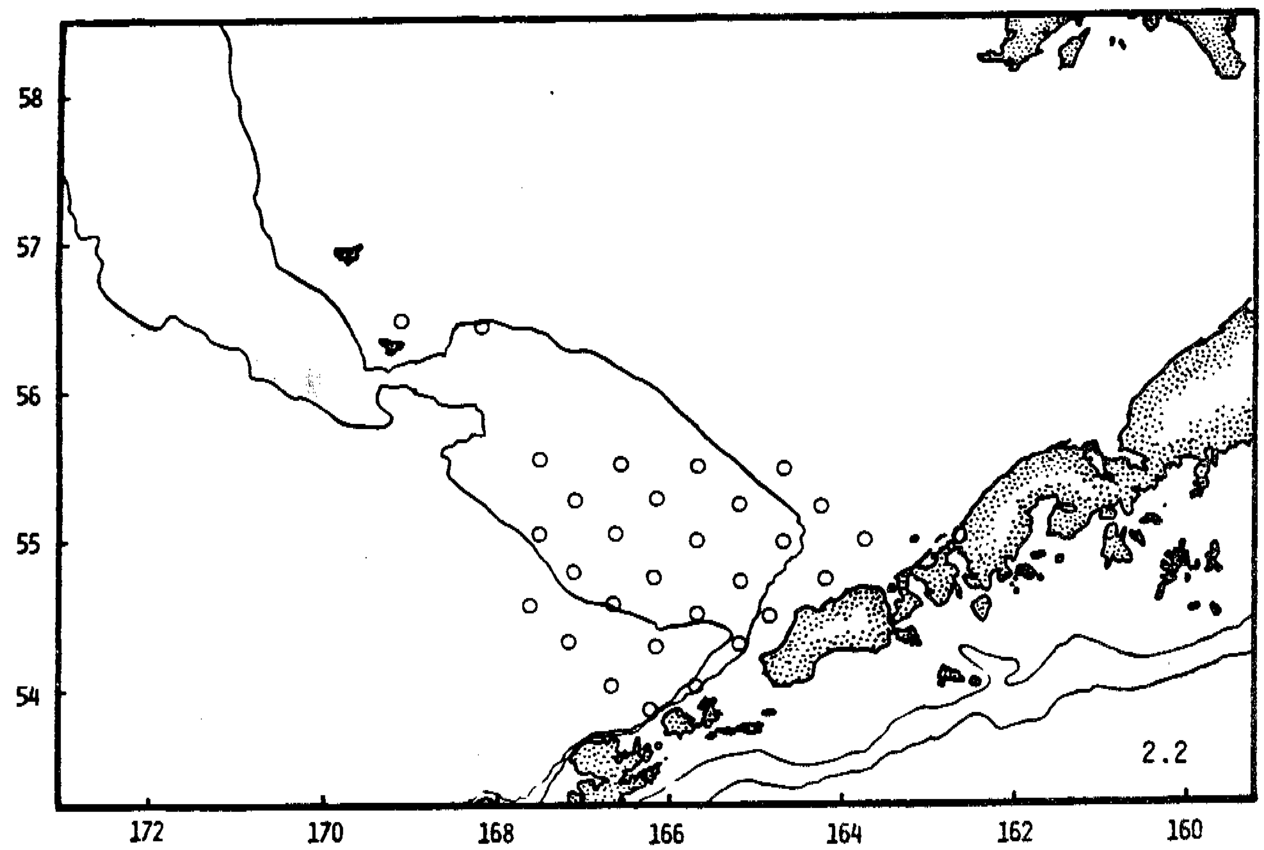
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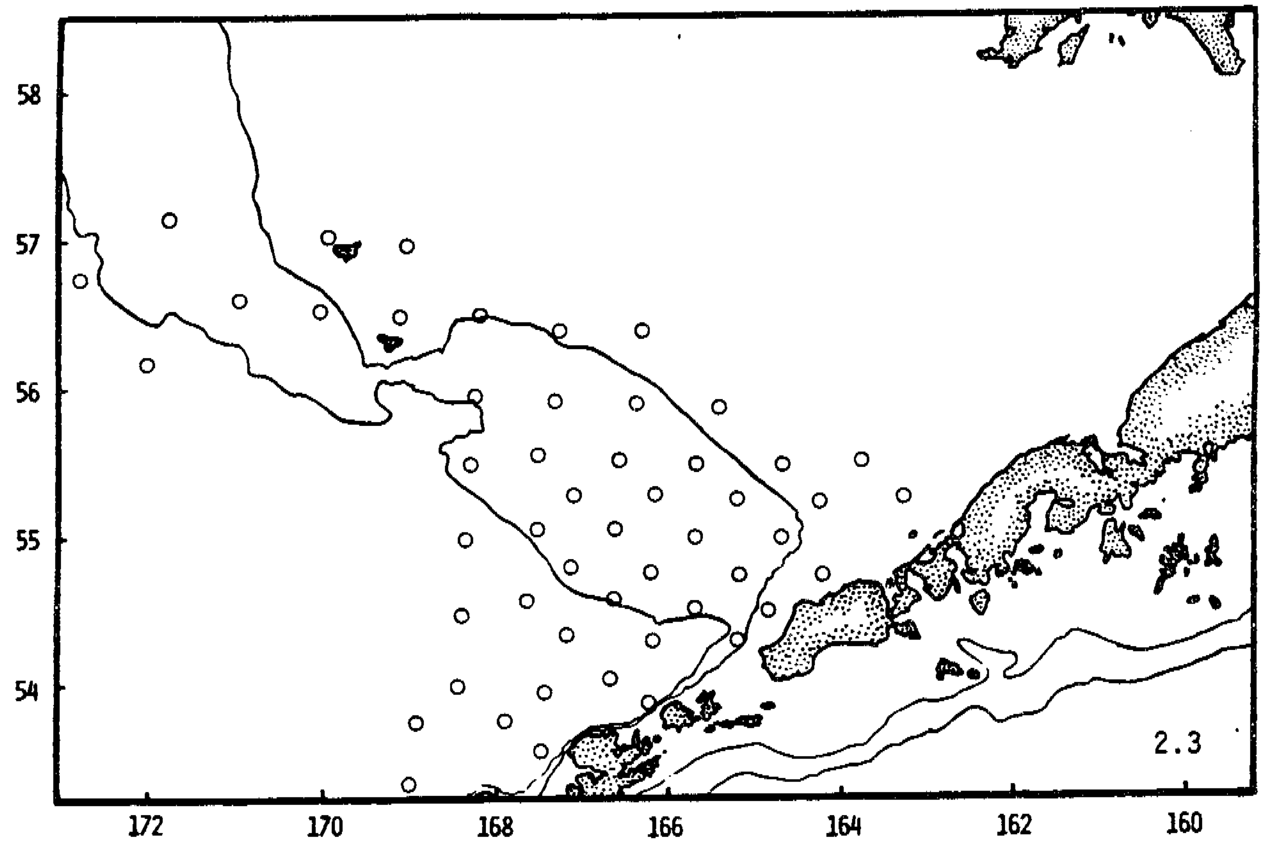
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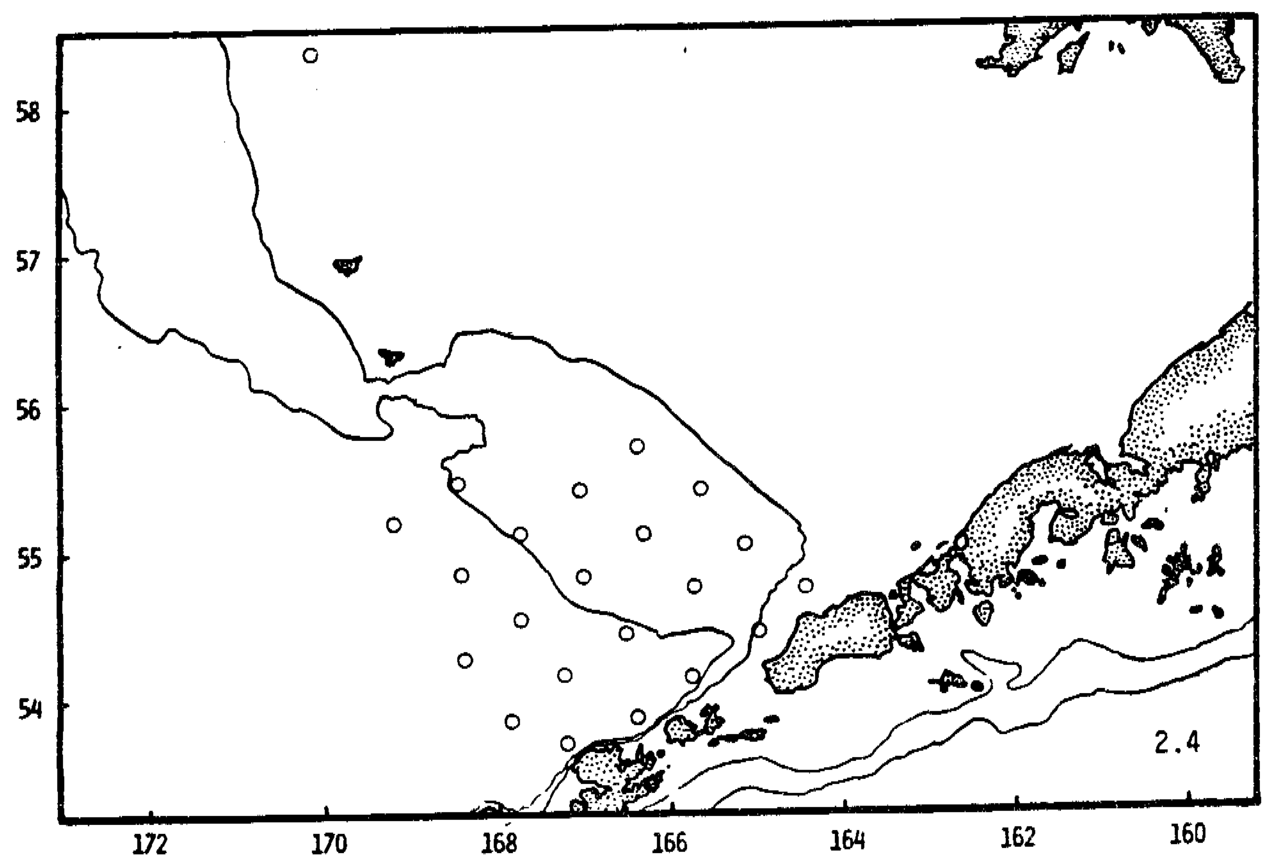
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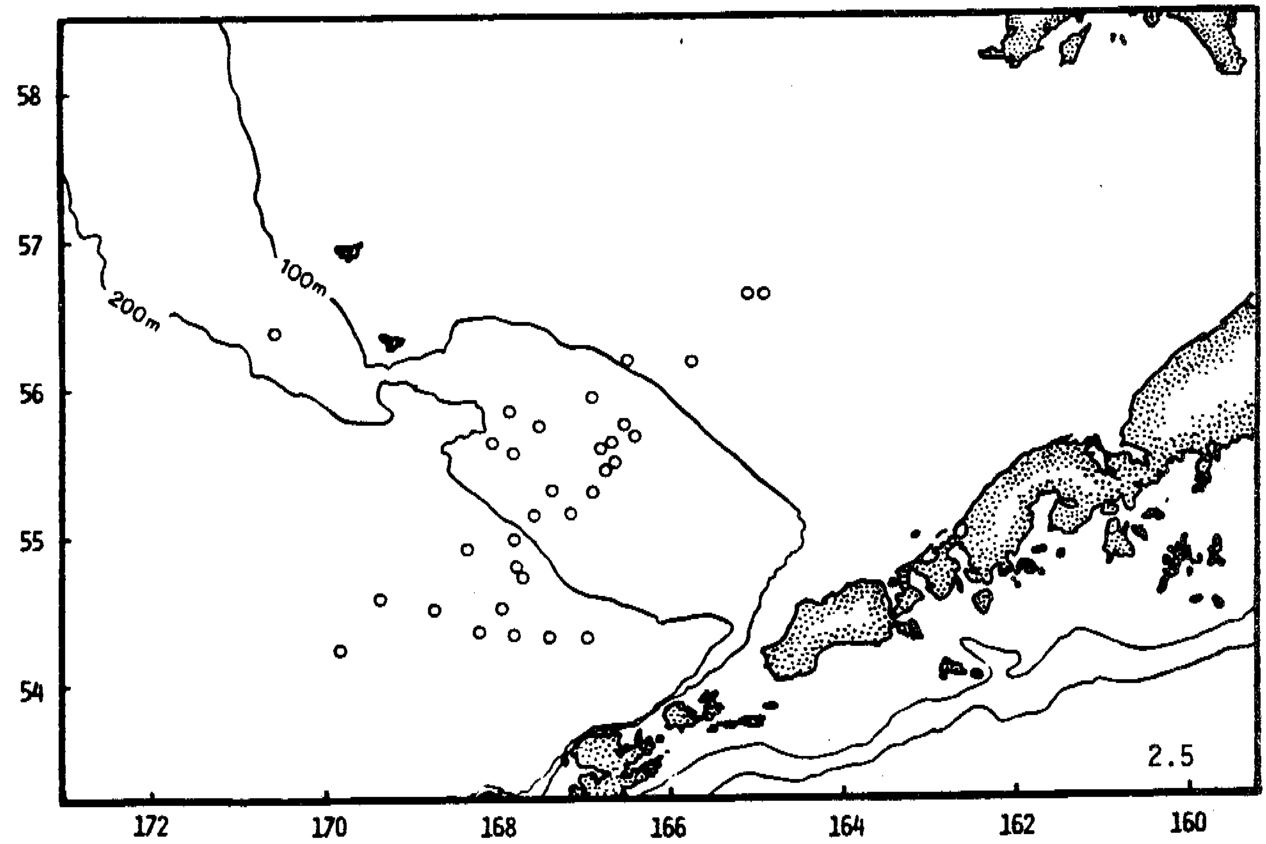
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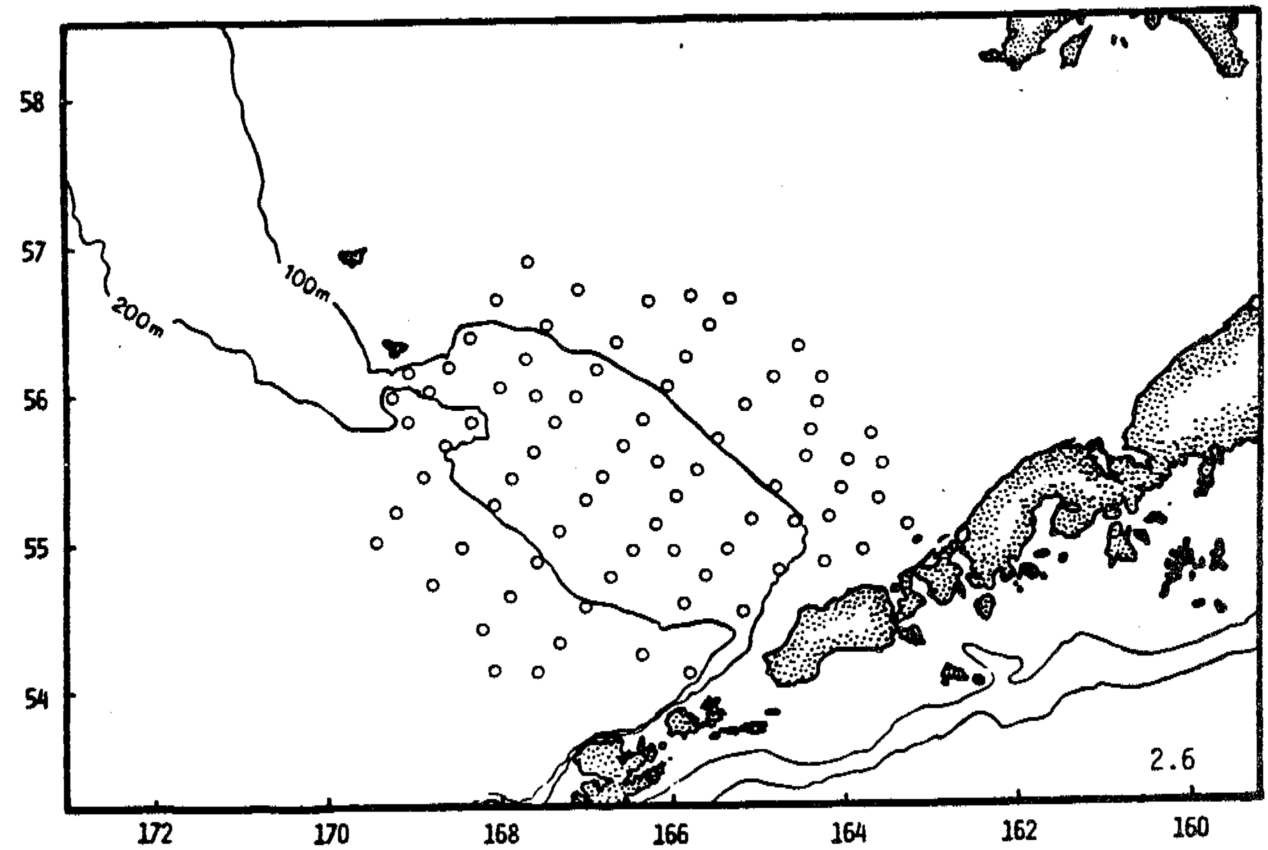
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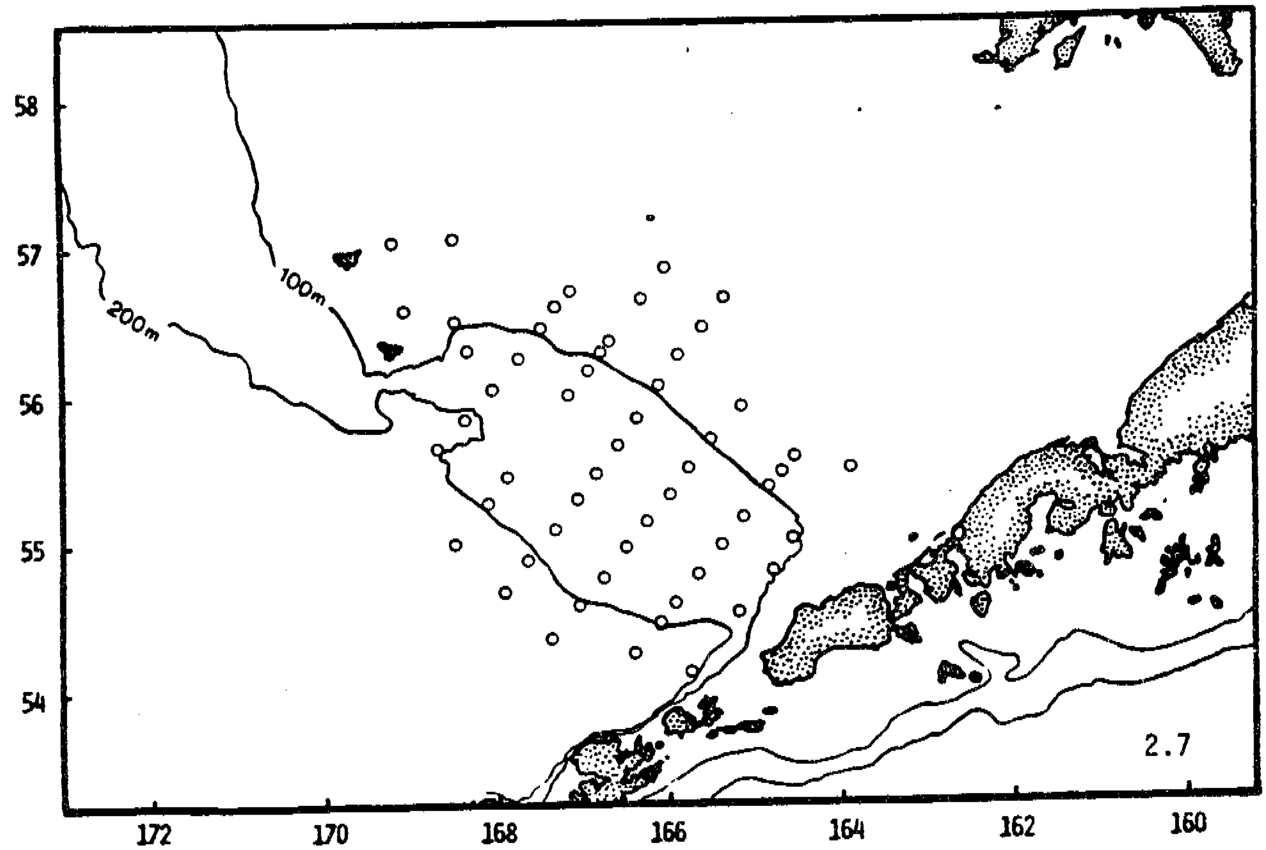
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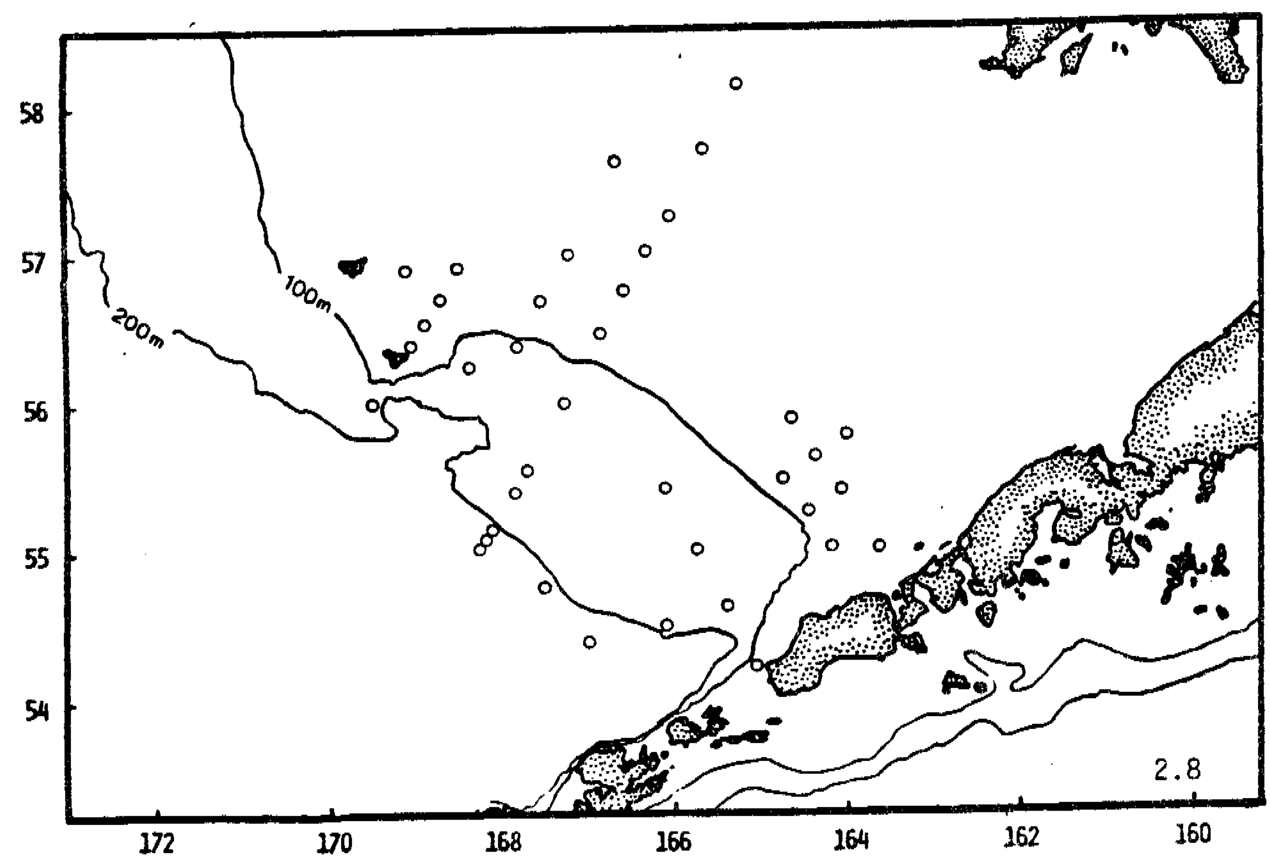
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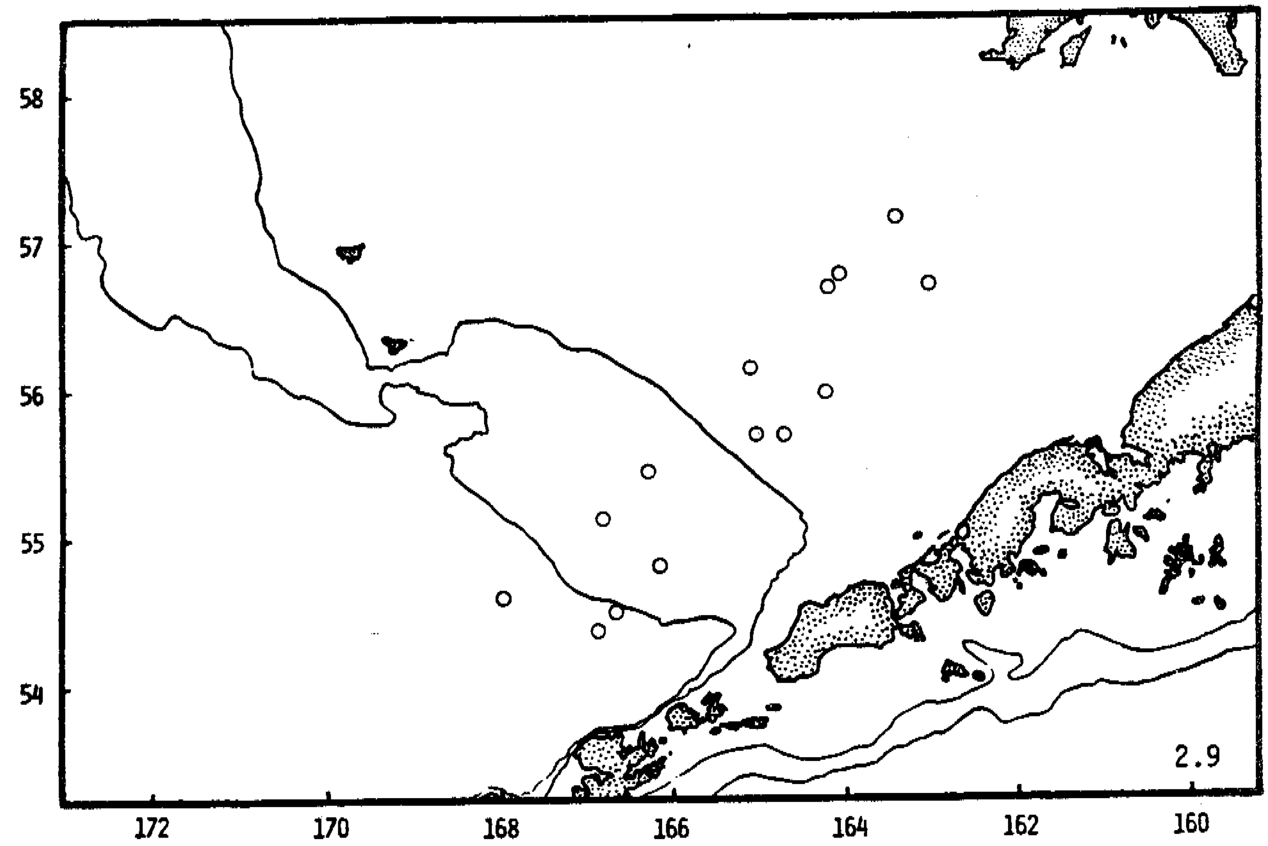
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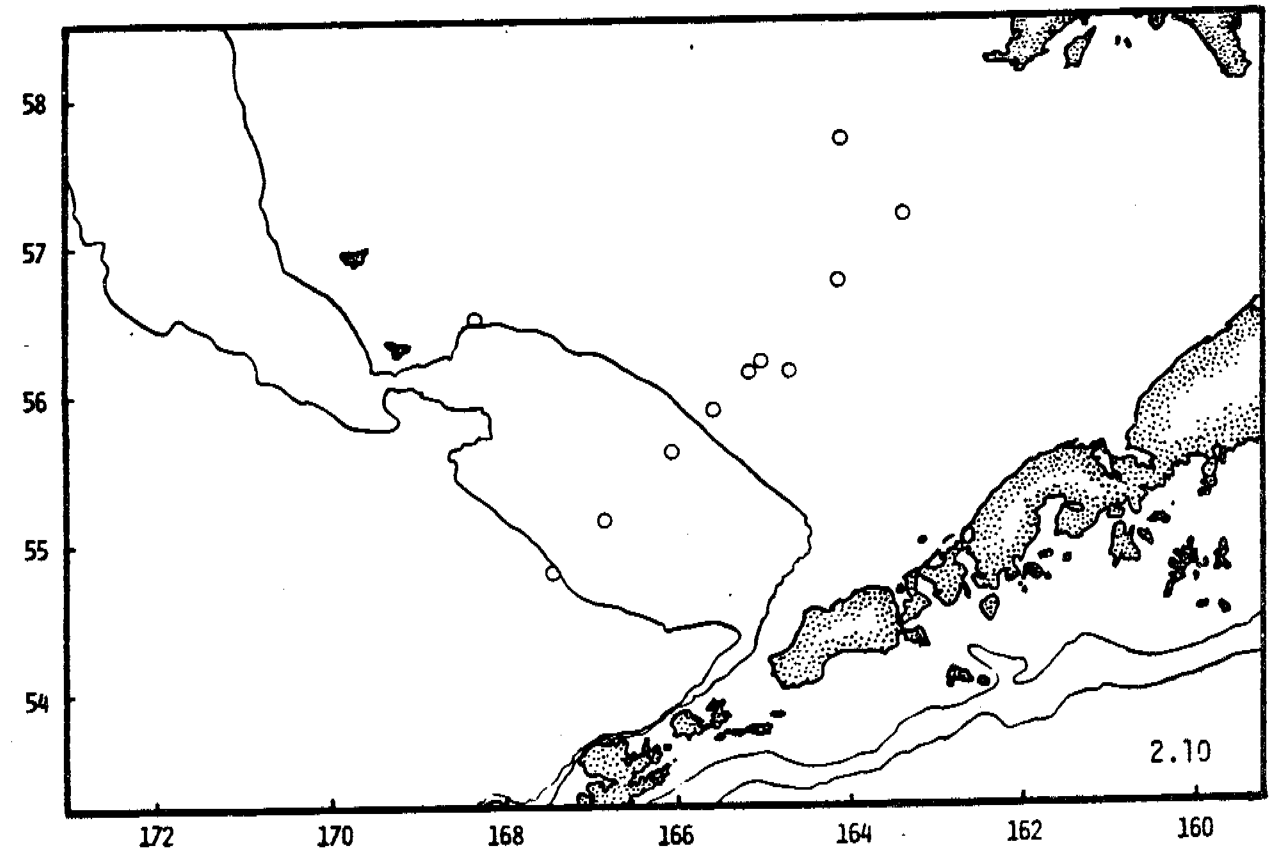
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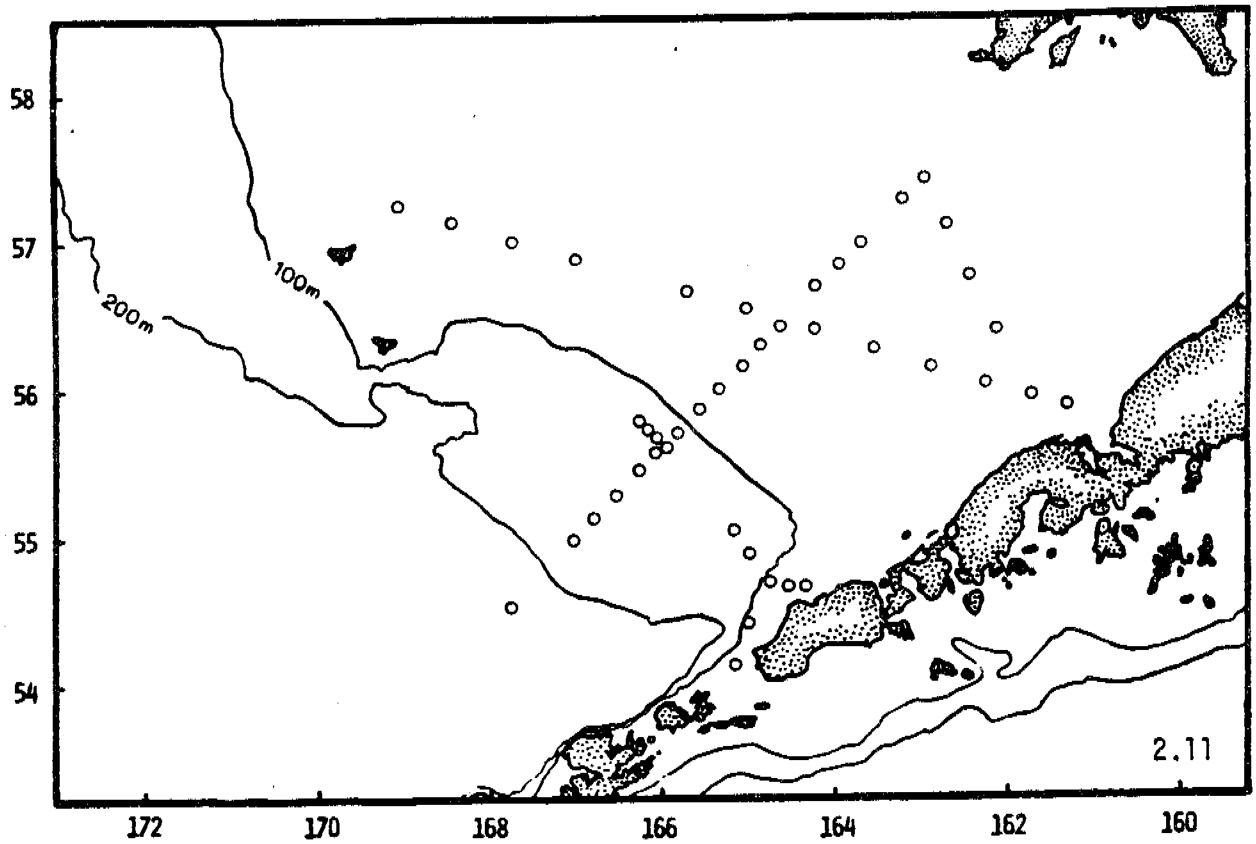
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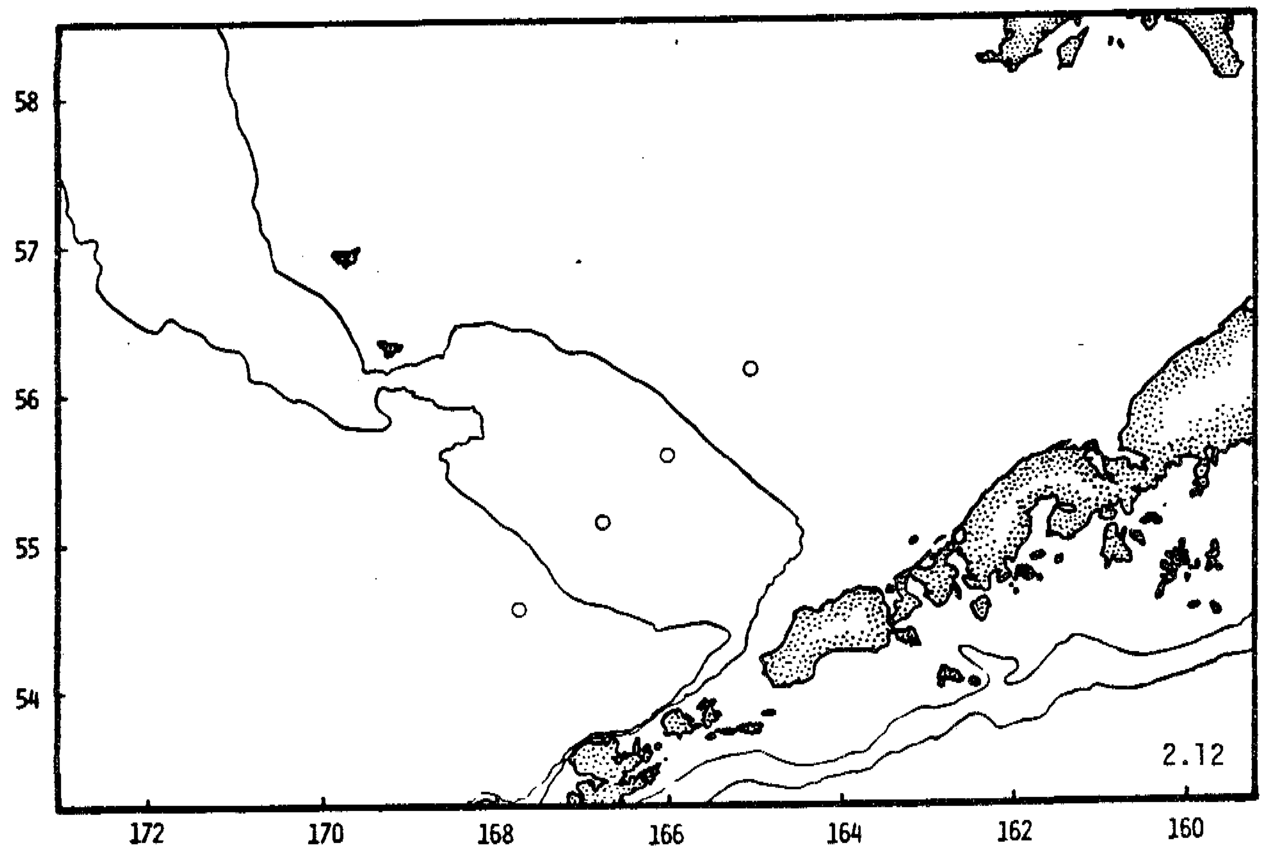
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during the 1978 PROBES cruise were 333 μm during Leg I and 505 μm during Legs II-IV (the investigators resorted to the larger mesh to reduce net clogging). A 505 μm net was used during the 1980 PROBES cruise. The NORPAC and MTD nets used both 333 and 505 μm mesh, and the MOCNESS was equipped with 153 μm mesh nets

Variability in the porosity of the nets used in obtaining samples was not considered a qualitative problem for this study (though it did introduce some quantitative problems, see below). None of the smallest decapod larvae found in samples from the 153 μm nets of MOCNESS were small enough to pass through a 505 μm mesh.* There should therefore be no size bias (species bias) imposed on samples collected by any mesh size within the range used in this study.

Flow meters attached in front of the opening of Bongo nets, the NORPAC net, and MTD nets or near the top of the MOCNESS were used to estimate the volume of water filtered by each net. Bongo tows were made using standard techniques which attempt to equally sample all depths involved in the tow (Smith and Richardson, 1977). The MTD nets and MOCNESS have discrete flow data for each depth strata or interval sampled. The only samples for which flow data are not currently available are those from PROBES 1978, so the average of flow values computed for other processed zooplankton data from that cruise was used. Since every effort was made to keep those tows uniform, the error introduced by this

*The smallest larvae were stage I zoeae of the Brachyuran family Pinnotheridae: minimum dimension of smallest individual collected with 153 m nets was approximately 1.5 mm.

estimation is probably small compared to real differences in decapod abundance.

The depth of sampling varied with the gear and cruise objectives. The depth of Bongo tows from OCS and NMFS cruises generally reflected changes in the depth of water at various stations, whereas PROBES Bongo tows tended to concentrate primarily on the upper 60 m of water, even at the deeper stations. MOCNESS was generally deployed to within 10-20 m of the bottom, depending on the depth of the station and sea conditions prevailing at the time. The depth intervals sampled by individual nets on this device were usually in twenty meter increments (0-20, 20-40, etc.) for the upper 100 m of water and thence at standard intervals determined by the depth of a station (MOCNESS stations ranged down to 1500 m. Since MOC has 9 nets, only 4 were left to sample depths greater than 100 m). The MTD net used to collect samples examined in this study was deployed at fixed depths (e.g., 10 m, 30 m, etc.) rather than hauled obliquely through larger depth intervals.

Samples were preserved in 3-5% (final strength) formalin:seawater.

2.3 Sample Processing

Raw zooplankton samples obtained for this study varied from a minimum of 20% (MOCNESS samples) to a maximum of 100% of the original tow sample. This sample was then either examined entirely for decapod larvae or was subsampled before removal of decapods. The decision of whether or not to subsample depended on the size of the sample and required some subjective judgement; the general rules governing this decision follow:

1. Subsampling was done only if the settled volume of zooplankton in a clean sample exceeded approximately 0.15 l. The desired settled volume of a clean sample from which decapod larvae would be removed was approximately half the above, or 75 mls. A Folsom plankton splitter was used for sample splitting.

2. Subsampling was not done if the original sample contained a large volume of gelatinous zooplankton or aggregating phytoplankton (i.e., palmelloid form of *Phaeocyctis foucheti*) which interfered with the subsampling (splitting) process.

3. Subsampling was not done if the original sample obviously contained a large number of large organisms (adult euphausiids, chaetognaths, etc.) but relatively few smaller animals.

4. A sample was not subdivided into a fraction containing less than 1/80 (MOCNESS) or 1/16 (Bongo) of the original tow.

The above guidelines were followed to ensure that subsampling yielded representative samples of the plankton. The adequacy of this approach was checked on several occasions with samples representing a variety of plankton conditions. These results are reported in the DATA Sensitivity & Accuracy section that follows.

In all cases where at least one split was possible, one of the final pair of samples was archived for possible future needs, including verification of results or examination of subsampling error. Decapod larvae were removed from the remaining subsample for identification. Occasionally, a subsample yielded hundreds of decapod larvae. When such numbers were found, these larvae were further sub-sampled using a small plankton splitter before taxonomic work was begun.

2.4 Taxonomy

Once removed from the raw plankton sample, decapod larvae were stored in a 95% ethanol:2% glycerol solution until they could be identified and counted. The principal objectives of this program include enumeration of the larvae of commercially important decapod crustacea, primarily king crab, Tanner crab, and a general category to include all shrimp. However, in the process of distinguishing king and Tanner crab larvae from other Anomura and Brachyura, several additional identifications are made simultaneously. The result is that, with a little extra effort, all other Anomurans and Brachyurans can be identified to some useful taxonomic level within these two orders. The level of identification of these "other" larvae varied as a function of their taxonomic affinity to the king and Tanner larvae and ranges from sub-family to genus.

Among the shrimp, identification to family can ordinarily be accomplished without too much difficulty,so this was routinely done. This has the advantage of separating out the pandalid shrimp (Family Pandalidae) for which there was once, and may be again, a commercial fishery. Identification of the pandalids has been done to species level.

A hierarchical list of taxonomic levels identified from our zooplankton samples is provided in Table 2.2. References for the identification of these larvae, including larval stages, are included in the sections for each major larval group.

Table 2.2. List of taxonomic levels of decapod crustacean larvae identified in this study.

Order Decapoda
- Suborder Reptantia
  - Section Brachyura
    - Family Majidae
      - Subfamily Oregoniinae
        - *Chionoecetes* spp.
        - *C. bairdi*
        - *C. opilio*
        - Non-*Chionoecetes* Oregoniinae (Includes *Hyas* spp. and *Oregonia* spp.)
      - Subfamily Acanthonychinae and/or Pisinae
    - Family Atelecyclidae
      - *Erimacrus isenbeckii*
      - *Telmessus cheiragonus*
    - Family Cancridae
    - Family Pinnotheridae
  - Section Anomura
    - Family Lithodidae
      - *Paralithodes camtschatica*
      - *P. platypus*
      - Non-*Paralithodes* Lithodidae
    - Family Paguridae
      - *Pagurus* spp.
- Suborder Natantia
  - Section Penaeidea
    - Family Penaeidae
      - *Penaeus* spp.
  - Section Caridea
    - Family Pandalidae
      - *Pandalus borealis*
      - *P. tridens*
      - *P. hypsinotus*
      - *P. stenolepis*
      - *Pandalopsis dispar*
    - Family Crangonidae
      - *Crangon* spp.
      - *Argis* spp.
    - Family Hippolytidae
    - Family Pasiphaeidae
      - *Pasiphaea* spp.

2.5 Data Reporting

The larvae of commercial decapod crustacea are the focus of this report; they include the larval stages (zoeae and megalops) of king crab, Tanner crab, korean horse-hair crab, and pandalid shrimp. In most cases, larvae of all other taxonomic divisions enumerated in our laboratory work are reported here in general categories as "other Anomura" and "other Brachyura." The pagurid crabs (Anomura: Paguridae), though of no direct commercial value, have received some special attention because of their large numbers and widespread occurrence in the plankton.

As noted earlier, the depth of sampling varied with the gear, the cruise objectives, and the station depth. The effect which sampling depth has on the calculated concentration of larvae must be normalized before valid interstation comparisons of concentration can be made.

The known sampling depth intervals of the MOCNESS and MTD nets simplified data interpretation with respect to calculating true concentrations of decapod larvae because it was possible to define those depth strata where the larvae were found and those where they were not. (The resolution of this approach is limited by the averaging which takes place over discrete oblique depth intervals, 20 m in the upper 100 m). In addition, depth information yielded by MOCNESS was used to substantially improve the value of samples from Bongo tows which did not conform to standard depths.

In many cases, Bongo tows included depths where decapod larvae of certain groups did not occur, this being known from analysis of MOCNESS samples. In these cases, the concentration of larvae was recalculated assuming that essentially all of the larvae within the sample had come from depth interval shallower than the total depth sampled. Since, in theory, all depths are sampled approximately equally during a Bongo tow, a correction factor (CF) can be used to estimate the concentration of larvae in the depth interval of interest. The CF would be a multiplier such that:

$$CF = \frac{z}{z'}$$

where z = the maximum depth sampled by the Bongo tow and z' is the depth to which the larvae are distributed (i.e., larvae are distributed from 0-z' m).

For example, if a sample had come from a Bongo tow which went from 0-250 m, but the larvae of a particular decapod group are known to occur almost exclusively in the upper 60 m, the CF for estimating the concentration in the upper 60 m would be:

$$CF = \frac{250}{60}$$

$$= 4.17$$

If the original calculated concentration had been 316 larvae/1000m^3, the estimated real concentration (the estimate of the concentration existing in the upper 60 m would be (4.17) (316) = 1318/1000m^3.

This is an important estimation tool. It is the only measure by which the various station samples can be compared. Another common method for facilitating comparison of stations or samples with widely varying depths is to express concentration per unit area of sea surface (no. per m^2), but the data for this calculation are not available for the 1978 or 1980 Bongo tows. Furthermore, application of this technique also requires some knowledge, and some applied assumptions, about the depth distribution of the larval group being considered when tows are considerably shallower than the station depth. This situation exists for many of the samples on hand. The volume adjustment technique was considered more informative for this project's needs; its use is referenced when applied in the various larval data sections.

2.6 Data Sensitivity and Accuracy

The volume (or mass) of plankton retained by the comparatively large mesh of the Bongo nets was frequently much smaller than that retained by the finer mesh nets used on MOCNESS. Yet the estimated volume of water sampled by nets of the two devices (according to the flow meters) was often similar (generally 200-300 m^3). It was determined above that all decapod larvae should be retained by any of the mesh sizes employed for the samples, so that the nets, in theory, should serve equally well for estimating the density of decapod larvae at various stations. However, at least three factors affect the estimates we make: (1) systematic differences in the degree of subsampling dictated by corresponding differences in the volume of plankton retained by each net per volume of water filtered; (2) inherent differences in net clogging related to net porosity and (3) differences in the location of the flow metering device.

When the volume of water filtered by a MOCNESS and a Bongo are approximately the same but there are large numbers of small organisms retained by MOCNESS and not by the larger mesh Bongo nets, the former will be sub-sampled to a greater extent than the latter. When the net plankton samples from MOCNESS and the Bongo are approximately the same size and consequently, subject to the same sub-sampling, it is frequently because the former has sampled less water than the latter. It is only when small plankton (in the intermediate size range 150-333 μm or 150-505 μm) are rare that the volumes of water filtered and the number of sub-sampling splits can be the same for both MOCNESS and Bongo samples. Since the latter condition does not usually prevail, the representative volume of water actually examined in MOCNESS sub-samples is almost always smaller than that examined from Bongo samples. This has the effect of decreasing the lower level of detection, or numerical sensitivity, of the MOCNESS samples relative to the Bongo.

Bongo samples are usually split no further than 1/8, and are never split to less than 1/16, of the original sample. Such splits place the lower level of detection in sub-samples at about 8-16 animals per 200-300 m^3 average tow, assuming perfectly uniform distribution of the larvae in the splitting process. Early in the season, much of the plankton community is not well developed, so splits are usually not necessary. Under these conditions the entire sample is examined and the probable lower level of detection for reporting becomes about 1 in 250 m^3 (assuming an average tow through the upper 60 m of water), or roughly 5 per 1000 m^3.

The discrete depth interval sampling of the MOCNESS is not as sensitive to low densities of larvae because of the relatively smaller volumes of sampled seawater represented in the subsamples. Most MOCNESS subsamples are from 1/20 - 1/40 of the original sample, and some may be as little as 1/80. Early spring samples containing relatively little plankton are frequently examined entirely, as in the case of spring Bongo samples. However, our share of PROBES MOCNESS samples is 1/5 of the original (the splits are done on board ship), so under no circumstances do we examine more than 1/5 of the original tow. (Assuming similar volumes of water filtered and no significant net clogging, MOCNESS samples provide only 1/5 the numerical resolution of Bongo samples for detecting very low larval densities). Pooling of discrete depth sample data for MOCNESS under early spring conditions provides about equal numerical sensitivity for MOCNESS and Bongo tows.

Since MOCNESS nets have a much finer mesh, they are more prone to net clogging than the larger nesh Bongo nets. This may be caused by phytoplankton as well as zooplankton, and reduces the actual amount of seawater filtered. The analytical problem created by this condition is compounded by the location of the flow-metering device. Unlike the Bongo frame, the MOCNESS frame cannot accomodate a flowmeter positioned in front of the net opening (because of the sliding nets and the way the frame is handled on deck (Weibe et al. 1976). Instead, the flowmeter sits atop the frame, where it is insensitive to actual changes in flow into the net. The MOCNESS therefore routinely over-estimates the volume of water filtered, and our calculations routinely underestimate the density of decapod larvae present. It should be recognized that this problem is not even internally consistent within a station, since phytoplankton and other zooplankton are not uniformly distributed with depth and may affect only some of the nets used. The 0-20 and 20-40 m nets are usually subject to much more clogging than the deeper ones, so that calculations of densities in the upper 40 m are usually underestimated relative to calculations for deeper samples.

In summary, samples from Bongo tows are generally the most sensitive to detection of low larval densities, particularly in early spring (prior to May) and late in the summer (at certain sites). Samples collected with MOCNESS are decidedly less sensitive to low larval densities during most of the year, but provide information on depth distribution of the organisms. MOCNESS nets in the upper 40 m are more prone to clogging than those deployed deeper, so larval densities are likely more underestimated for the upper 40 m than for deeper intervals.

3.0 DISTRIBUTION AND ABUNDANCE OF KING CRAB LARVAE, *PARALITIODES CAMTSCHATICA*, IN THE S. E. BERING SEA

David A. Armstrong

3.1 Life History and General Biology

3.1.1 Distribution and Abundance

The Bering Sea shelf including Bristol Bay has been characterized as three principal water domains, the coastal, middle shelf, and outer shelf domain that extend to about the 50 m, 100 m, and 200 m isobaths, respectively (Kinder and Schumacher 1981; Fig. 3.1). Information on distribution and abundance of king crab in these shelf areas is more comprehensive than for any other decapod fished by U.S. fleets (*see* Section 4.0 for discussion of Tanner crab). For more than 12 years, the National Marine Fisheries Service has conducted broadscale trawl surveys in the S. E. Bering Sea (Fig. 3.2), and Otto (1981a) provides a history of information gathered by Japanese and Russian fleets during their participation in the fishery.

In general, female and small male king crabs are found closer to shore and somewhat east of large males (Otto et al. 1980a, 1981b; Figs. 3.3 and 3.4; small crabs are classified as males <110 mm carapace length and females <89 mm). Very small, sexually immature juvenile red king crabs are rarely caught in survey nets throughout the survey area of Fig. 3.2, even though mesh used will retain animals as small as 30 mm. The implication is that juvenile crabs up to 60 mm in carapace length (about 3 years old; Weber 1967) are absent from the survey area and likely very nearshore along the North Aleutian Shelf.

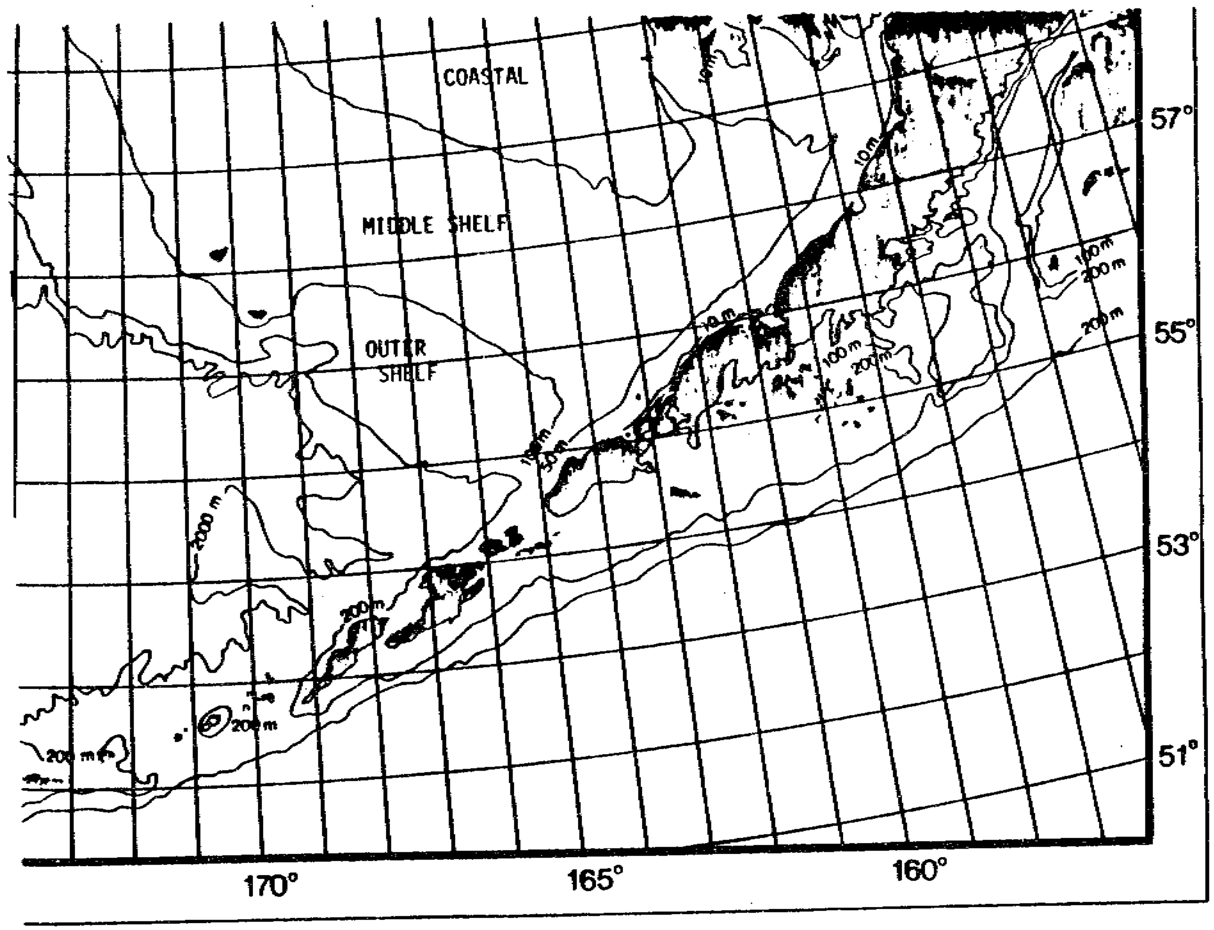


Fig. 3.1. Location of shelf domains in the southeastern Bering Sea. Oceanographic frontal systems occur approximately at the 50, 100, and 200 m isobaths. After Kinder and Schumacher (1981).

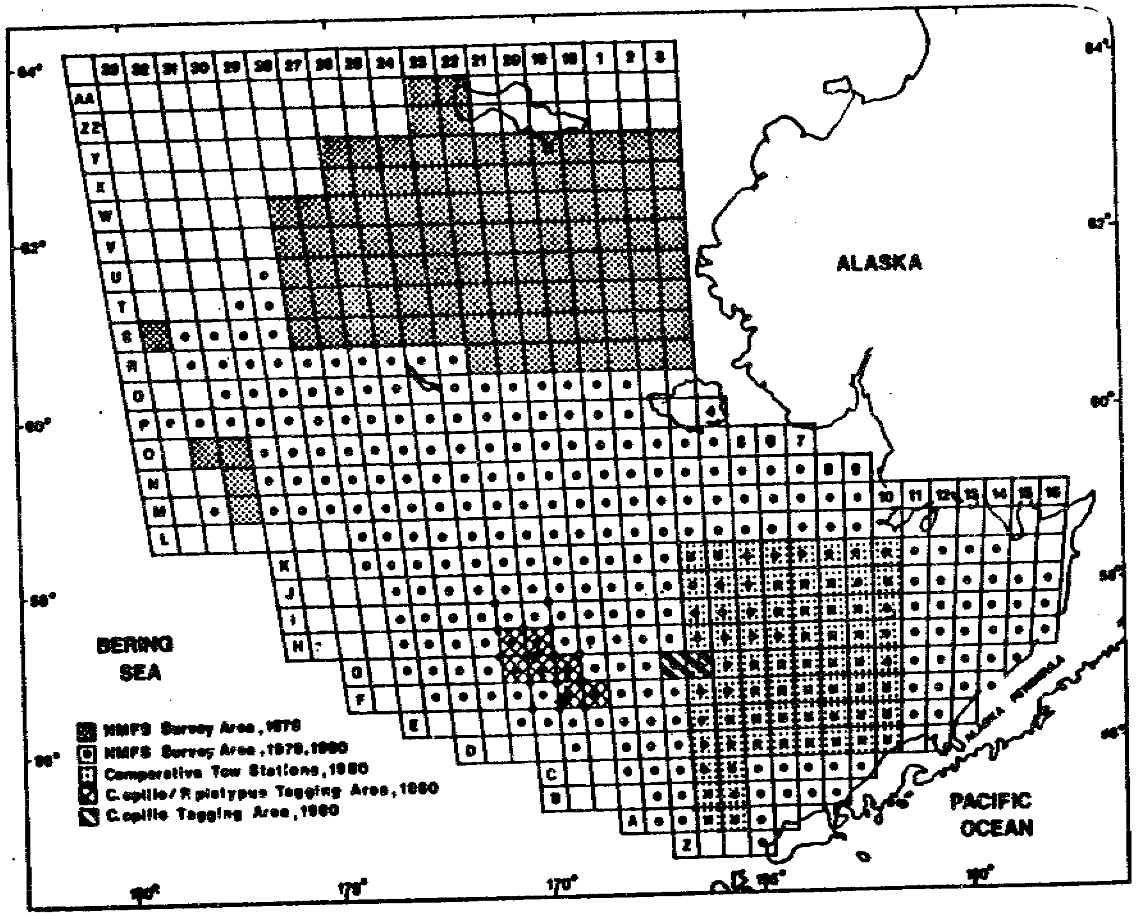


Fig. 3.2. NMFS eastern Bering Sea crab survey areas in 1979 and 1980. From Otto et al. (1980a).

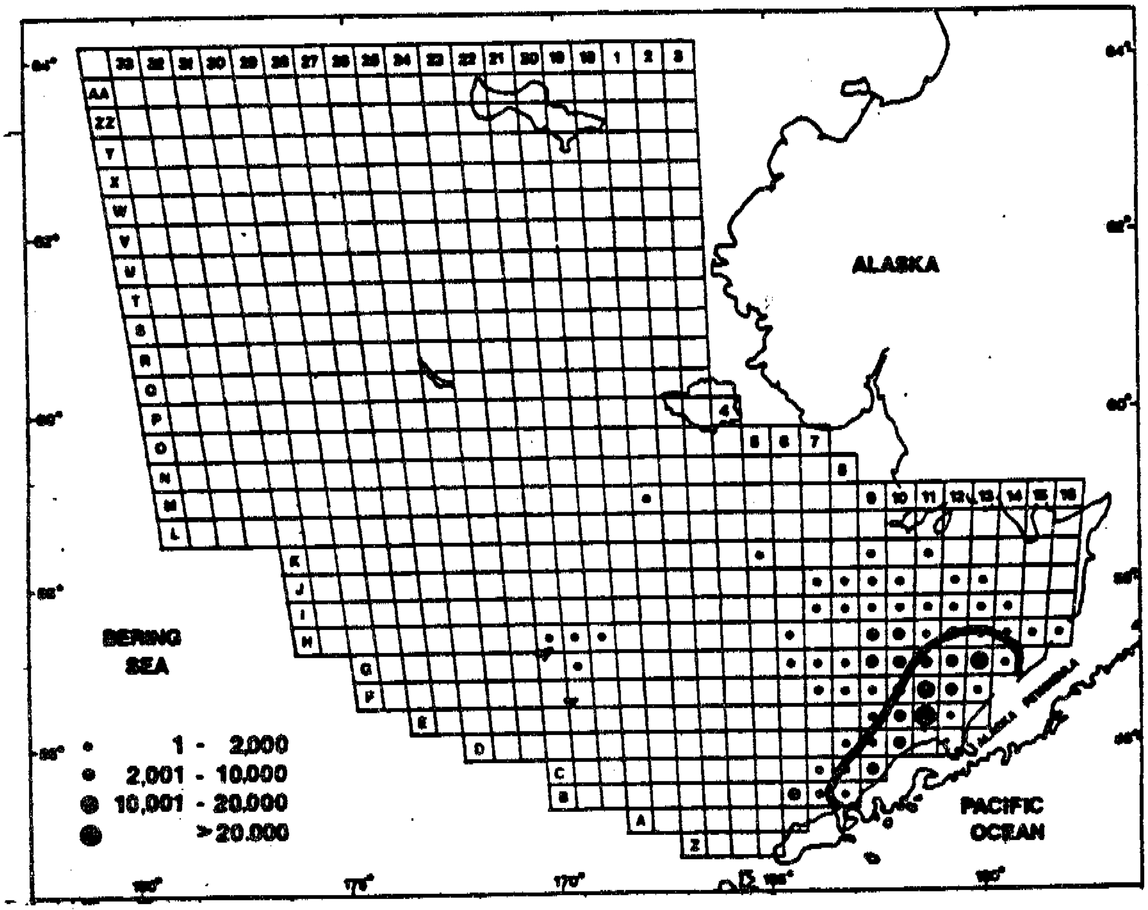


Fig. 3.3. Distribution of female red king crab (P. camtschatica) greater than 89 mm carapace length, in the eastern Bering Sea during May-July, 1980. From Otto et al. (1981a).

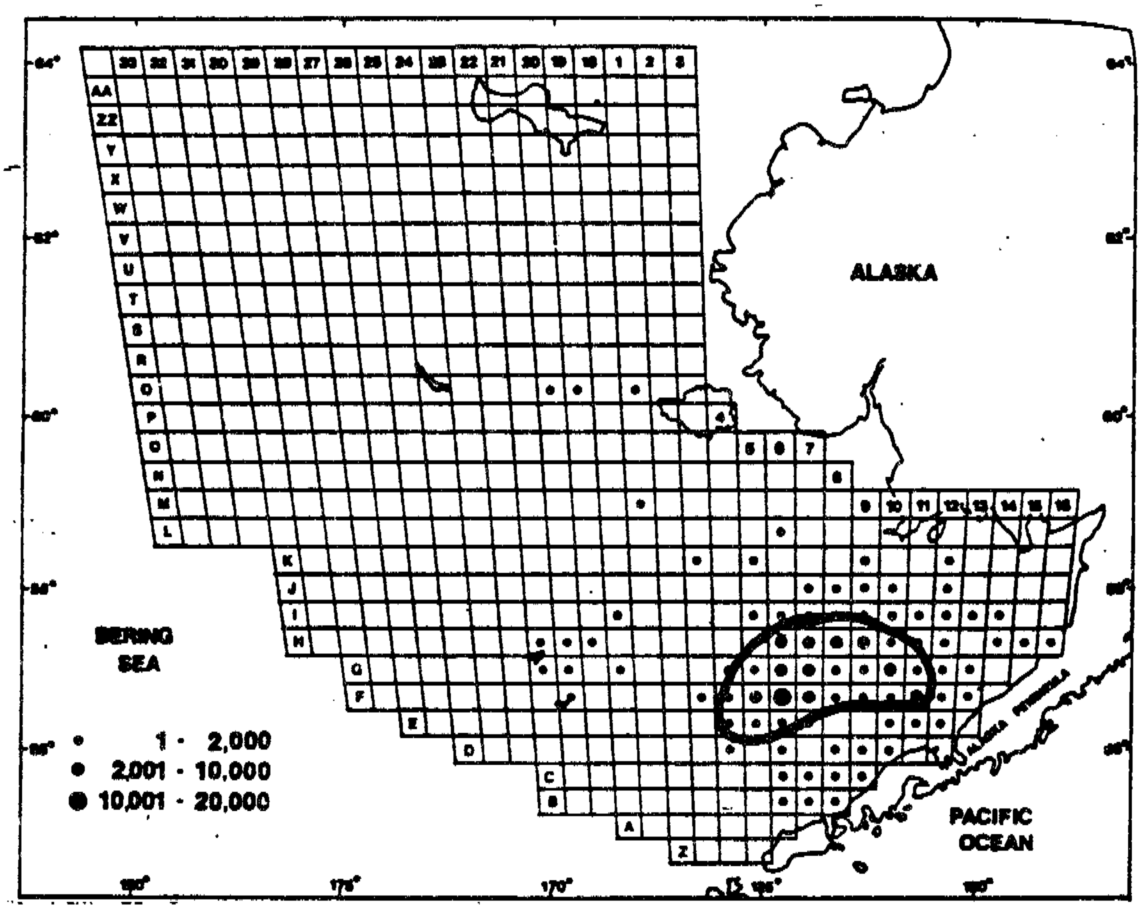


Fig. 3.4. Distribution of male red king crab (P. camtschatica) greater than 134 mm carapace length, in the eastern Bering Sea during May-July, 1980. From Otto et al. (1981a).

Abundance estimates have fluctuated between years in the last decade and cycles of high to low abundance may occur in this species' populations as observed in Dungeness crab, Cancer magister (Botsford and Wickham 1978). The Kodiak king crab fishery increased to 94 x 10^6 lb by 1965, fell to 10 x 10^6 lb by 1971, and has remained around 14 x 10^6 lb to the present (NOAA 1981); poor recruitment is cited as the cause. In the S.E. Bering Sea, crabs were in moderate abundance in 1953, increased in abundance to 1959, fell between 1964-70, and have increased to the present (Otto 1981a). However, abundance estimates for total male king crab have declined from 181 million animals in 1977 to 116 million in 1980 (Otto et al. 1980a). Most importantly, estimates of sublegal males one to two years from entering the fishery have declined nearly threefold from 64 to 24 million, leading to predictions of several consecutive years of poor fisheries. (The annual NMFS groundfish survey for king crab along the North Aleutian Shelf caught very few crab in May-July 1981; Tom Oswold, skipper of the Alaska, personal communication 11/23/81. Landings during the fall 1981 fishing season have been poor as predicted by NMFS). Change in abundance of king crab populations is an important biological factor to consider later in discussing oil impacts. Cycles of abundance suggest that year class failure or success may be based on survival of critical life-history stages such as larvae or young juveniles, probably in nearshore habitats. Annual instantaneous mortality rates of juvenile and sublegal, sexually mature crab are estimated to be low, .10 (Balsiger 1976; Reeves and Marasco 1980) until entering the fishery, and consequently the magnitude of a future fisheries cohort is largely determined by the reproductive success and survival of larvae and young-of-the-year in nursery areas. Vagaries of temperature, food supply, and predator populations are factors affecting survival, now the question of potential oil perturbations could add to natural pressures on larval and juvenile populations.

3.1.2 Reproduction

In late winter and early spring adult males apparently migrate from deeper, offshore areas to join females in shallow water for breeding (Powell et al. 1974; Weber 1967; NOAA 1981). Eggs carried from the previous year hatch about April 1 (Haynes 1974; Armstrong et al. 1981) and females soon undergo physiological changes leading to molt. By pheromone attraction (NOAA 1981) sexually mature males locate preecdysial females, embrace them for as long as 16 days, and mate just after the female molts (Powell et al. 1974). The nearshore, shallow water habitat is apparently selected in part for warmer water temperatures (and perhaps greater food supplies). The average temperature inhabited by sexually mature males and females is 1.5° and 4°C, respectively; (NOAA 1981). Stinson (1975) correlated male and female abundance with temperature and, from NMFS survey data through 1975, located most sexually mature females inside a 4°C isotherm nearshore off Unimak Island and directly in front of Port Moller.

After molting a female must be located and mated within 5 days for viable eggs to be produced (possible impact of oil on chemosensory pheromone cues could impair males' search for females). For 97% of all mating pairs males are larger than females (Powell et al. 1974); insemination of larger females by smaller males results in reduced clutch size (egg number). Any combination of events through natural and fishery mortality and pollution that substantially reduce numbers of large males at some point in time could threaten the breeding potential of the species. Reeves and Marasco (1980) estimated that a population (nearshore) of 60 million sexually mature females is required to sustain fishable levels of king crab.

Females carry eggs for up to eleven months as embryos develop through naupliar stages to prezoea (Marukawa 1933). This protracted developmental time makes eggs (during early cleavage) and later embryos susceptible to long-term benthic oil pollution, and will be considered in scenarios of oil mishaps and possible perturbations to larval populations (see Section 8.0). Again, gravid king crab females are aggregated nearshore in relatively shallow water along the North Aleutian Shelf but such distribution is poorly studied to date.

3.1.3 Larval Development

Larvae are hatched nearshore, molt through four zoeal stages every two-three weeks (Marukawa 1933), spend about a month as megalopae, and then metamorphose to first instars about mid-July to August (Weber 1967; Kurata 1960). Eggs normally begin to hatch in early April (Sato 1958; INPFC 1960, 1963, 1965; Haynes 1974), although female king crab may vary in time of hatch between widely separated populations from Unimak Island to Port Moller. Korolev (1968) summarized data collected by Soviet scientists for June, 1959 along the North Aleutian Shelf. Over 95% of the female populations between 161°25' - 164°10'W had spawned and carried new egg masses (violet to brown color) in June, while 90% of females east of 161°25'W (Port Moller and east) carried empty egg cases indicative of recent hatch and only 10% carried new violet egg masses.

Interannual timing of the onset of hatch and seasonal occurrence of pelagic larvae can vary by as much as a month. Japanese data (INPFC 1963, 1965) show that nearly 100% of gravid females sampled during 1960 carried "eyed" eggs (fully developed zoeae, hatch immiment) until May 10 and 50% carried empty egg cases by May 20-30. In 1963, eyed eggs were carried until April 20 and 50% had hatched by April 30. Such changes in the general timing of larval hatch are important for predictions of potential oil impact to larvae of the species.

Horizontal transport of king crab larvae by currents is thought to move them significant distances from the origin of hatch, and implies to some authors that recruitment of juveniles to a given area might depend on larvae hatched elsewhere, including areas south of the Alaska Peninsula (Hebard 1959; Haynes 1974). Hebard (1959) calculated that larvae hatched at Amak Island could be transported over 60 miles to the northeast and metamorphose at Port Moller (net current of 0.04 knot moving northeasterly along the North Aleutian Shelf). He further discussed possible transport of larvae from south of the Peninsula through Unimak and False Pass. Haynes (1974) adds credence to this supposition by showing a northernly dispersion of king crab larvae off the southwest tips of Unimak Island, and a northeast shift in areas of larval abundance from the Black Hills into Bristol Bay (May-July, 1969 and 1970; this pattern may in part be due to inadequate spatial sampling). Transport of larvae by currents is also important to consider in predicting oil impacts. Oil reaching relatively unproductive areas of the North Aleutian Shelf (low female abundance, few larvae hatched) could still be lethal if larvae are transported through such contaminated areas. Alternatively, oil and larvae could be transported together in a water mass resulting in relatively long-term exposure of sensitive zoeal stages to hydrocarbons.

Temperature is considered one of the most crucial physical factors affecting survival and growth of larvae, and Kurata (1960, 1961) calculated that 460 degree-days were required to progress from hatch to metamorphosis. Lethal temperatures are those greater than 15°C or lower than 0.5-1.8°C (Kurata 1960). He found greatest survival of zoeae between 5-10°C and formulated an equation that relates developmental time to temperature. Time from egg-hatch to molt of zoeae I to zoeae II varies from 24 days at 2°C to 9 days at 8°C (Kurata 1960). Severe climatological changes could account for large fluctuations in survival of a year-class and later recruitment to the fishery. Niebauer (1981) shows the limit of ice in the S.E. Bering Sea was several hundred kilometers farther south in 1976 than 1979 and actually extended to the Alaskan Peninsula near Black Hills. Both 1975 and 1976 were severely cold years and poor survival of larvae and juveniles then could account for low abundance of sublegal males 5-6 years later in 1981.

Growth rates of 0+ year and older juveniles have been studied and animals reach mean carapace lengths of about 11 mm, 35 mm, 60 mm, and 80 mm at 1, 2, 3, and 4 years, respectively (Powell and Nickerson 1965; Weber 1967). Growth models for the species have been developed by Weber

(1967), McCaughran and Powell (1977) and Reeves and Marasco (1980). Young-of-the-year molt from 8 (Powell 1967) to 11 (Weber 1967) times in the first year; such high frequency molting could make them particularly susceptible to nearshore oil perturbations since ecdysis is the time of greatest sensitivity to toxicant stress (Armstrong et al. 1976; Karinen 1981).

Juvenile crabs just entering their third year though four years old form large aggregates called "pods" in the Gulf of Alaska (Powell and Nickerson 1965). Podding behavior is probably based on chemosensory cues (subject to oil effects) and is thought to serve as protection from predators. It is not known if the same behavior occurs among nearshore juveniles of the North Aleutian Shelf.

Red king crab are sexually mature at about 95-100 mm carapace length for males (Weber 1967, NOAA 1981), and 85-90 mm for females in the Bering Sea (Weber 1967) or 93-122 mm in the Gulf of Alaska (Powell and Nickerson 1965). Animals are 5-6 years old at sexual maturity and males are therefore capable of breeding 2-3 years prior to entering the fishery at about eight years old.

3.2 The Fishery

Red king crab are the most important crab fishery of the United States in both dollars and pounds landed. In 1980 king crab landings were 185 x 10^6 lbs and even exceeded blue crab (Callinectes sapidus) landings of the east coast (NOAA 1981). In 1979 and 1980 the value of king crabs landed was about $168.7 million or 58% of total U.S. ex-vessel value of crabs (Otto et al. 1980a; Eaton 1980; Otto 1981b; NOAA

1981) (Fig. 3.5). Of the total Alaska statewide king crab landings in 1978-79 and 1979-80, over 75% came from catches in the S. E. Bering Sea (117 x 10^6 and 130 x 10^6 lbs, respectively; NPFMC 1980; Pacific Packers Report 1981). Red king crab commercial catches (Fig. 3.6) come largely from the middle shelf between 50 and 100 m, and 50 to more than 200 km offshore of the North Aleutian Shelf (Otto 1981a, b). Blue king crab, P. platypus, also support a commercial fishery in the S. E. Bering Sea around the Pribilof Islands where adult populations are centered.

King crab are the largest and oldest crab caught by U. S. fisheries. Males are 50% recruited to the pot fishery at 8 years of age and fully recruited by 9 years (McCaughran and Powell 1977; Reeves and Marasco 1980). Legal size at recruitment is about 135 mm carapace length and 165 mm (6 1/2") width and mean annual weight per animal fluctuates from 6.4 to 7.5 lbs (NOAA 1981; Eaton 1980). Annual fishing mortality is managed to approximate 40% (NOAA 1981) but the percent of the fishery constituted by new recruits has varied from 67% in 1977 to 47% in 1979, indicating that differential natural mortality rates can significantly affect the importance of any single year-class to the fishery (Eaton 1980). Oil pollution that adversely affects a significant portion of larvae in any year-class could eventually impact the fishery despite longevity of the species and commercial stock comprised of two to three year-classes.

3.3 Results

3.3.1 Monthly Distribution and Abundance

Two of the most striking aspects of results thus far are: 1) The pronounced absence of Paralithodes larvae over most of the St. George

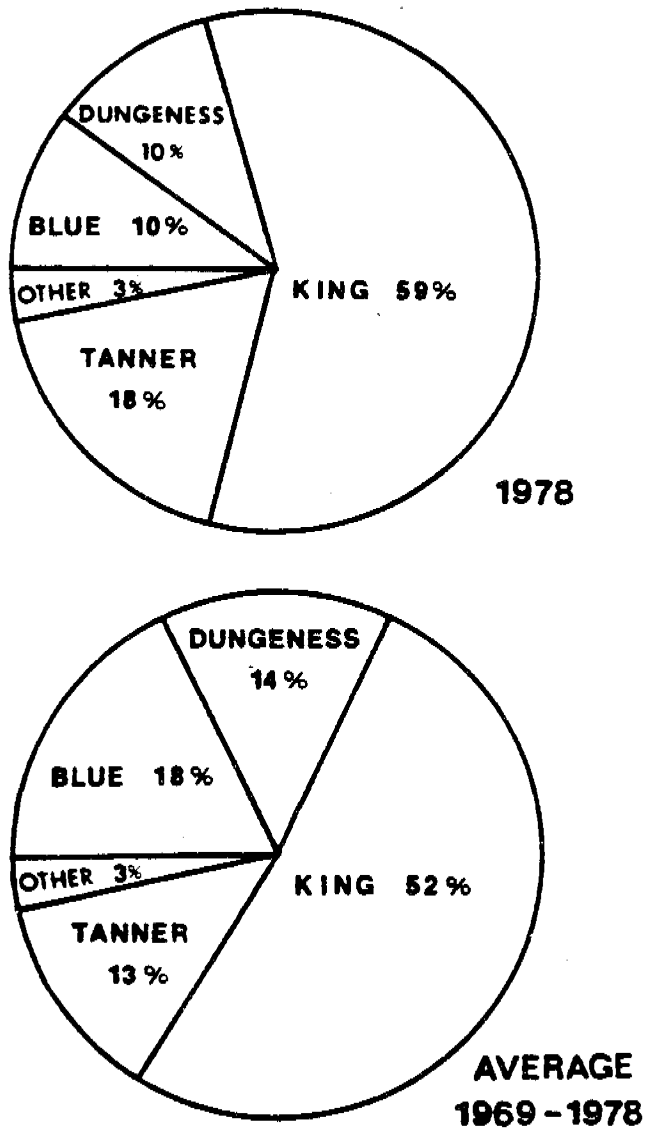


Fig. 3.5. Relative contributions of various crabs to the landed value of United States crab landings. From Otto (1981a).

Basin despite extensive sampling in that area and; 2) a paucity of samples collected along the North Aleutian Shelf where female king crab are known to aggregate prior to hatching of eggs (Fig. 3.3).

Paralithodes larvae were first found in samples collected during early April but not in the February-March collections of NOAA 1978. In all months king crab larvae are distributed in two general regions: east of the Pribilof Islands (blue king crab, *P. platypus*; Fig. 3.6) and along the North Aleutian Shelf from Unimak Pass to east of Port Moeller (red king crab, *P. camtschatica*). April abundance of blue king crab larvae never exceeded 500 larvae/1000 m^3 around the Pribilof Islands (Fig. 3.7). Red king crab larvae were abundant just north of Unimak Island during April at densities exceeding 10,000 larvae/1000 m^3. Very few specimens were found over the St. George Basin (Fig. 3.7).

Distribution and abundance of red king crab zoeae had increased appreciably by May. High densities in excess of 10,000 larvae/1000 m^3 were recorded from Unimak Island, Black Hills, and off Port Moeller at several stations (Fig. 3.8). Data clearly show a sharp decline in abundance at increasing distances from the Shelf; eg. along a 70 m isobath transect line larval density declined from 14,000/1000 m^3 near Port Moeller to less than 800 larvae/1000 m^3 in Bristol Bay (Fig. 3.8). Densities of blue king crab larvae were low around the Pribilof Islands and a few isolated areas of the St. George Basin had low (<100 larvae/1000 m^3) red king crab densities in May (Fig. 3.8).

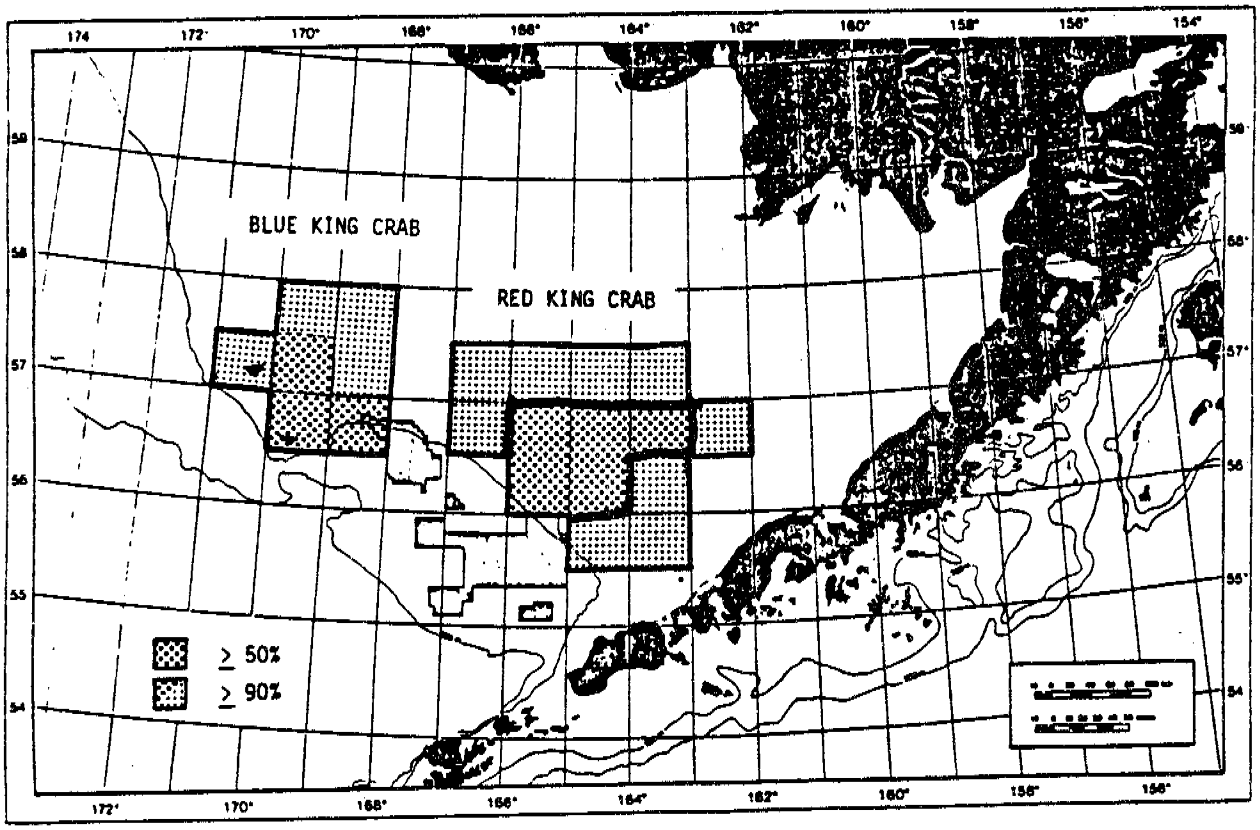


Fig. 3.6. Geographic distribution of king crab catches in 1979 and 1980 (combined), relative to proposed St. George Basin leases. (From Otto 1981b).

Patterns of distribution and abundance of larvae during June were significantly changed from the previous two months, largely due to grossly inadequate sampling of the North Aleutian Shelf where these larvae are most abundant (Fig. 3.9). Relatively low densities of larvae were found north of Unimak Pass and Island (compare Figs, 3.7 and 3.9) that never exceeded 500 larvae/1000 m^3. No samples from any years studied (1976-1980) had been collected east of False Pass during June (Fig. 3.9), and so information on larvae from Black Hills to Port Heiden is completely lacking during June and later months when any year-class is approaching metamorphosis. A composite of distribution and abundance data for all four years is given in Figure 3.10.

3.3.2 Molt Frequency

All four zoeal stages and megalopae of Paralithodes were found in samples collected from mid April to late June. The frequency of occurrence of all larval stages collected during the 1978 PROBES cruises are given in Figure 3.11. A predictable progression is shown, from predominately stage 1 zoeae in mid April to stage 2 by early May, stage 4 in early June, and stage 4 and megalopae in mid to late June. Molting occurs approximately every 3 weeks and, if megalopae require four weeks of development, metamorphosis should commence about late July (during the 1981 PROBES cruise, Leg 4, king crab megalopae were caught July 4-26). Therefore, the peak of larval abundance lasts about four months from mid April to August when the year-class metamorphoses to benthic juveniles.

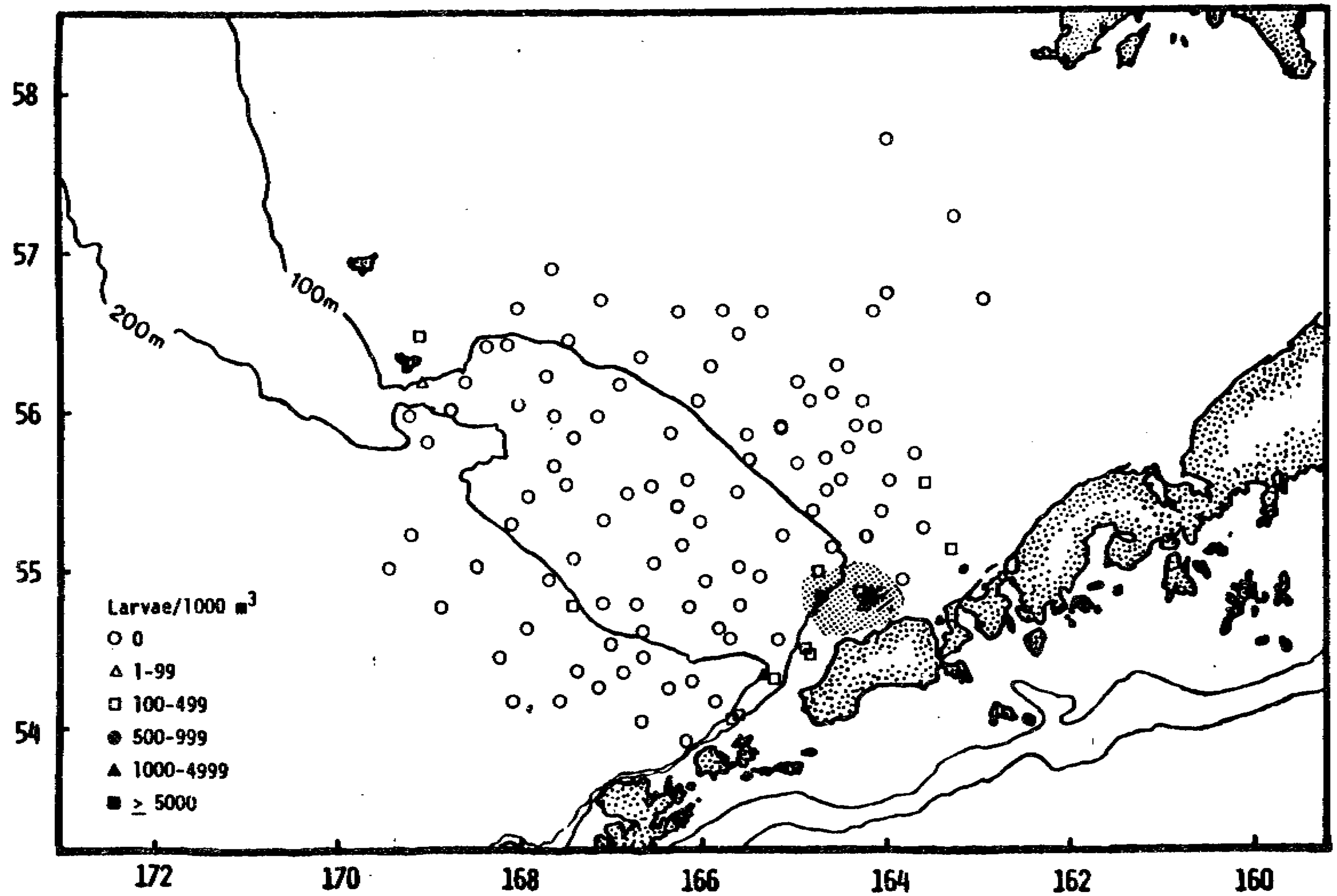


Fig. 3.7. Distribution and abundance of Paralithodes spp. for the month of April; NOAA 1977, PROBES 1978 and 1980. Note center of abundance just north of Unimak Island and distribution along the convergence of the 100 m and 200 m isobaths by Unimak Pass. Solid square with diagonal hatch are densities >10,000 larvae/1000m^3.

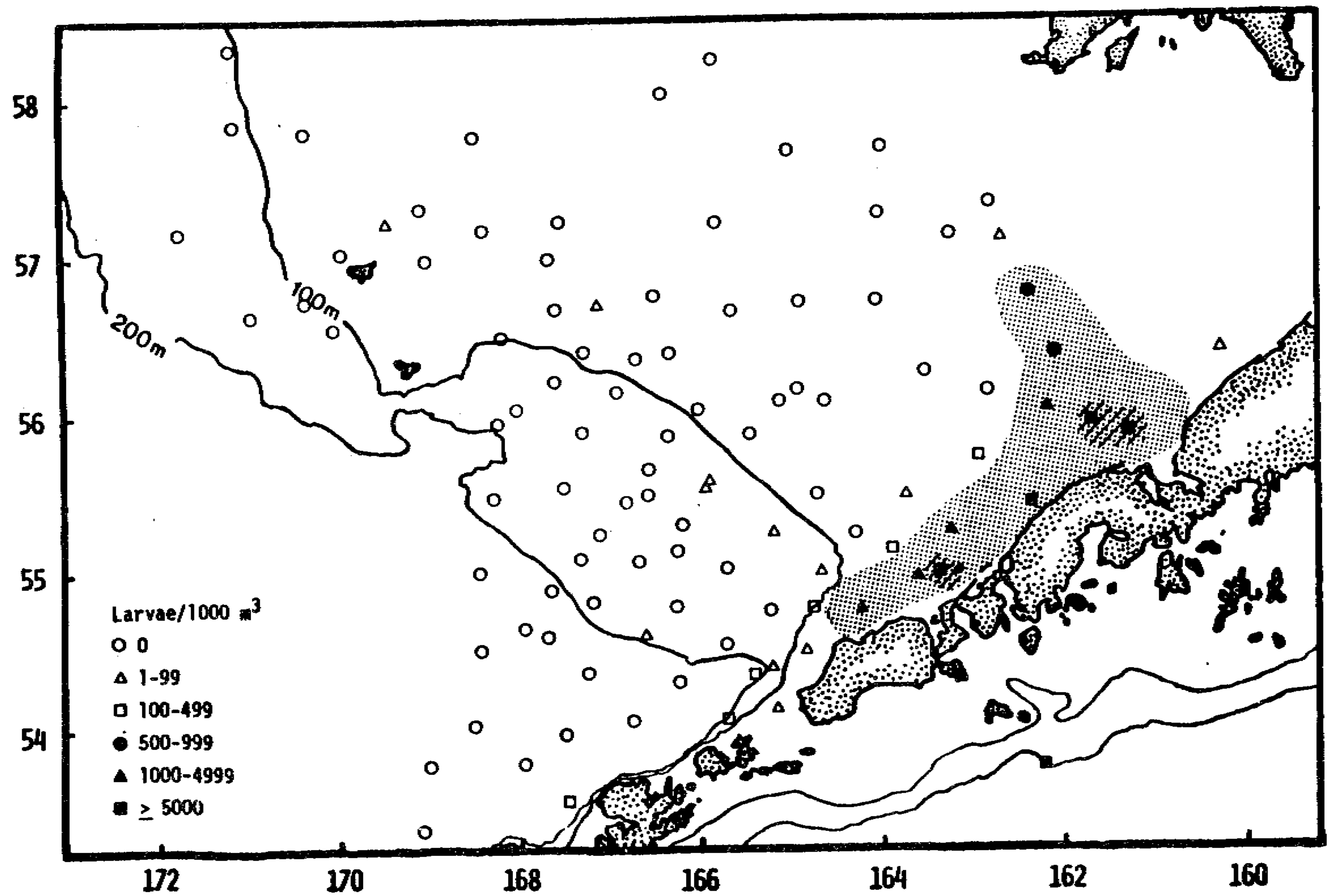


Fig. 3.8. Distribution and abundance of Paralithodes spp. for the month of May; NOAA 1976 and 1977, PROBES 1978 and 1980. Solid squares with diagonal hatch are densities > 10,000 larvae/1000m^3.

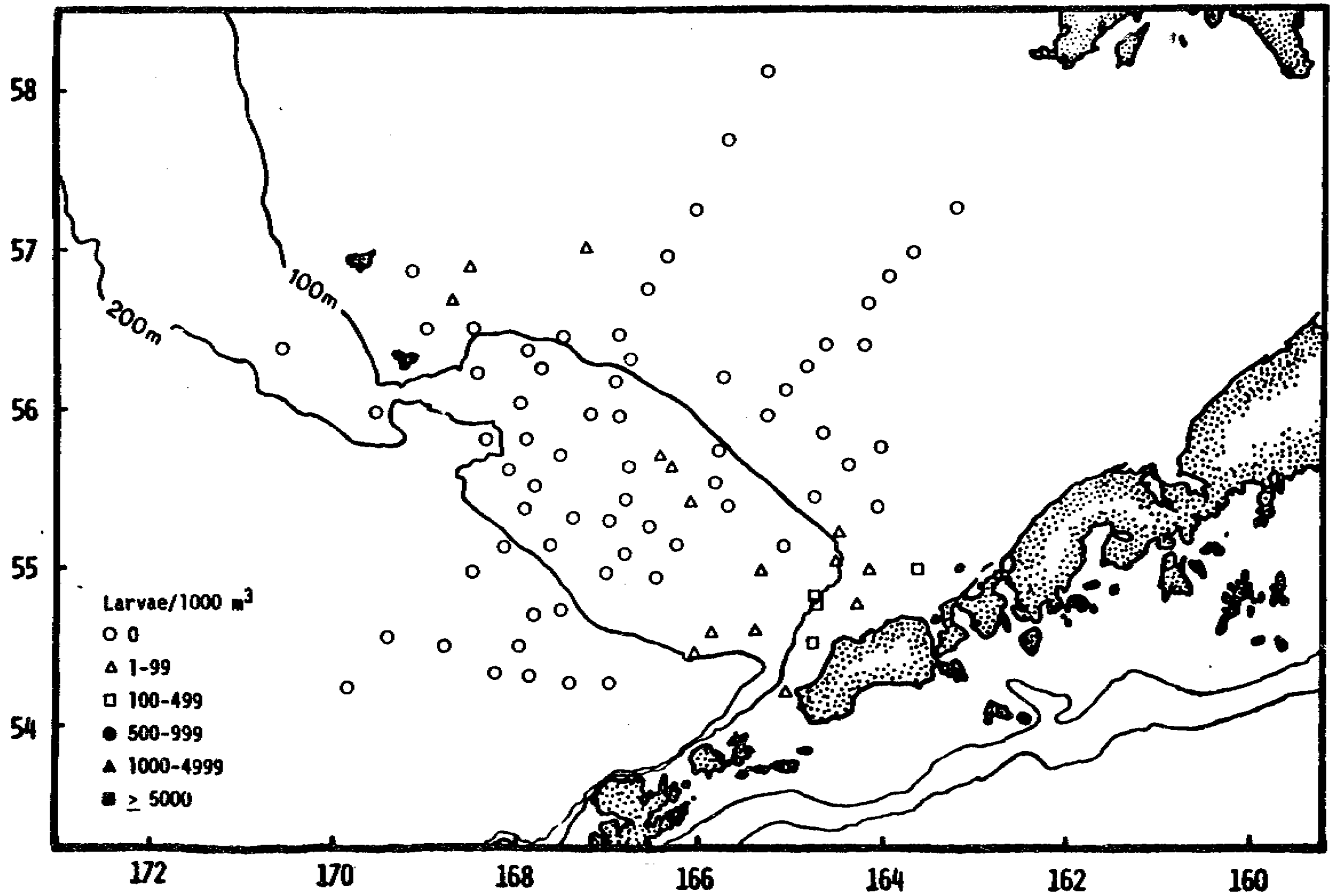


Fig. 3.9. Distribution and abundance of *Paralithodes* spp. for the month of June; NOAA 1979, PROBES 1978 and 1980. Note reduced density north of Unimak Island and lack of samples east of False Pass.

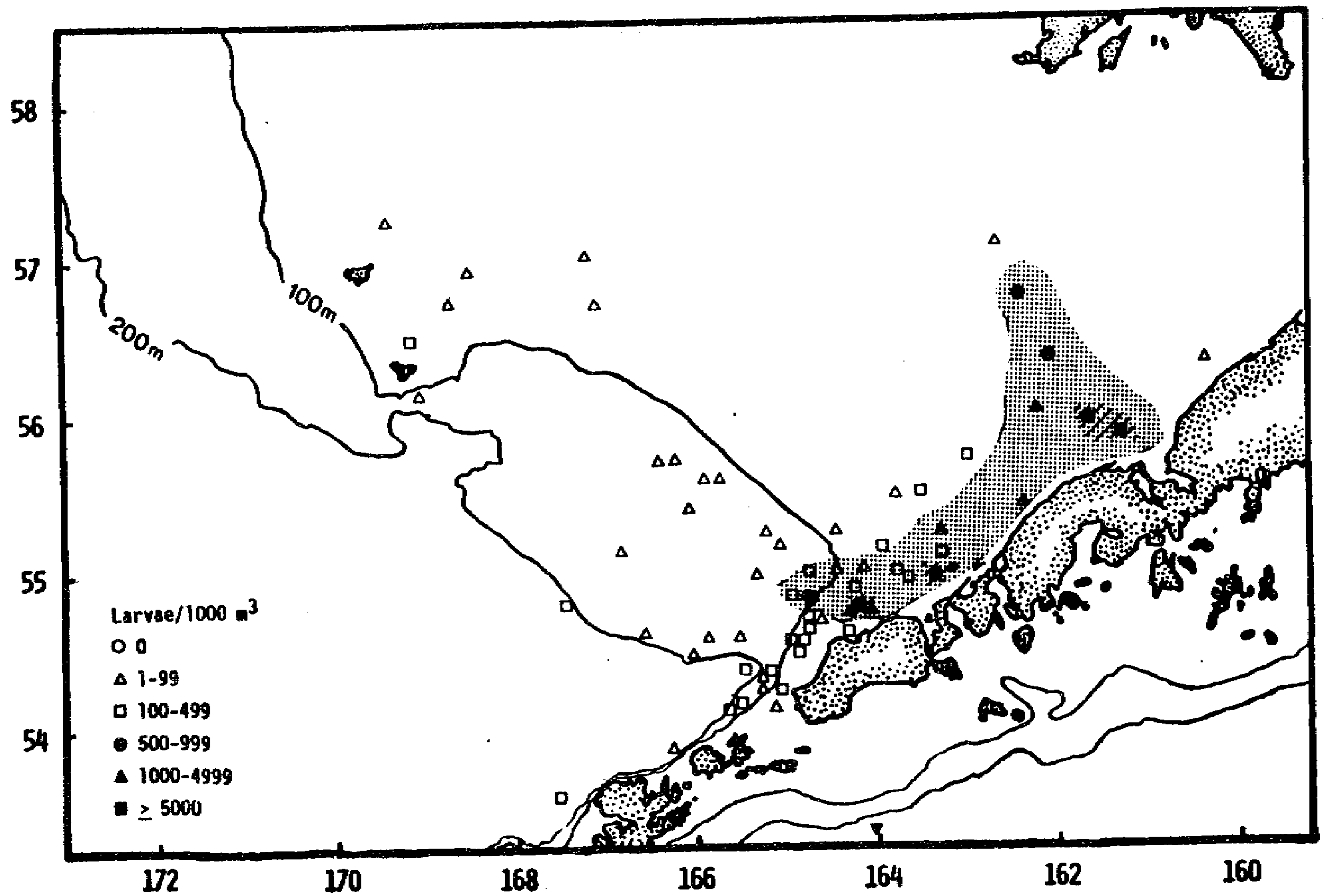


Fig. 3.10. Distribution and abundance of Paralithodes spp. all cruises all years (1976-1980). Stations where no larvae were found are omitted but shown in Figs. 3.7-3.9.

3.4 Discussion

3.4.1 Hatching Period

Both *P. camtschatica* and *P. platypus* begin to hatch in early to mid April as seen in Figure 3.7. This agrees with data gathered by Japanese investigators (INPFC 1965) which showed that 20% of female red king crab sampled in early April 1963 had empty eggs. Haynes (1974) first found larvae during samples collected in April 1969 and 1970, but Takeuchi (1962) reported that only 17% of females collected in early May 1960 carried empty egg cases. Therefore, commencement of hatching may vary by three to four weeks between years.

Synchrony of hatch seems to be rather close within the major female populations inhabiting the North Aleutian Shelf which are centered just north of Unimak Island and off Port Moller (Stinson 1975; Pereyra et al 1976; Figs. 3.3 and 3.4). Females repeatedly sampled in a general area such as Port Moller all release larvae within a three to four week period. A relatively concerted hatch-out period is also indicated by the frequency of occurrence of zoeal stages in the plankton. Discrete peaks of stage 1 zoeae, for example, are found and then followed by a preponderance of stage 2 some three to four weeks later (Haynes 1974; Fig. 3.11 this report). Whether discrete populations of females hatch larvae in different months is not well substantiated but is suggested by data of Korolev (1968).

3.4.2 Distribution and Abundance

Nearshore areas of the North Aleutian Shelf and the Pribilof Islands are unquestionably the areas of greatest larval residence and

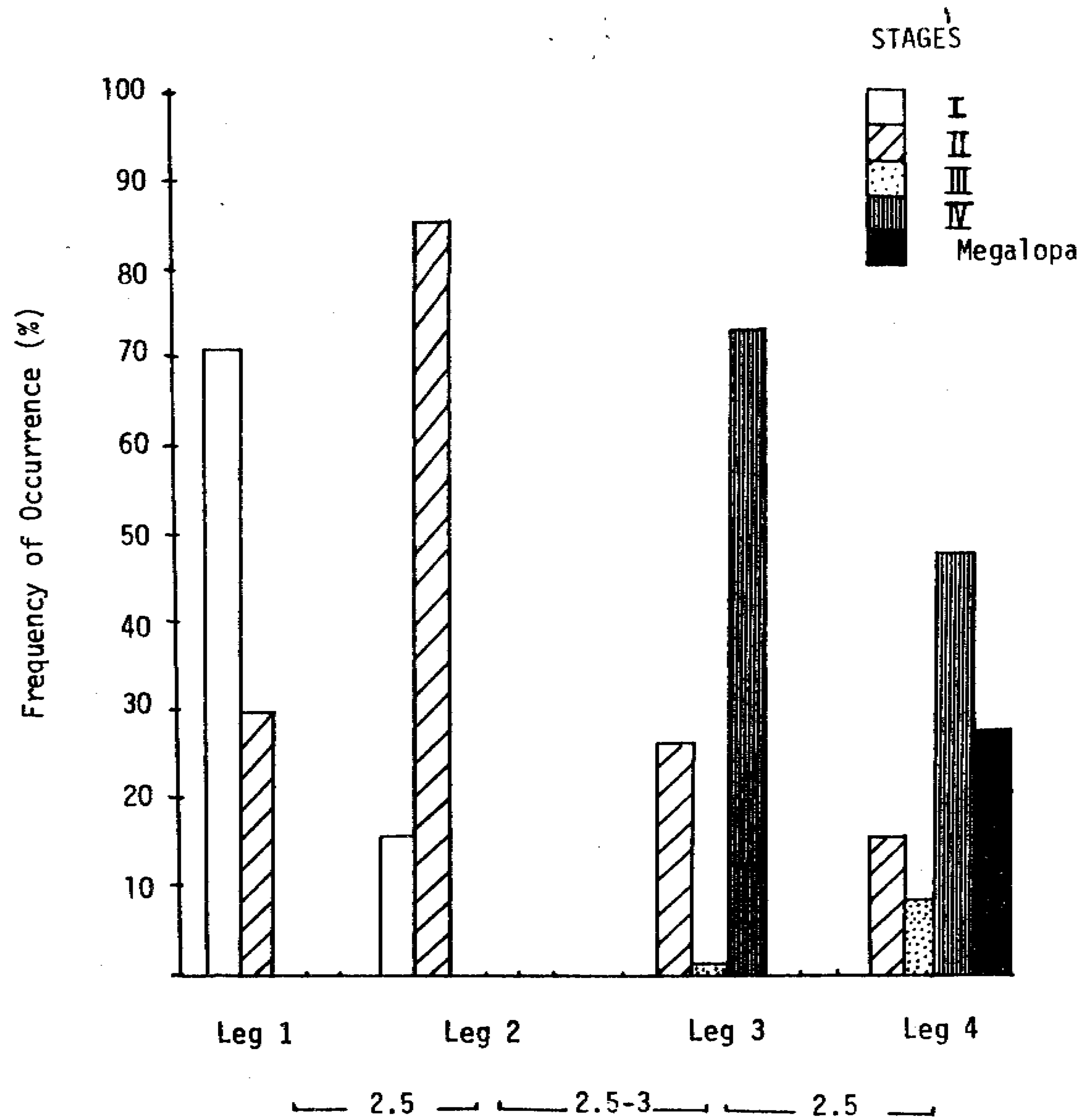


Fig. 3.11. Frequency of occurrence of Paralithodes spp. larval stages collected during four legs of the 1978 PROBES cruises. The number of weeks between mid-points of legs are shown along the bottom axis and serve as an approximate guage of molt frequency.

development for red and blue king crab, respectively (Figs. 3.7-3.10; Takeuchi 1962; Haynes 1974). Haynes is the only other study of king crab larvae over a wide area of the S. E. Bering Sea, and in several respects his findings are in close agreement with ours. Larvae first hatch in early April just north of Unimak Island and through May become widely distributed northeast to Port Moller (and beyond to Port Heiden based on Haynes' samples, 1974). Increased distribution may be due to dispersion by currents (Hebard 1959) and/or by later hatch from Amak Island and Port Moller female populations.

By June larval king crab abundance near Unimak Island has declined substantially and our own data set does not provide information on zoeae from Port Moller to Port Heiden. Haynes (1974) shows a progressive shift of larvae to the northeast along the shelf in June through mid July, and relatively high abundance in upper Bristol Bay. Unfortunately his data set like ours does not cover large areas of the North Aleutian Shelf for weeks at a time. He does show, however, larvae still in high abundance in early July but all metamorphosed by July 16 in the years 1969-70. Figure 3.8 of this report indicates that relatively high densities of larvae occur over 100 kilometers off of Port Moller into Bristol Bay in support of Haynes findings. Unlike his results though, we found significantly fewer larvae beyond 30-50 km off shore and virtually none over St. George Basin. (Our data on densities cannot be compared directly to that of Haynes since he presents results as number of larvae per tow rather than number per 1000 m^3 as in this report).

3.5 Summary

Based on the data of this and other reports the following conclusions regarding *Paralithodes* larvae can be drawn:

1. Hatching first occurs in early April off Unimak Island followed shortly by hatch along the North Aleutian Shelf to Port Heiden, and localized distribution also occurs around the Pribilof Islands.

2. High larval densities are those in excess of 800-1000/1000 m^3 and may be as great as 15,000 larvae/1000 m^3. Such abundance during May extends from Unimak Island east to Port Moller.

3. Densities decline in June around Unimak Island but remain high off Port Moller.

4. Molt frequency data indicate that larval *Paralithodes* molt every three weeks and should metamorphose to the benthos by late July. Larvae are therefore present in the water column about 4 months.

5. Poorly studied but potentially crucial regions of larval development and metamorphosis to the benthos are between Port Moller and Port Heiden along the North Aleutian Shelf, and farther offshore in Bristol Bay.

6. Areas of greatest larval abundance correspond closely to the benthic distribution of large populations of sexually mature females.

4.0 DISTRIBUTION AND ABUNDANCE OF TANNER CRAB LARVAE IN THE S.E. BERING SEA

Lewis Incze

4.1 Introduction

Tanner crabs are Brachyuran crabs of the genus *Chionoecetes* (Family Majidae). In the southeastern Bering Sea (SEBS) *Chionoecetes bairdi*, *C. opilio* (both numerous) and unknown munbers of *C. angulatus* and *C. tanneri* occur (Garth 1958; Somerton 1981). The latter two species are deepwater organisms inhabiting slope water generally more than 300-400 m deep. These crabs are small, are of no commercial interest, and probably have an exceedingly small role in the benthic and pelagic shelf sea environment. On the other hand, adult *C. bairdi* and *C. opilio* are large organisms which occur over a large portion of the southeastern Bering Sea shelf from 50-200m; they are the target of a large commercial fishery and they are dominant organisms in the benthic ecosystem. This section will examine the life history of these two Tanner crab species with emphasis on the pelagic larval phase. Of particular concern is the definition of spatial and temporal patterns of larval abundance for the two species. Special effort is devoted to assessing the degree of interannual regularity of these patterns.

4.2 Description of the Fishery and Stocks

Prior to 1964 the catch of Tanner crab was only incidental to the king crab catch of Japanese and Russian fishermen. After 1964, however, U. S. restrictions on foreign harvest of declining king crab stocks encouraged exploitation of Tanner crabs as a substitute. The initial fishery was based exclusively on *C. bairdi* because of its larger size and more desirable flesh consistency, but by 1969 the directed harvest of this species had increased to the level where fishing quotas appeared necessary. As a result of restrictions imposed by the U.S., foreign vessels began harvest of C. opilio, a smaller animal which occurs in greater numbers and over a wider geographic area than its congener.

As total landings of Tanner crab from the EBS increased (from 12 to 24 million crabs from 1967 to 1970), so did American interest in the fishery. Through a series of unilateral (U.S.) harvest quotas and bilateral agreements, foreign participation in the EBS Tanner crab fishery was gradually reduced and forced north and west. Today, all Tanner crab fishing in the SEBS (except for by-catch) is conducted aboard American vessels (154 vessels in 1979-80) and is directed at both C. bairdi and C. opilio. Landings from this region have steadily increased since 1975 and totaled more than 74 million pounds (40.4 million crabs) during the 1979-80 fishing season (November-September, Fig. 4.1). Landings of C. opilo exceeded those of C. bairdi by almost 3 million pounds during this period, though C. opilio continues to command a considerable lower ex-vessel price (Table 4.1).

EBS stocks of Tanner crabs have been assessed by annual trawl surveys conducted by the National Marine Fisheries Service (NMFS) since the early 1970's. In addition, an extensive, joint NMFS-OCSEAP survey was conducted in the EBS in summer 1975 and reported by Pereyra et al. (1976). Two of the sub-areas defined in the NMFS-OCSEAP survey are of particular interest. Sub-areas 2 (Fig. 4.2) contains nearly all of the St. George Basin and Sub-area 1 (Fig. 4.2) contains the proposed oil

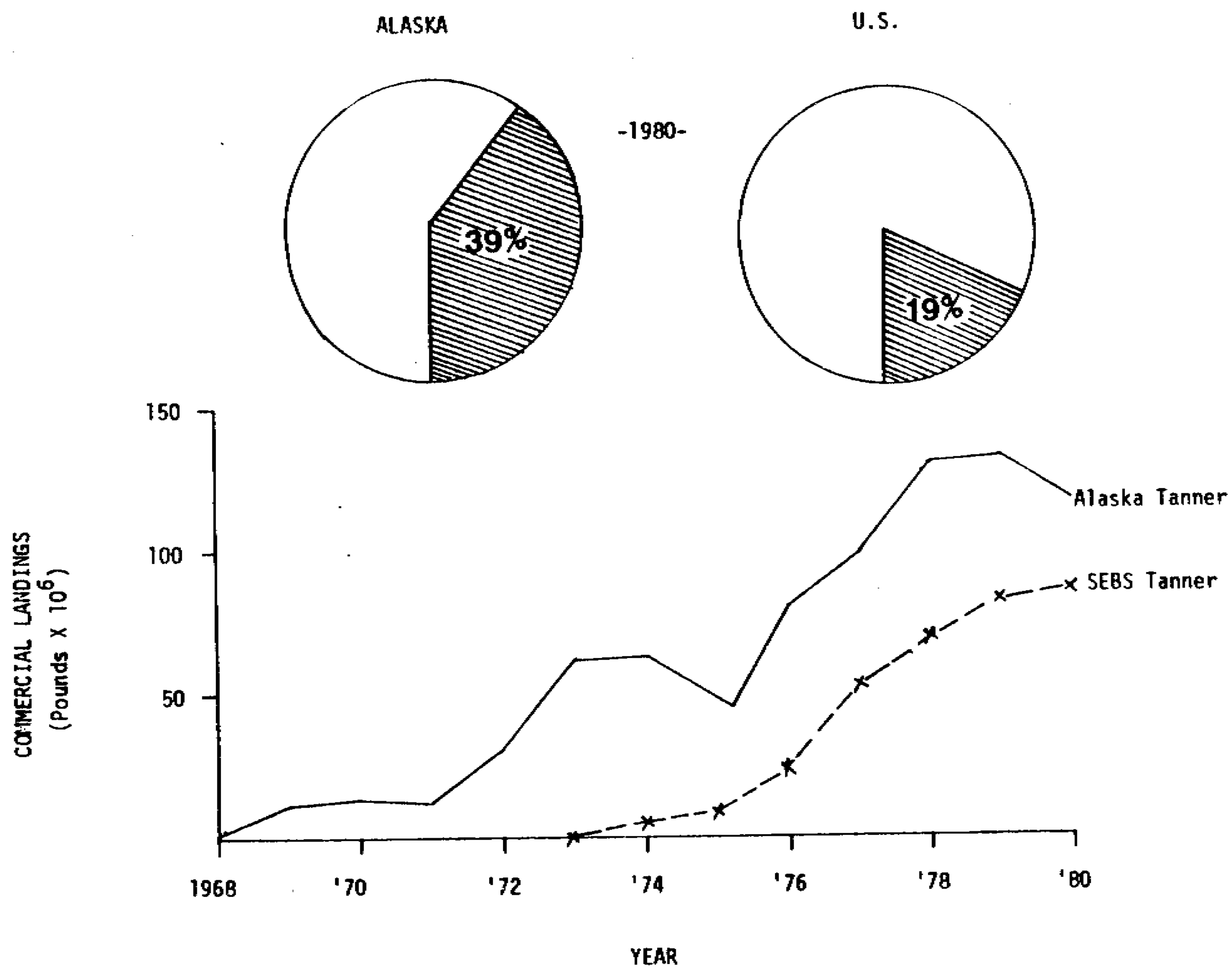


Fig. 4.1. Commercial landings of Tanner crabs from the southeastern Bering Sea (SEBS) compared to total commercial catch for Alaska, 1968-1980 (lower). Pie diagrams show Alaska tanner crab landings as a percentage of total Alaska and total U.S. commercial crab landings for all species combined for 1980. [Compiled from data of Eaton (1980), Fisheries of the United States, 1980 (1981) and Pacific Packers Report, Spring 1981 (1981)].

Table 4.1. Historic U.S. Tanner crab catch in the eastern Bering Sea, 1968-1980 (From Eaton, 1980).

Year	Number of Vessels*	Number of Landings	Number of Crab	Number of Pounds	Number of Pot Lifts	Average Weight	Average Crab Per Pot	Price Per Pound
1968		7	6,408	17,858	1,426	2.8	5	
1969		131	353,273	1,008,898	29,851	2.9	12	
1970		66	482,307	1,410,721	16,372	2.9	29	
1971		22	61,347	166,058	7,343	2.7	8	
1972		30	42,561	119,170	6,728	2.8	6	
1973		45	132,941	301,868	16,530	2.3	8	
1974	18	69	2,531,825	5,044,197	22,014	2.0	115	
1975	27	80	2,773,770	7,028,378	38,462	2.5	72	.13
1976	66	305	8,949,886	22,341,475	141,179	2.5	63	.19
1977	83	580	20,412,566	51,876,235	305,052	2.5	67	.30
1978								
C.bairdi	119	823	26,188,543	66,228,040	508,776	2.5	51	.38
C.opilio	15*	38	1,267,196	1,716,249	13,177	1.3	96	.30
TOTAL		861	27,455,739	67,944,289	521,953	2.5	53	
1979								
C.bairdi	138	801	16,711,455	42,518,233	393,788	2.5	42	.52
C.opilio	101*	490	22,118,498	32,187,039	190,746	1.5	116	.30
TOTAL		1,291	38,829,953	74,705,272	584,534	1.9	66	N/A
1980								
C.bairdi	154	804	14,739,611	36,614,315	488,434	2.5	30	.52
C.opilio	141*	603	25,706,262	39,538,896	272,065	1.5	94	.21
TOTAL		1,407	40,445,873	76,153,211	760,499	1.9	53	N/A

*Vessels landing C. opilio also have C. bairdi, so the total number of vessels participating in the EBS Tanner crab fishery is equal to the number landing C. bairdi for 1978-1980.

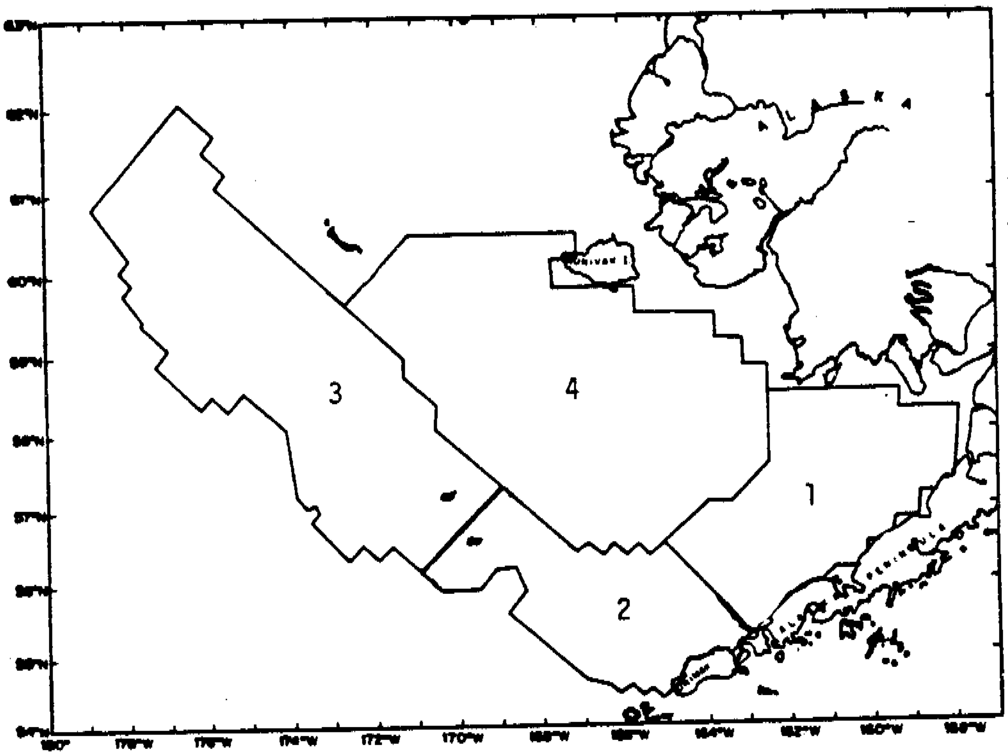
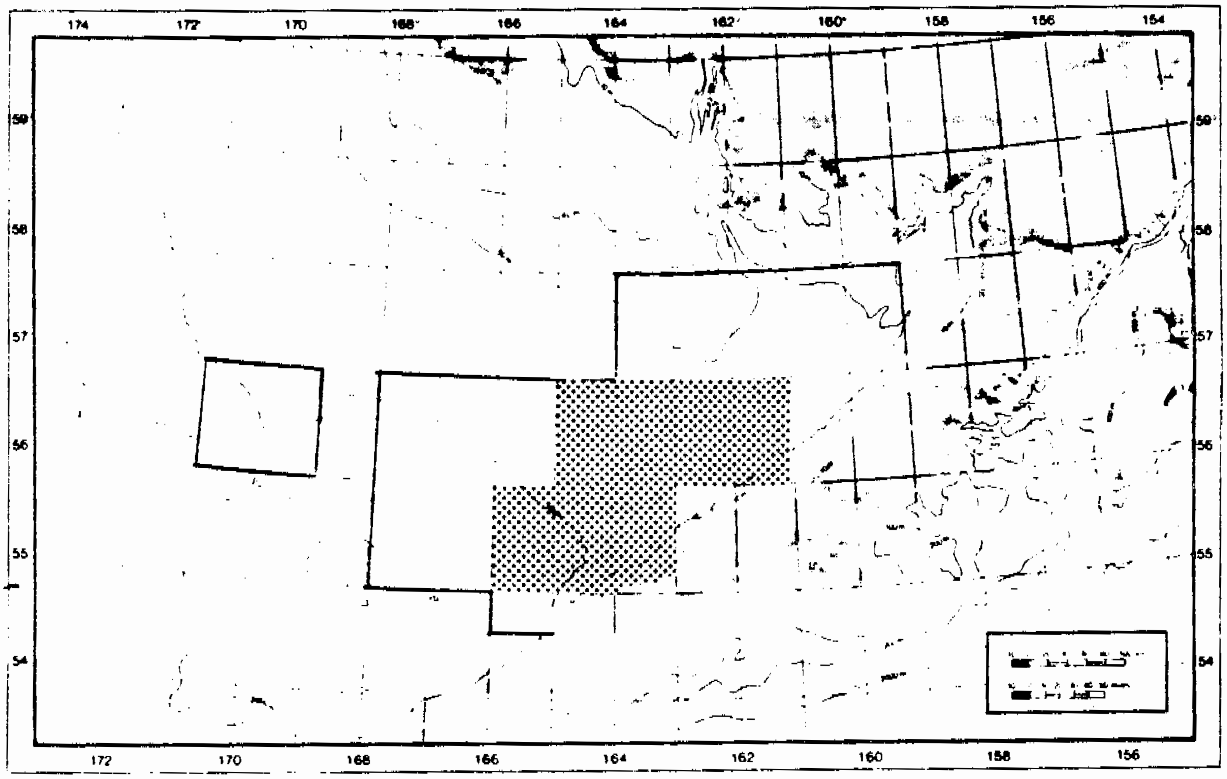


Fig. 4.2. Sub-areas defined for the NMFS/OCS-BLM benthic faunal resource survey of 1975 (from Pereyra _et al._, 1976). Areas 1 and 2 contain large stocks of commercial Tanner crabs.

lease areas of the North Aleutian Shelf. Both areas contain large stocks of Tanner crab (Pereyra et al. 1976:326, 331) and are the principal focus of recent commercial fishing efforts (Fig. 4.3). The prognosis is for a continued high yield from the fishery when both species are considered together (Otto 1981).

The fishery for Tanner crabs is managed for the harvest of males only. For *C. bairdi*, the lower legal size limit is 139 mm (5.5 inches) across the widest portion of the carapace (carapace spines not included). No size limit is in effect for male *C. opilio*. The average landed Tanner crab of the two species was 2.5 and 1.5 pounds, respectively, for the past fishing season, with mean carapace widths (CW) of 151.3 and 118 mm (Eaton 1980). The catch per unit effort (CPUE) for *C. bairdi* was 30 crabs per trap in 1975-80 (down from 42 crabs per trap the preceding season). The total landings of *C. bairdi* were down by nearly 6 million pounds (approximately 2 million crabs), and this seems largely attributable to a substantial decline in catch from the Pribilof region (from 13 million pounmds in 1978 to less than 1 million pounds in 1980). There were 154 vessels involved in the 1979-80 *C. bairdi* fishery.

CPUE for *C. opilio* was 94 crabs per trap in 1979-80 and the harvest exceeded that of the previous season by 7 million pounds. The 1979-80 *C. opilio* catch was harvested by 141 vessels. The number of vessels involved in the American Tanner crab fishery has shown a steady increase since 1974 (Table 4.1). Primary landing ports for Tanner crab caught in the SEBS are Dutch Harbor and Akutan. Otto (1981) provides a more detailed history of the Tanner crab fishery of this region.



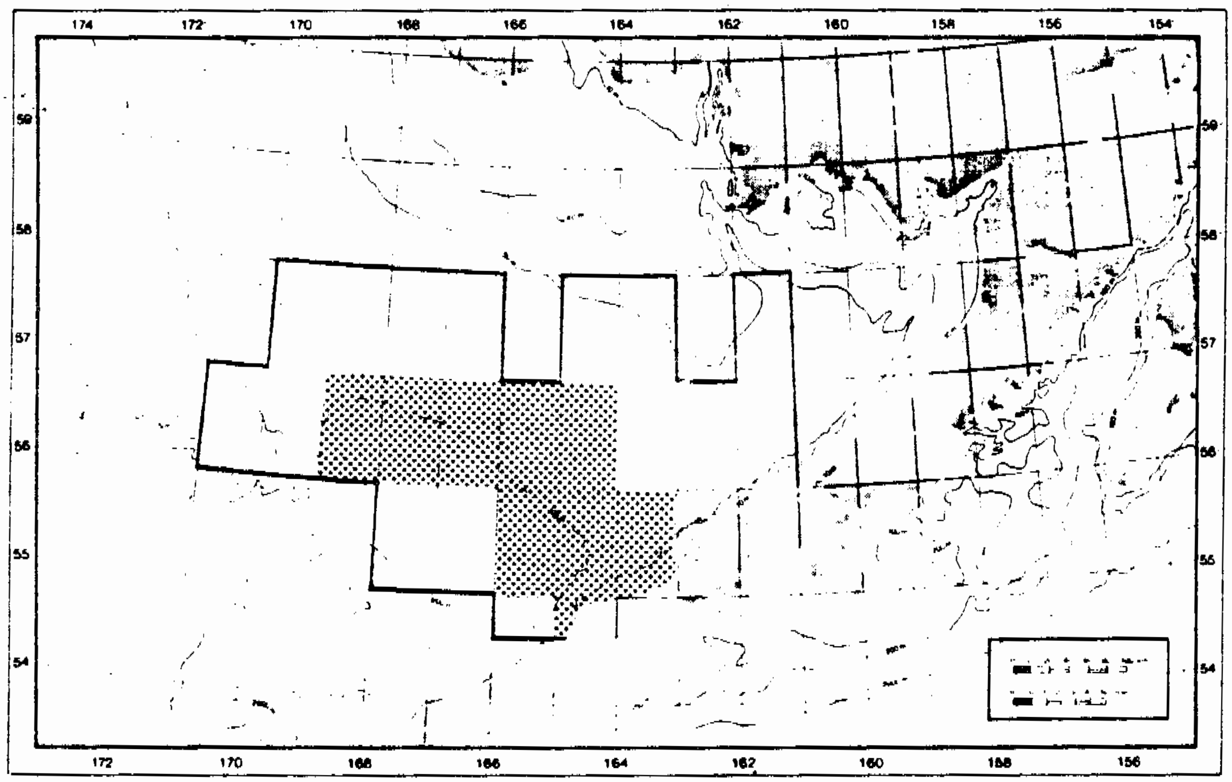


Fig. 4.3. Principal areas of 1980 Tanner crab catch in the southeastern Bering Sea, Chionoecetes bairdi (upper) and C. opilio (lower). Shaded areas yielded 1 x 10^6 pounds or more. (After Eaton, 1980).

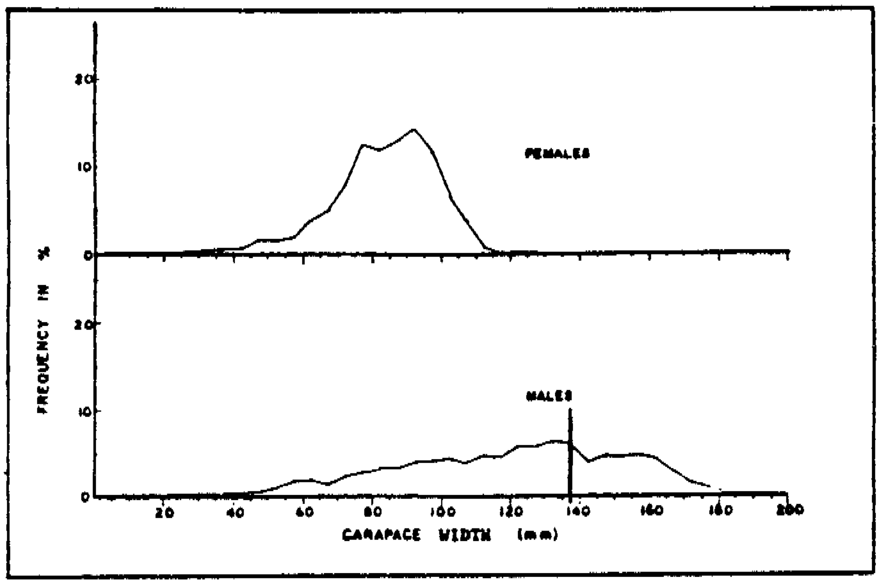
4.3 Life History and General Biology

4.3.1 Sexual Maturity in Adults

Sexual demorphisms in the Tanner crabs include a distinct difference in size after maturity, resulting from a terminal "puberty" molt of the female (Hilsinger 1976). In addition, there is a distinct interspecific difference in the adult size of each sex (Fig. 4.4). Since females undergo a terminal molt at maturity, the approximate size of reproductively capable females can be estimated by inspection of the size-frequency distributions illustrated in Figure 4.4.

The size at 50% maturity (size at which 50% of the specimens are sexually mature) in female C. bairdi from the Gulf of Alaska is reported to be 83 mm CW. The molt to maturity in the remaining females, when fitted with the growth model of Somerton (1978), would result in a mean CW of 97 mm (Donaldson et al. 1980). This projection fits reasonably well with the data for upper size limit of female C. bairdi from the SEBS.

Donaldson et al. (1980) report that the molt to maturity in males of this species occurs at approximately 90 mm, producing a mature male of approximately 112 mm CW. The lower size limit for legal harvest (139 mm CW) virtually assures that most of the males live through at least one reproductive season before attaining commercial legal size. The age of legal size male C. bairdi is generally 6-7 years (Donaldson et al. 1980). Sexual maturity in C. opilio is reached at approximately 50 mm CW in the females (Watson 1970; Jewett 1981) and 57 mm CW in males (Watson 1970).



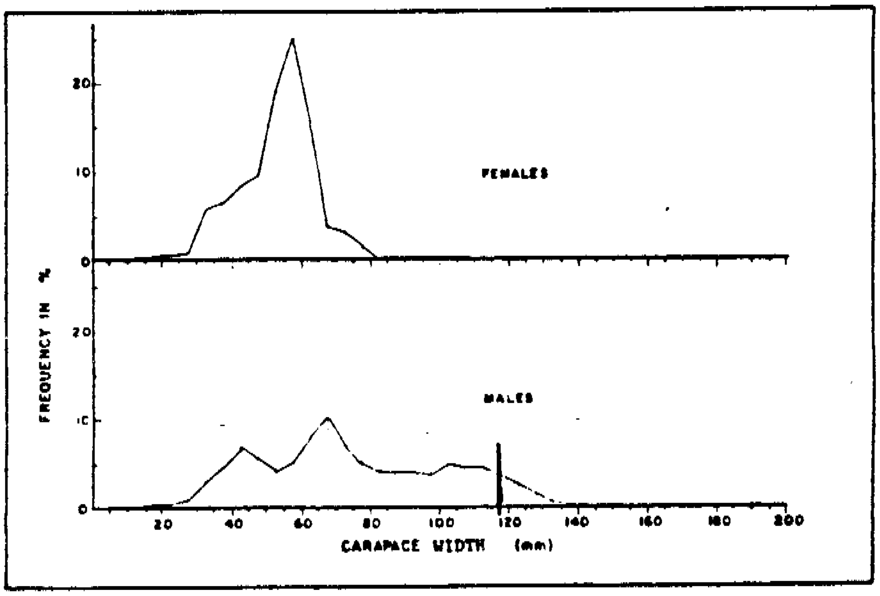


Fig. 4.4. Size-frequency (carapace width) distribution of _Chionoecetes bairdi_ (upper) and _C. opilio_ (lower) males and females. Legal size for commercial _C. bairdi_ and currently-harvested (1979-80 season) mean size (no legal limit in effect) for _C. opilio_ are shown. [Size-frequency data from Pereyra _et al_. (1976) and carapace width data from Eaton (1980)].

Within each species, growth rates for each sex appear similar up to the size of female reproductive maturity, after which only the males grow. The females of both species reach sexual maturity at about 5 years of age (*cf*. Donaldson 1980: Table 4; and Adams 1979: Table 11). The mean age of *C. opilio* landed in the 1979-80 fishing season is probably greater than for *C. bairdi* by a few years (using growth data of Watson 1970, tabulated in Adams 1979).

4.3.2 Reproduction and Larval Life History

Studies of reproduction and the occurrence of larval stages of *C. opilio* have been conducted in Japanese waters (Ito 1963, 1968; Fukatake 1969; Ito and Ikehara 1971; Kurata 1963), in the Okhotsk Sea (Kurata 1963) and in the Gulf of St. Lawrence (Watson 1972: reproductive status in adults only), but the conclusions of the various investigations differ with respect to the implied temporal patterns of reproduction and larval development. This is not surprising given environmental differences between the regions, but the lack of clear environmental correlates indicates that the data cannot be confidently used to predict patterns in the EBS. Studies of reproduction (Hilsinger 1976; Donaldson et al. 1980; English 1978) and limited information on the larvae of *C. bairdi* from the Gulf of Alaska (Kendall et al. 1980) provide the nearest geographical comparison for EBS populations of this species. However, since the EBS prepresents the northern extent of *C. bairdi* populations, environmental effects on temporal aspects of larval development and on survival and recruitment of these larvae may be significant. The currently knowledge of hatching times for *C. opilio* is provided by Adams (1979: Table 4).

The general pattern in _C. opilio_ and _C. bairdi_ is for a spring hatch of larvae (April, May, June) from a mature egg mass attached to pleopods on the ventral surface of the curved adult female abdomen. Extrusion of the new egg mass and fertilization from stored sperm generally follows within days, and these eggs are carried externally by the female until they complete development and hatch roughly one year later. Various aspects of the reproductive biology of the Tanner crabs are discussed in detail by Watson (1972), Hilsinger (1976) and others.

Mature female _C. opilio_ are quite fecund with respect to both the number of eggs per individual (5,500 to 150,000: Adams 1979) and the frequency of berried (gravid) mature individuals (Powles 1966; Ito 1967; Watson 1969). Karinen et al. (1976) report a mean number of 36,273 eggs per individual (1800 crabs examined), but point out that the females were primiparous spawners and might yield a higher egg count in subsequent reproductive seasons. Mature female _C. bairdi_ carry an average of 769,000 eggs after extrusion and 133,000 eggs before hatching, implying a natural loss rate of aproximately 20% (Hilsinger 1976).

In general, the temperate majid crabs have long pelagic larval phases compared to most Brachyura (Ito 1967). All majid larvae go through two zoeal stages and a megalops stage. In addition, the larvae may hatch from the egg mass as prezoeae covered with an embryonic cuticle, but this stage is typically very brief. _Chionoecetes opilio_ and _C. bairdi_ both emerge as prezoeae (approximately 2.5 mm length) and molt to stage I (SI) zoeae generally within an hour (Kon 1967, 1970; Kuwatani et al. 1971; Haynes 1973).

Although there is considerable variation in the estimates of various investigators (Adams 1979; Table 9), most agree that, in nature, the larvae of *C. opilio* exist for approximately one month each as SI and SII zoeae and one month as megalops larva. Differences in the estimates appear related to differences in the method of determination (observations of the plankton *vs.* laboratory-raising) and differences in water temperature (laboratory).

Kon (1970) raised groups of SI zoeae at various temperatures from 4.1 to 19.8°C. Zoeae did not molt to SII at the highest temperature (>12.9°C) and were only marginally successful at the lowest (<4.1°C). The number of days required for molting in the successful groups held at temperature ranges between these extremes ranged from 10 to 53, with decreased time at the higher temperatures. Stage II zoeae molted to megalops after 11-61 days, with greatest molting success (53-60%) in water from 7.1-10.7°C. Within this range, the shortest SII duration occurred at the highest temperatures. For both zoeal stages in the laboratory, then, the intermolt period was considerably shortened by warmer temperatures within an acceptable range. A similar relationship was not found for the megalops stage in Kon's experiment, however. The intermolt period for megalops larvae held at three temperature ranges from 8.5°C to 17.4°C varied by only four days, from 26-30.

Field observations of the larval stages in Japanese waters indicate periods as brief as 19-20 days each for SI and SII and 27 days for megalops larvae (Kon 1970), but most estimates based on plankton samples fall in the range of 25-30 days each for SI and SII (Yamahora 1966;

Fukataki 1969; Fukiu Pref. Mar. Exp. Sta. 1969). The longevity of the megalops appears the most variable, with observation in the plankton up to 6 months after initial appearance of this stage (Fukataki 1969). Prolongation of the megalops stage is also indicated by examination of the stomachs of salmonid (Fukataki 1965, 1969) and zoarcid (Ito 1970) fish. Similar observations of *C. opilio* larvae from North American waters or of *C. bairdi* larvae have not been made.

The depth distribution of *Chionoecetes* larvae from Japanese waters has not been studied in much detail, although the data of Ito and Ikehara (1971) suggest that SI and SII zoeae were primarily in the upper 75 m (mostly between 10-50 m) and that the concentration of megalops larvae tended to increase with depth to 75 m. Their data on diurnal vertical migraiton (DVM) is somewhat equivocal, but it is noteworthy that measurable surface concentrations of any of the stages (I, II and M) were found only at night.

For *C. bairdi*, plankton data from the Kodiak shelf (Kendall et al. 1980) show a pronounced vertical migration of larvae of *C. bairdi*, but in almost all cases illustrated, the direction is the reverse of the normal pattern, i.e., *Chionoecetes* larvae were found in greatest concentrations nearer the surface during the day and deeper at night. The depths of major concentration varied, but daytime maxima at 30-50 m were common, with nighttime maxima at 50, 70 or 90 m.

The megalops larva molts to the first (benthic) crab stage shortly before or after it descents to the bottom.

4.3.3 Juvenile Growth

The first 2-3 instar molts (from Instar I to III or IV) occur within the first year on the bottom of *C. opilio* in Japanese waters (Kon 1969; Ito 1970). The following 1 or 2 molts occur approximately 6 months apart, and subsequent molts occur at yearly intervals (Ito 1970) or occasionally two-year intervals for the adults (Kon 1970; Donaldson 1980). Growth of early juveniles and adults is similar for *C. opilio* from the Gulf of St. Lawrence (Watson 1969). Molting frequency of early instars of *C. bairdi* appears higher than *C. opilio* (*cf.* Donaldson et al. 1980, and Adams 1979), but the molting patterns otherwise appear similar (Donaldson et al. 1980).

4.4 Materials and Methods: Taxonomy

The taxonomy of the two *Chionoecetes* species of interest is problematic and has demanded nearly full-time attention from one of the authors (DW). Because the two species are clearly two different fisheries resources with potentially different larval dynamics (corroborated by our findings to date), the effort is entirely needed. A discussion of the criteria employed in the taxonomic categorization of *Chionoecetes* larvae in this study follows.

Larvae of the genus *Chionoecetes* can be separated from those of other genera following the descriptions of Haynes (1973, 1981), Hart (1960), Kurata (1963a) and Makarov (1966). However, larvae of *Chionoecetes bairdi* and *C. opilio* are nearly indistinguishable by appearance, and separation of these two species of zoeae found in southeastern Bering Sea plankton samples is a difficult and time-consuming task.

Definitive species identification is frequently not possible, despite fairly detailed descriptions available in the literature (Haynes 1973, 1981; Motoh 1973). At least two factors contribute to this situation: 1) morphological characteristics considered diagnostic for the two species are subtle and may exhibit considerable intraspecific morphometric variability; and 2) interspecific mating is apparently common (Pereyra et al. 1976), and the resulting larvae may possess as yet undetermined combinations of dominant characteristics.

Haynes (1973) examined SI zoeae of C. bairdi and C. opilio hatched from gravid females collected north of the Alaska Peninsula (55°22' N. Lat., 164°37' W. Long.) and found that they differed primarily in the length of abdominal spines. According to Haynes' observations, the posterior lateral spines (PLS) on the third and fourth abdominal somites of C. bairdi are longer than those of C. opilio, extending past the posterior margin of the respective somites in C. bairdi, but failing to do so on specimens of C. opilio.

However the PLS-somite length relationships of SI zoeae of Chionoecetes spp. collected in the southeastern Bering Sea do not fall so clearly into one category or the other (an observation also reported by Karen Anderson of the NMFS laboratory at Kodiak, Alaska). Furthermore, examination of the relative length of the PLS of Cook Inlet C. bairdi SI zoeae (borrowed from the University of Washington Oceanography laboratory reference collection) revealed considerable variability even for specimens from an area where the potential complication of interspecific breeding should not exist. Therefore, the difficulty encountered in basing definitive species identification of Bering Sea Chionoecetes larvae on this one diagnostic feature should not be surprising.

Other morphological characteristics were introduced in a later paper by Haynes (1981) in which he discusses both zoeal stages of C. bairdi and the second stage of C. opilio. In this paper Haynes examined specimens of C. opilio sent to him from Japan and reported:

> "For both stages, zoeae of C.bairdi are morphologically identical with zoeae of C. opilio from Hokkaido and the Sea of Japan, except for length of the curved lateral processes on the third abdominal somite [these are not the PLS's used earlier]. In Stage I and II zoeae of C. opilio from Hokkaido and the Sea of Japan, the curved lateral processes reach the posterior margin of the third abdominal somite; but in zoeae Stage I and II of C. bairdi they are markedly shorter."[1]

S.E. Bering Sea samples from this study include numerous zoeae, both SI and SII, in which the curved lateral processes (knobs) described above reach the posterior margin; many in which the processes are slightly shorter; and some in which they are markedly shorter. The zoeae described by Haynes (1973, 1981) are also smaller than those described by Motoh (1973) and Kurata (1963), introducing an additional variable to be considered. Measurements made by Motoh (1973), and Haynes (1973, 1981) of the length from the tip of rostral spine to the tip of the dorsal spine (rostral-dorsal length: RDL) are provided in Table 4.2.

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[1]The use of PLS measurements for distinguishing between C. bairdi and C. opilio is not pursued in this paper.

Table 4.2. Rostral-dorsal length (RDL) measurements of Stages I and II larvae of *Chionoecetes opilio* and *C. bairdi*.

	C. opilio Motoh (1973)	*C. bairdi* and *C. opilio* Haynes (1973)
Stage I RDL	4.8 to 5.4 mm	3.96 to 4.55 mm
Stage II RDL	6.2 to 7.1 mm	5.96 to 6.37 mm

In our study, the following morphometric relationships appear consistent. Stage I zoeae from the S.E. Bering Sea with knobs reaching the posterior margin of the 3rd abdominal somite and those with knobs only slightly shorter have RDL measurements greater than 4.5 mm; SII zoeae fitting this description for knobs normally have RDL measurements greater than 6.5 mm. The SI and SII zoeae with markedly shorter knobs have RDL measurements of less than 4.5 mm and approximately 6.0 mm, respectively. These characteristics allow the separation of SI and SII zoeae from the SEBS into two categories and these categories have been temporarily designated H (after Haynes's description of the smaller larvae) and M (after Motoh's description of the larger ones). Zoeae of each category also have carapace lateral spines (CLS) characteristic in shape and length: the CLS of the larger zoeae are short and stout when compared to the relatively long, droopy CLS of the group of smaller zoeae. No characteristic length of PLS could be associated with either category. Occasionally zoeae were difficult to categorize and these individuals were grouped with the larger specimens. Both categories are otherwise morphologically similar.

We may ultimately determine that these two categories, H and M, are, in fact, *Chionoecetes bairdi* and *C. opilio* larvae, as they appear to be. However, we must currently recognize two potential sources of error in stating such a conclusion at present. First, our separation does not strictly adhere to the currently published criteria for distinguishing between the two species. Second, *Chionoecetes angulatus* (larvae undescribed) and *Chionoecetes bairdi* x *opilio* hybrids also occur in the southeast Bering Sea (Pereyra et al. 1970; Feder 1978; Otto et al.

1979), and larvae of both are probably included in the above categories. In particular, hybrid larvae of C. bairdi and C. opilio crosses are possibly abundant based on the benthic hybrid population (Pereyra et al. 1976). At present, we have no means of distinguishing these from the two proper species of interest. Recent progress has been rapid, however, and we anticipate clearer definition of the larval species in the very near future.

Badly damaged specimens which could be determined to belong to the genus Chionoecetes but which could not be categorized further were classified as "Chionoecetes unidentifiable." In most cases, this was a small percentage of all Chionoecetes larvae found. For purposes of this report, only data on the categorized larvae are used. To avoid awkwardness in the discussion and to maintain focus on the two species of interest the groups are usually referred to as the C. opilio group or C. bairdi group or simply as C. opilio and C. bairdi.

The final, megalops, stage of the two species were distinguished following the description of Jewett and Haight (1977).

4.5 Results and Discussion

4.5.1 Depth Distribution

Depth distribution data for this study comes from MOCNESS nets used during PROBES 1980 and 1981 cruises. To date, most of the 1980 MOCNESS samples (containing SI zoeae) have been analyzed. Of the 25 stations for which all data is currently complete, 14 were occupied at a time and place where zoeae were abundant. Of these, 9 had no zoeae below 60 m.

At 4 of the 5 stations where some zoeae were found below 60 m, the concentrations were low ($\leq$ 40 larvae per 1000 m^3) and represented less than 5% of the larvae in the water column. In only one instance was an appreciable concentration of larvae (122 per 1000 m^3) observed only below 60 m.

The overall impression provided by these data is that SI zoeae of these species are primarily concentrated in the upper 60 m in the SEBS for the time period investigated (for 1980, 6 April-8 June). Considerably more data will be available from the 1981 cruise and will include both zoeal stages and the megalops stage

Based on the above observations, a depth of 60 m was used to normalize the concentration of zoeae calculated for the various sampling stations in this study. This was necessary because past zooplankton samples had been collected from a variety of depths, ranging from 0-60 m to 0-1200 m, and this normalization enabled comparison of densities found at various stations irrespective of the lower depth of the plankton tow. This approach was of further advantage because the PROBES 1978 samples, a very valuable data, had all been collected essentially from 0-60 m. 1980 and 1981 Bongo tows taken on PROBES cruises for this study were taken from 0-60 m. MOCNESS samples continue to be taken from all depths.

No further description of the depth distribution of larvae is possible from the data collected to date. Larvae were sometimes very uniformly distributed in the water column with a sharp cut-off at 60 m; at other times they were found only in the upper 40 m; at others, they were concentrated in the middle depth range, with values tapering off in both shallower and deeper directions. Part of the variability in these patterns undoubtedly results from horizontal patchiness in the sampling area.

A similar variety of depth distribution patterns was found for C. bairdi larvae off of Kodiak Island (Kendall et al. 1980). A notable difference is that these investigators reported deeper night-time distributions than found to date in this study. Diel differences in the SEBS will receive increased attention in the coming year and will include analysis of SII and megalops larvae.

During October 1980, stratified depth tows in the outer shelf collected megalops larvae of C. bairdi. Samples were collected at the surface (NORPAC net) and at 10, 30, 50, 75, 100, and 150 m (MTD net: maximum depth of sampling varied with station depth). In no case were megalops larvae found at 30 m or shallower, but this stage was found at 50 m at all three stations sampled. Samples collected at 75 and 100 m at the deeper stations also contained megalops larvae.

4.5.2 Comparison of BONGO and MOCNESS Estimates

The time required to sample with the MOCNESS is many times that required with the BONGO, and the former is deployed far less frequently than the latter. During 1980, relatively few stations which had larvae were sampled by both the MOCNESS and the BONGO. There are three paired estimates, however, and these indicate that the differences are not substantial when compared to the natural variability which probably exists in nature. (The paired estimates for MOC and BONGO, respectively, were

768:990; 67:340; and 599:695 larvae per 1000 m^3). These do not appear larger than the paired estimates from MOCNESS tows taken 4-6 hours apart at the same approximate locations (7:62; 84:0; 233:642 larvae per 1000 m^3).

Examination of trends in the data, consideration of the above comparisons, and consideration of estimation errors involved in our subsampling suggest that we are unable to detect differences between "0" and "100" with much accuracy, and such differences are probably not significant when mapping the abundance patterns of *Chionoecetes* larvae. That is, since the density of *Chionoecetes* larvae can be very large, variability in the estimates for low larval densities are of little interpretive significance.

4.5.3 Temporal Patterns of Appearance and Development

Despite the fact that temporal coverage varies from year to year, all available data are consistent with the generalized development curves depicted in Fig. 4.5 and generalized as follows. Stage I zoeae of *C. opilio* are present by mid April (1978 data indicates hatchout after mid March) and begin metamorphosing to SII by late May. Stage I zoeae of the *C. bairdi* group begin to appear in the water column in late April-early May and metamorphose to SII during June. Observations made at sea during 1981 but not yet quantified indicate that the majority of larvae of both species metamorphosed to the last planktonic (megalops) stage in early-mid July. Based on the timing of SII zoeal abundance in the other years, there is no reason to assume that this is not a typical temporal pattern.

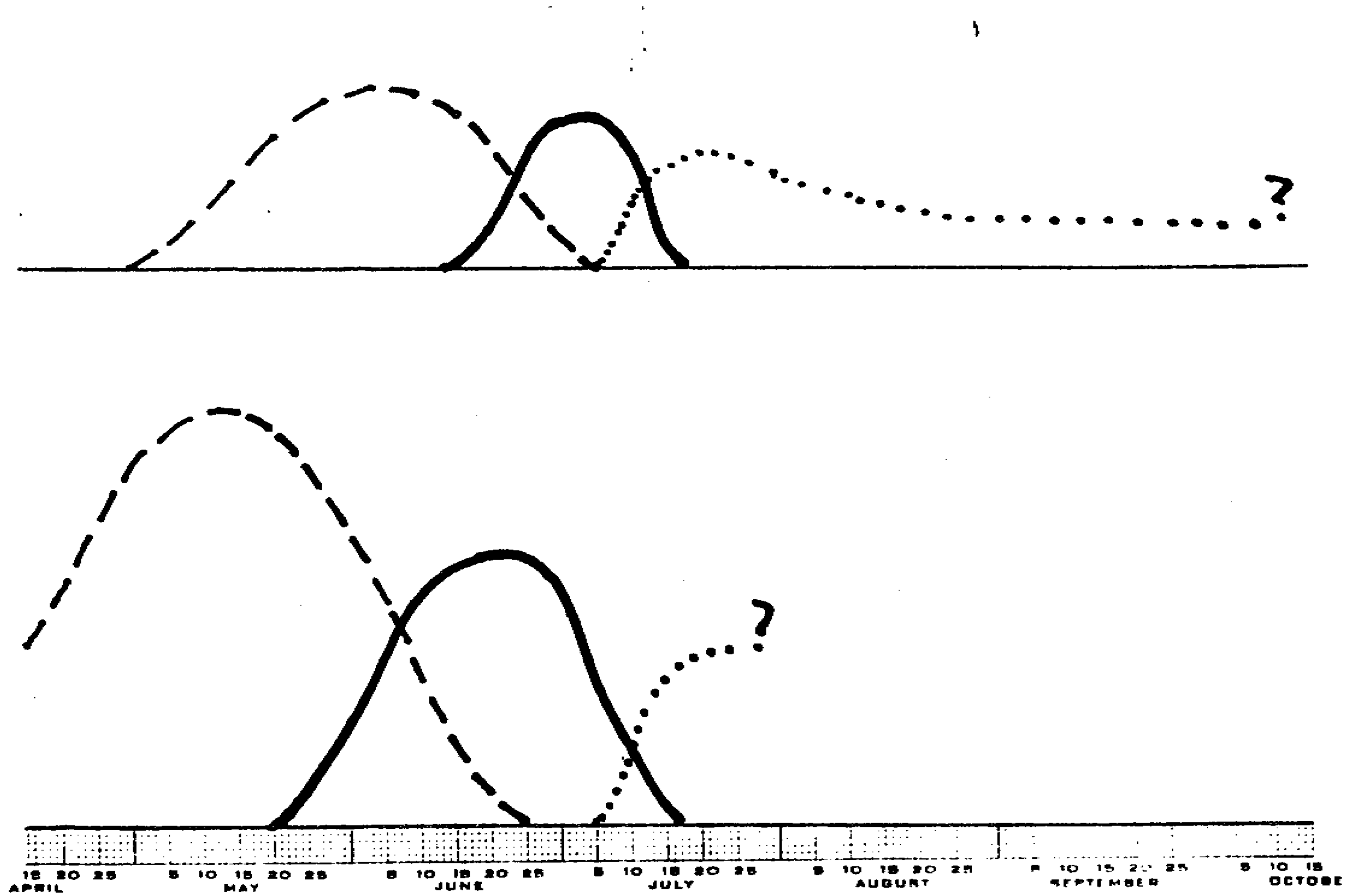

Fig. 4.5. General development curves showing relative abundance of Zoea I, Zoea II, and megalops larvae of *Chionoecetes bairdi* (upper) and *C. opilio* (lower) derived from data for 1976-1980 and observations made in the field during 1981. Question marks indicate lack of information on changes in megalops numbers.

Analysis of the data sets for years when cruise tracks covered wide regions of the shelf demonstrate that the temporal pattern of hatch-out and development, at least to SII zoeae, is similar for the outer shelf (100-200 m) from near the Pribilofs to near Unimak Island. The patterns shown in Figure 4.5 thus appear applicable over a wide region, including all of the St. George Basin. The data suggests that the metamorphosis to SII zoeae may have been a little later over the middle shelf than the outer shelf in 1978, but this point requires further exploration and the difference is, in any case, quite small.

4.5.4 Spatial Patterns of Abundance

The ultimate goal of this research is to relate the dynamics of the pelagic larval phase of Tanner crabs to the regional oceanography of the SEBS, and then to relate the implied cause-effect relationships in the plankton to patterns of recruitment to the benthic populations. At this time approximately one year into the project, work has progressed to the point where it is possible to characterize the prevailing patterns of distribution and abundance of larvae for the period 1976-1980.

As with the temporal data discussed above, not all years received equal sample coverage. As a result, data for some years are fragmentary, but these data still show striking similarities with those data from years with more thorough sampling. Discussion will begin with the most thorough data set and will then proceed to similarities and/or differences observed for the other years. The reader is referred to Figures 2.1-2.12 in the Materials and Methods section for station locations when maps are not provided here.

Samples from the 1978 PROBES cruise provide the best areal coverage of the SEBS and lay the groundwork for interpretation of data from other cruises. Zooplankton were collected from 11 April to 29 June and included a grid of sampling stations between the Pribilof Islands and the Aleution Islands/Alaska Peninsula region from 1600 m to 80 m depth. The period of collection included both SI and SII zoeae.

For analysis of cross-shelf patterns of distribution and abundance, a series of quasi-synoptic "transects" were selected from the grid of available stations (Fig. 4.6 a-b). Virtually all cross-shelf transects selected from the Leg 1 stations (11-29 April) showed a pattern of abundance for the *C. opilio* larval group resembling the model in Figures 4.7 and 4.8a. In all cases, these larvae were at greatest concentration (on the order of 10^4 or more larvae per 1000 m^3 water) near the 100 m isobath, with a pronounced decrease in the landward direction and a somewhat more gradual decline seaward. Transect lines repeated one week apart showed no significant differences in the cross-shelf abundance profiles, indicating that the density estimates were reasonably reliable over the range of values observed.

Leg 3 of the 1978 PROBES cruise (27 May-11 June) shows the same general distribution as Leg 1 data for SI larvae of *C. opilio*. The SII larvae of this group are found only in the outer shelf during this period, suggesting either that hatch-out was earlier or development more rapid. During this leg, SI *C. bairdi* larvae were abundant over the outer shelf in all 3 transects (up to 10^3 larvae per 1000 m^3), and SII zoeae were just making their appearance.

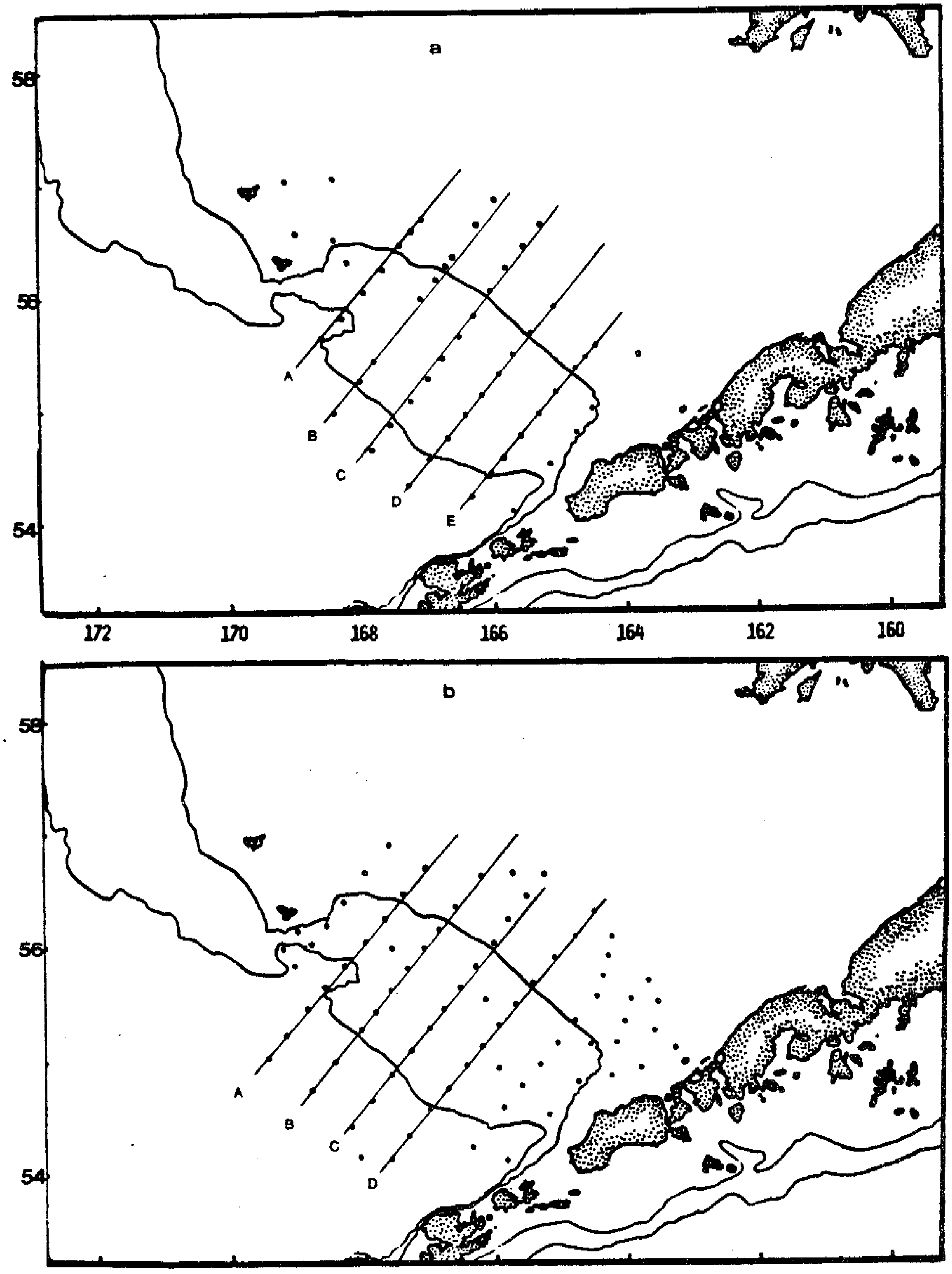

Fig. 4.6. Cross-shelf transects selected from the grid of sampling stations available from PROBES 1978 Leg 1 (a) and Leg 2 (b). These transects were used to model cross-shelf distribution of the larvae (Figs. 4.8, 4.9).

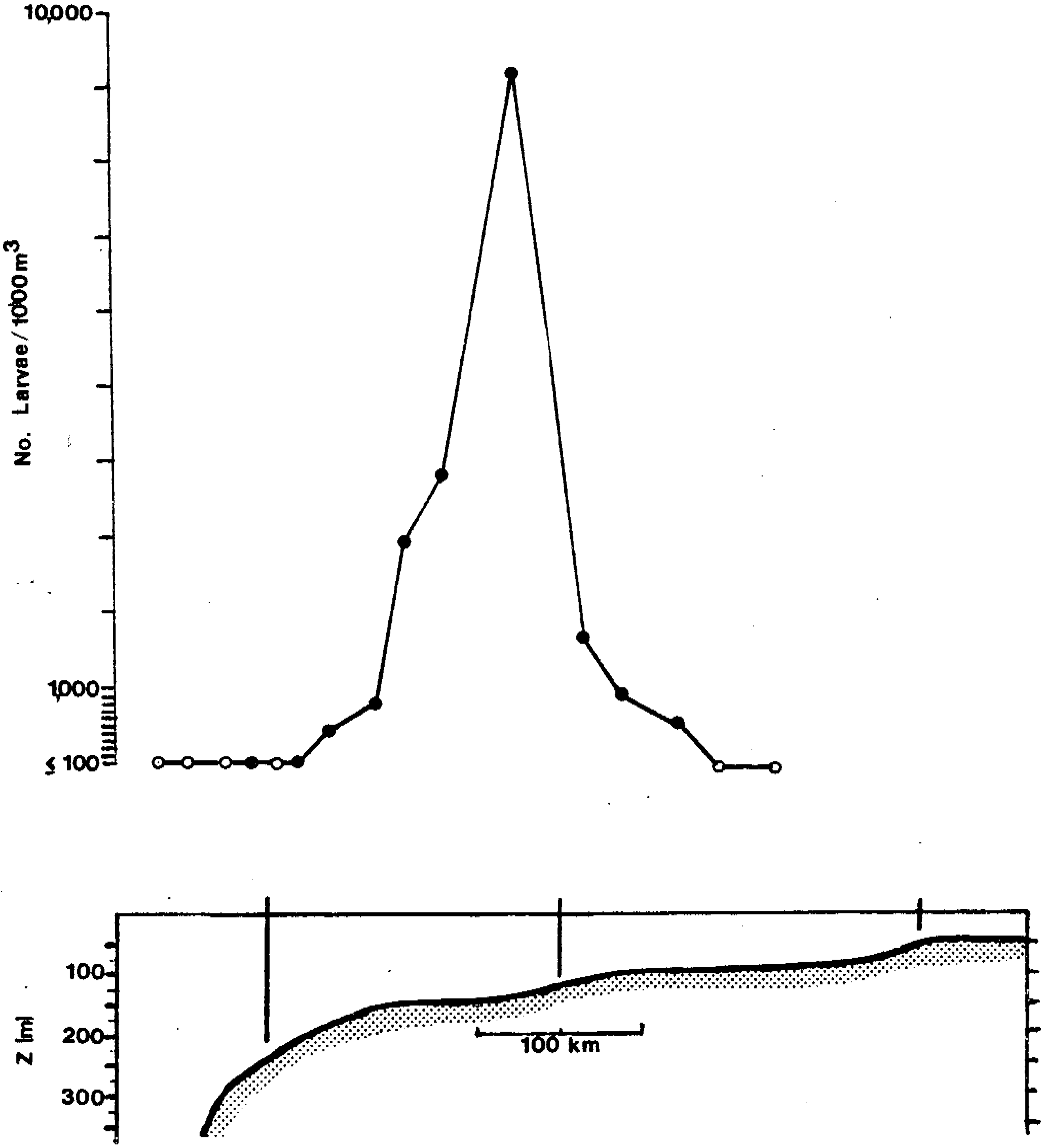

Fig. 4.7. Typical cross-shelf pattern of abundance of <u>C</u>. <u>opilio</u> from 1978 data. (cf. Figs. 4.6, 4.8a). Note that bottom axis is set at lower level of significance for detection of <u>C</u>. <u>opilio</u> larvae: open circle indicates no larvae present in sample; full circle indicates larvae present.

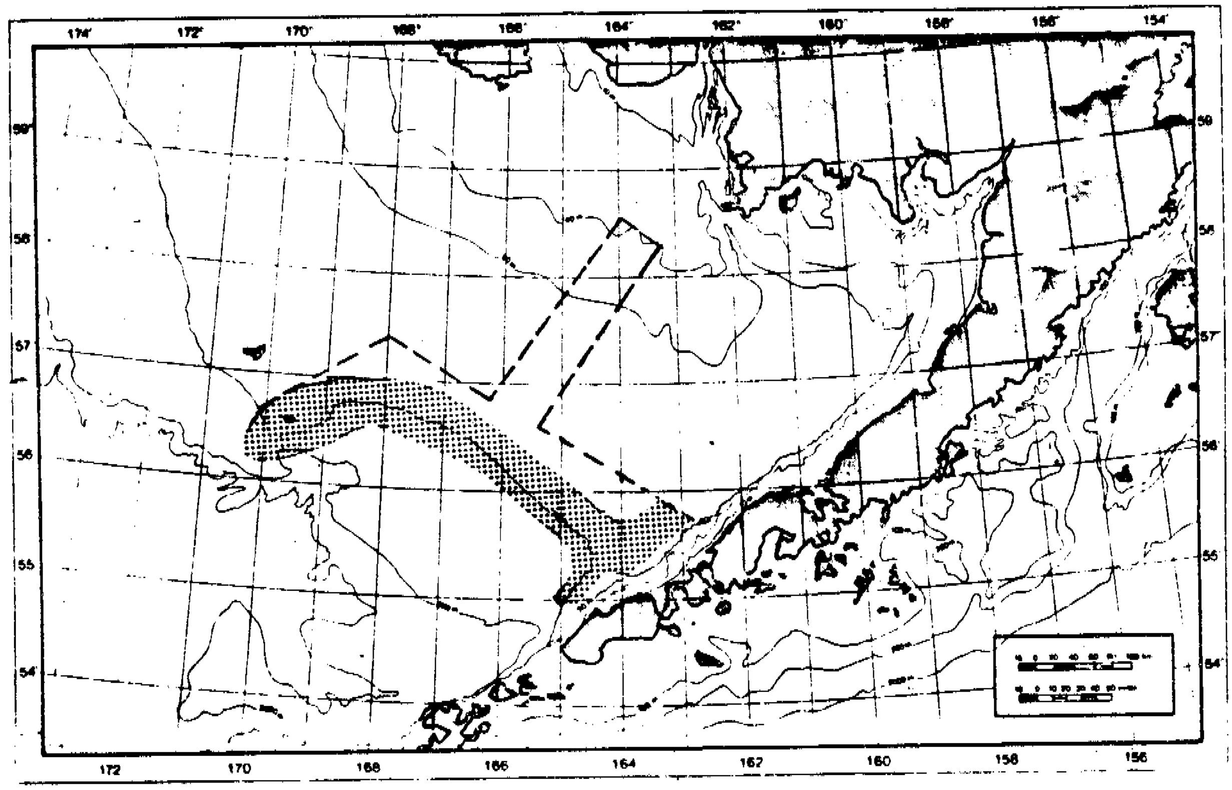

Fig. 4.8a. Model distribution of high densities of C. opilio larvae based on PROBES 1978 data and substantiated by data from NOAA 1977 and 1979 cruises. Shaded area represents larval densities one order of magnitude greater than surrounding areas.

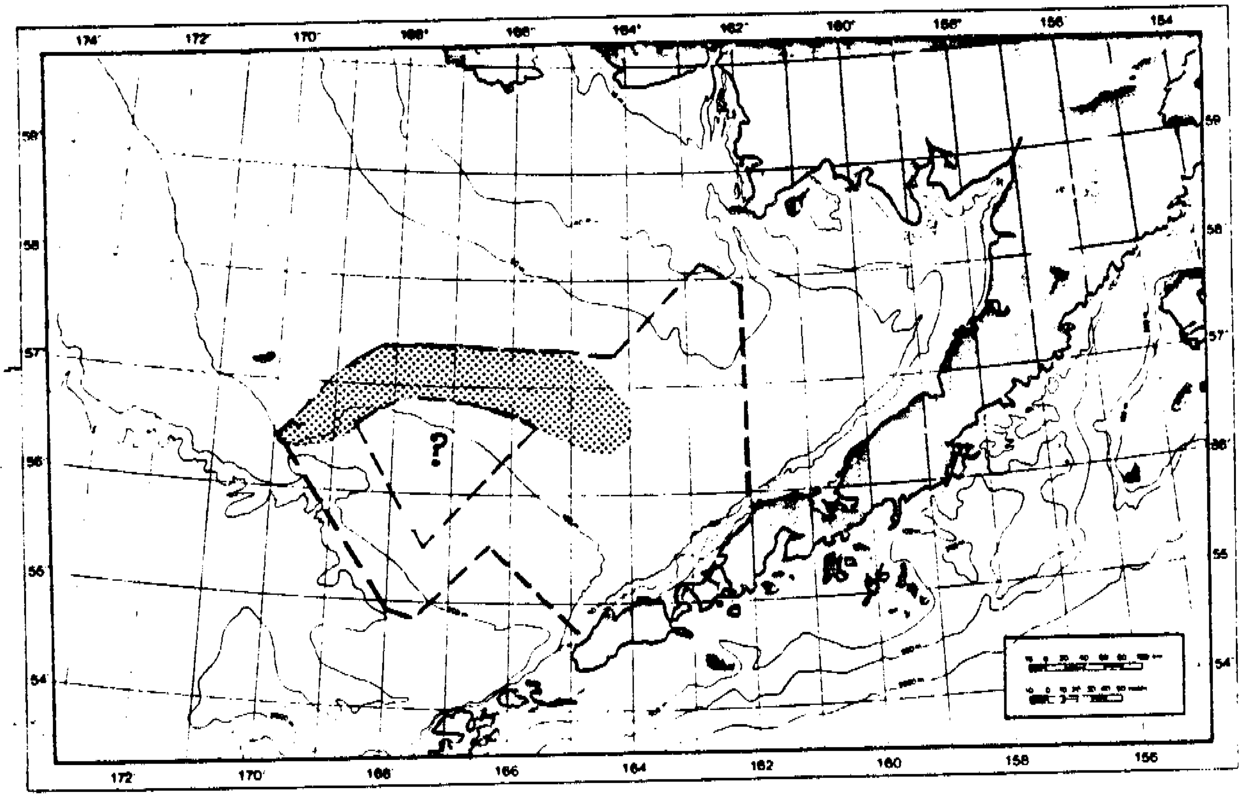

Fig. 4.8b. Distribution of abundant C. opilio larvae during 1980 PROBES cruise. Triangular area with question mark is an unsampled area. Shaded area represents minimum of one order magnitude greater abundance than neighboring areas.

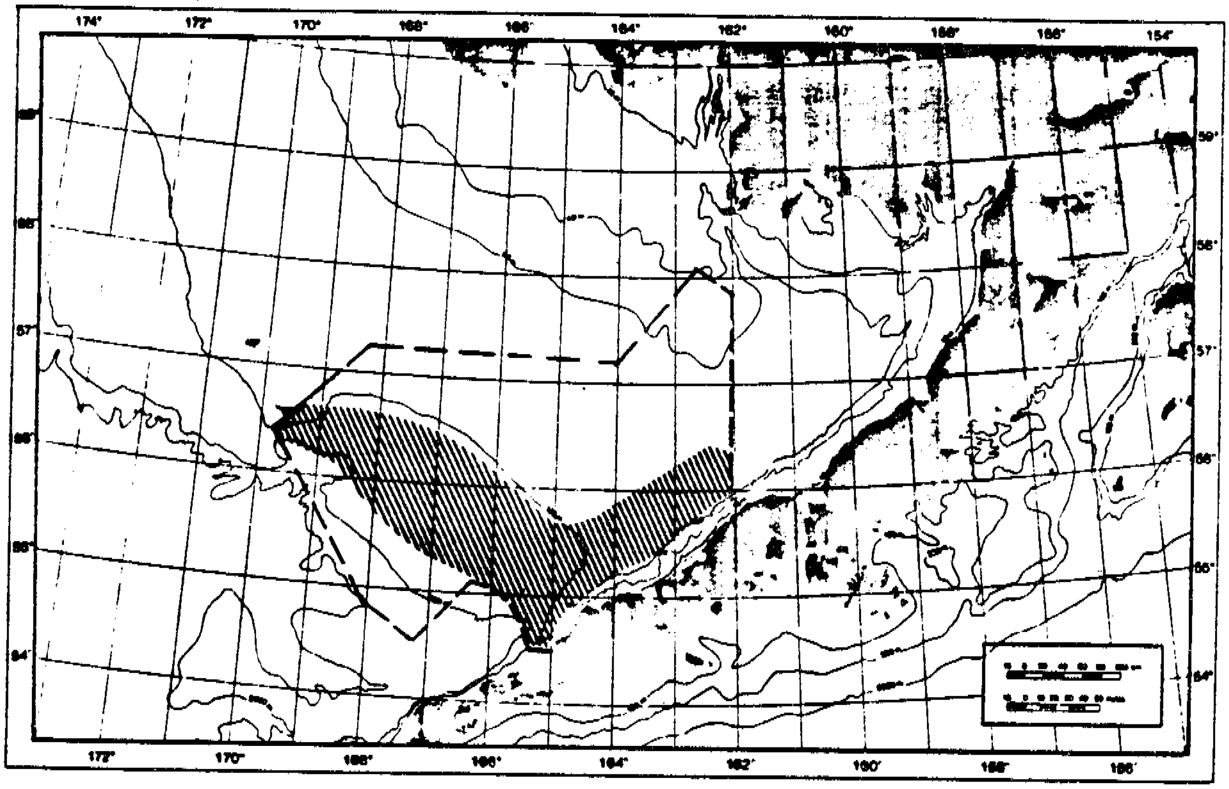

Fig. 4.9. Pattern of abundant <u>C</u>. <u>bairdi</u> larvae. Shaded area represents densities at least one order of magnitude greater than those prevailing in neighboring areas. Dashed line is border of sampling area.

ences can be detected in plankton samples. Interpretation of planktonic interactions based on oceanographic data and appropriate physiological/ecological studies may thus be possible.

Throughout the four-year period for which we have data, the distribution of abundant C. bairdi larvae appears consistent with the spatial pattern depicted in Figure 4.9. Since C. bairdi larvae are found at much lower densities (10^2-10^3 larvae per 1000 m^3) than C. opilio, there do not appear to be the sharp localized increases in density observed in the latter species.

Monthly distribution and abundance of C. bairdi and C. opilio were studied by grouping data from several years into that collected in April, May, or June. Although interannual variation could result in very different temporal/spatial patterns of larvae, our impression of the data thus indicates this is not so with the exception of May-June 1980 which is graphed separately. (Statistical contrasts of annual variation will be done when all data is on file in 1982.)

Larvae of C. bairdi were found in early April samples and were somewhat limited in distribution to the lower St. George Basin across the 100-m isobath (Fig. 4.10), south to Unimak Island (contrast this to C. opilio April distribution in Fig. 4.13). Centers of abundance occurred just north of Unimak Island where densities approaching 1000 larvae/1000 m^3 were found. During May C. bairdi were widely distributed throughout the St. George Basin with densities in excess of 10,000 larvae/1000 m^3 in the southern Basin near 100 meters (Fig. 4.11). High densities of C. bairdi were found throughout June, primarily to the west of the 100-m isobath but also approaching the North Aleutian Shelf near Unimak Island (Fig. 4.12).

Larvae of C. opilio were more abundant and more ubiquitously distributed in all months than C. bairdi. In April C. opilio were widely distributed over the outer shelf and the middle shelf near the 100-m isobath (Fig. 4.13). Many stations sampled had densities greater than 1000 larvae/1000 m^3, and an area in excess of 10,000/1000 m^3 extended from 165° to 169°W at about 56°N to the east of St. George Island (Fig. 4.13). This pattern was maintained during May and relatively high densities were also found to the west of the Pribilofs (Fig. 4.14), consistent wih adult distribution. The extensive area of density greater than 10,000 larvae/1000 m^3 had diminished somewhat in June (Fig. 4.15) although it was still located in the northen St. George Basin and about the Pribilofs.

4.6 Summary of Preliminary Findings

1. Stage I zoeae of C. opilio are present in April. Precise time of hatch-out is not known due to lack of earlier samples. No zoeae were found in samples collected as late as 16 March in the outer shelf in 1978, so hatch-out occurred sometime between 16 March and 15 April. Maximum larval densities are 10^4-10^5 per 1000 m^3.

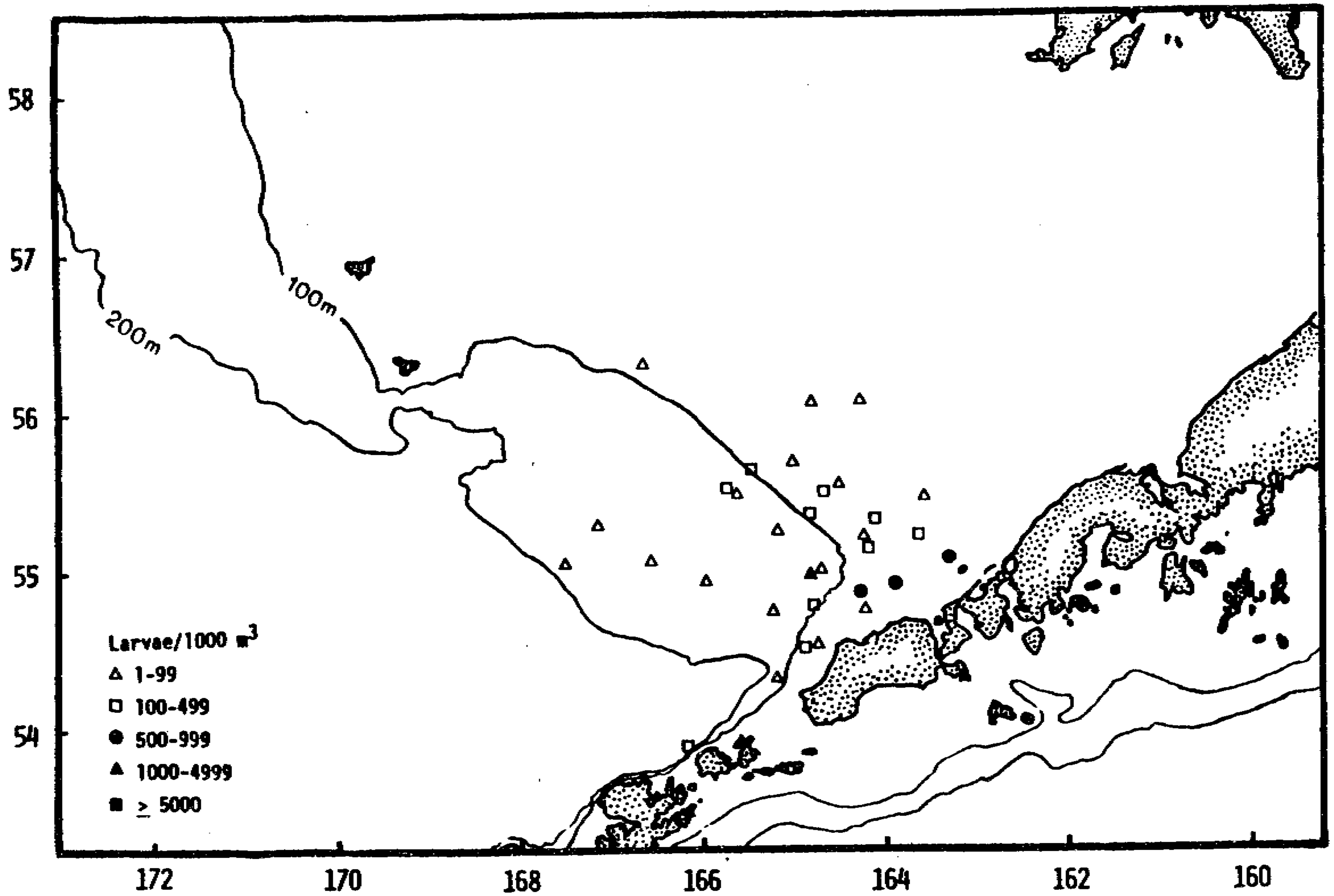

Fig. 4.10. Distribution of C. bairdi larvae during April; data combined from April samples of NOAA '77, PROBES '78 and '80. Note highest densities northwest of Unimak Island.

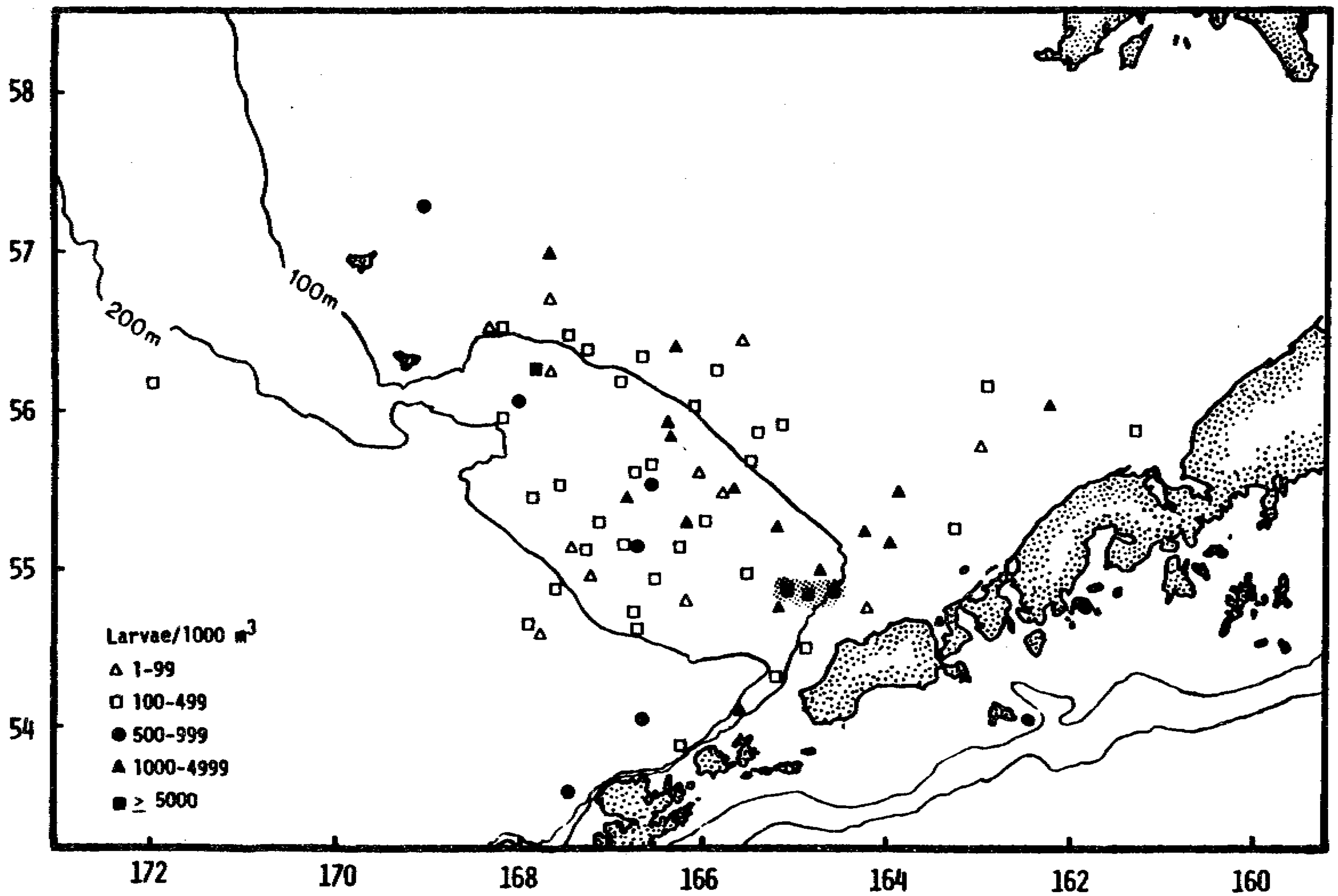

Fig. 4.11. Distribution of C. bairdi larvae during May; data from NOAA '76 and '77, PROBES '78 and '80. Solid squares under stippling represent densities > $10{,}000/1000m^3$.

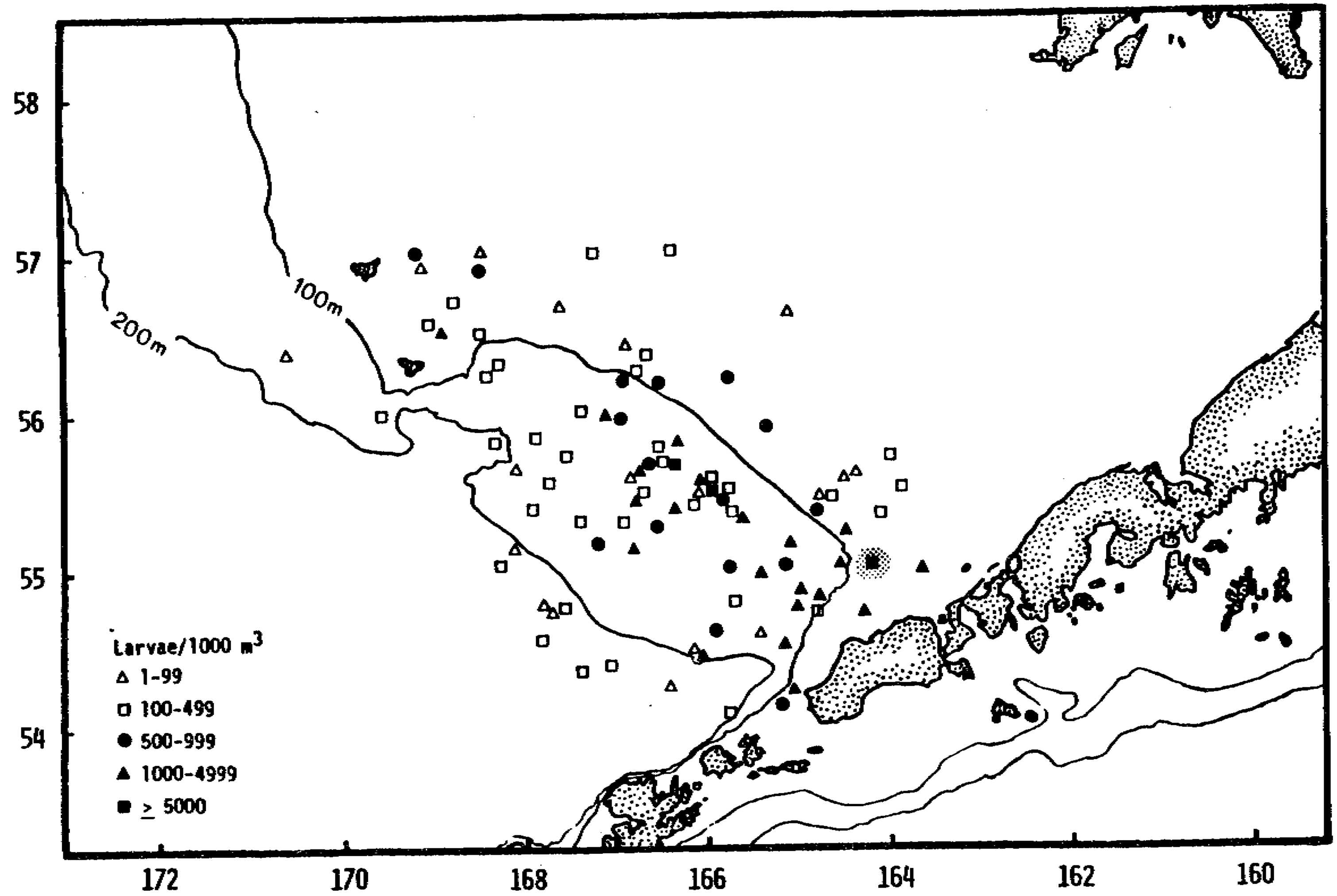

Fig. 4.12. Distribution of C. bairdi larvae during June; data from NOAA '79, PROBES '78 and '80. Stippled square are densities > 10,000 larvae/1000m^3. Note high abundance toward eastern edge of the St. George Basin, south to Unimak Pass and Island.

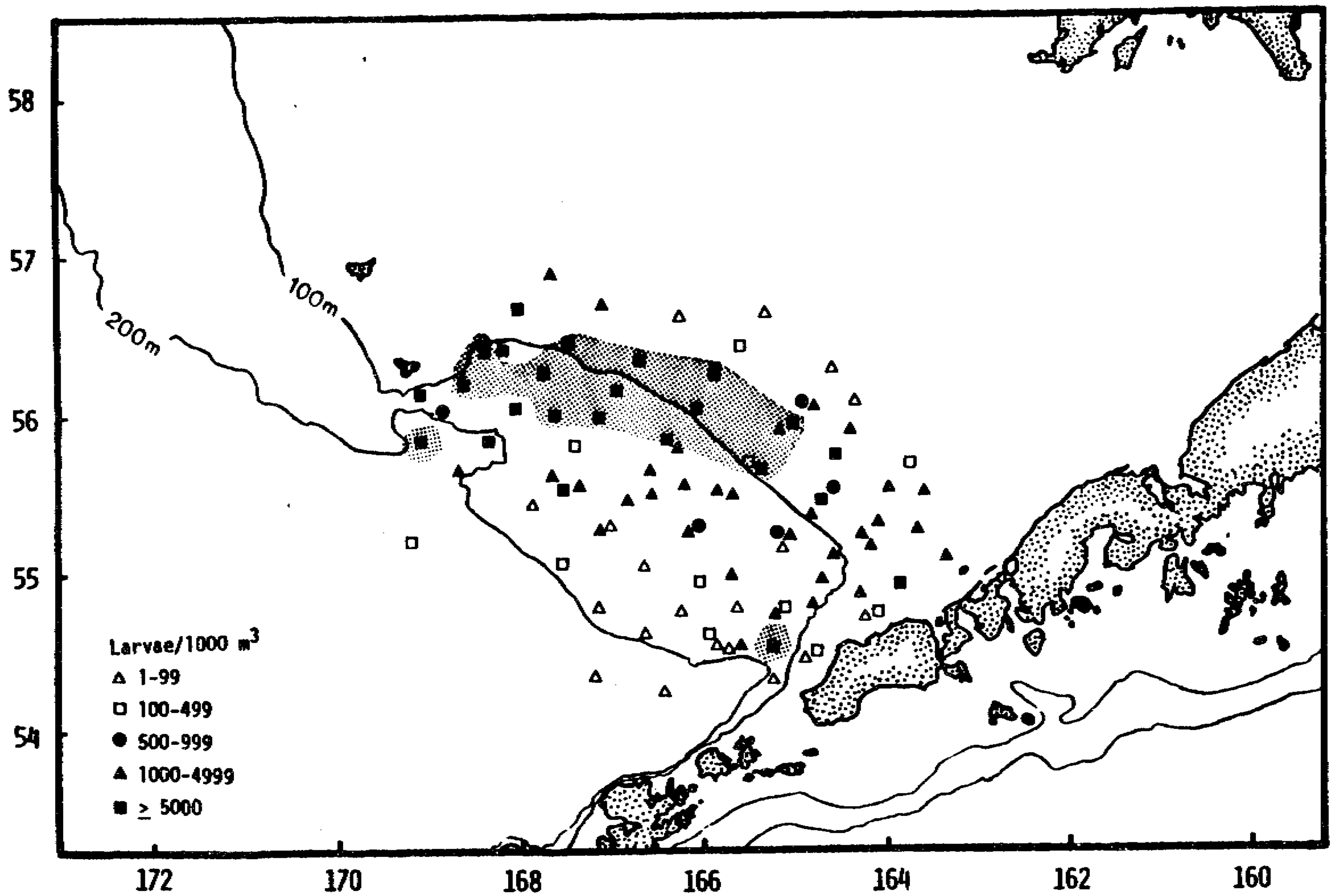

Fig. 4.13. Distribution of C. opilio larvae during April; data from NOAA '77, PROBES '78. Note more expansive distribution and greater abundance of C. opilio than C. bairdi in the month (refer to Fig. 4.10). Stippled squares are densities > 10,000 larvae/1000 m^3.

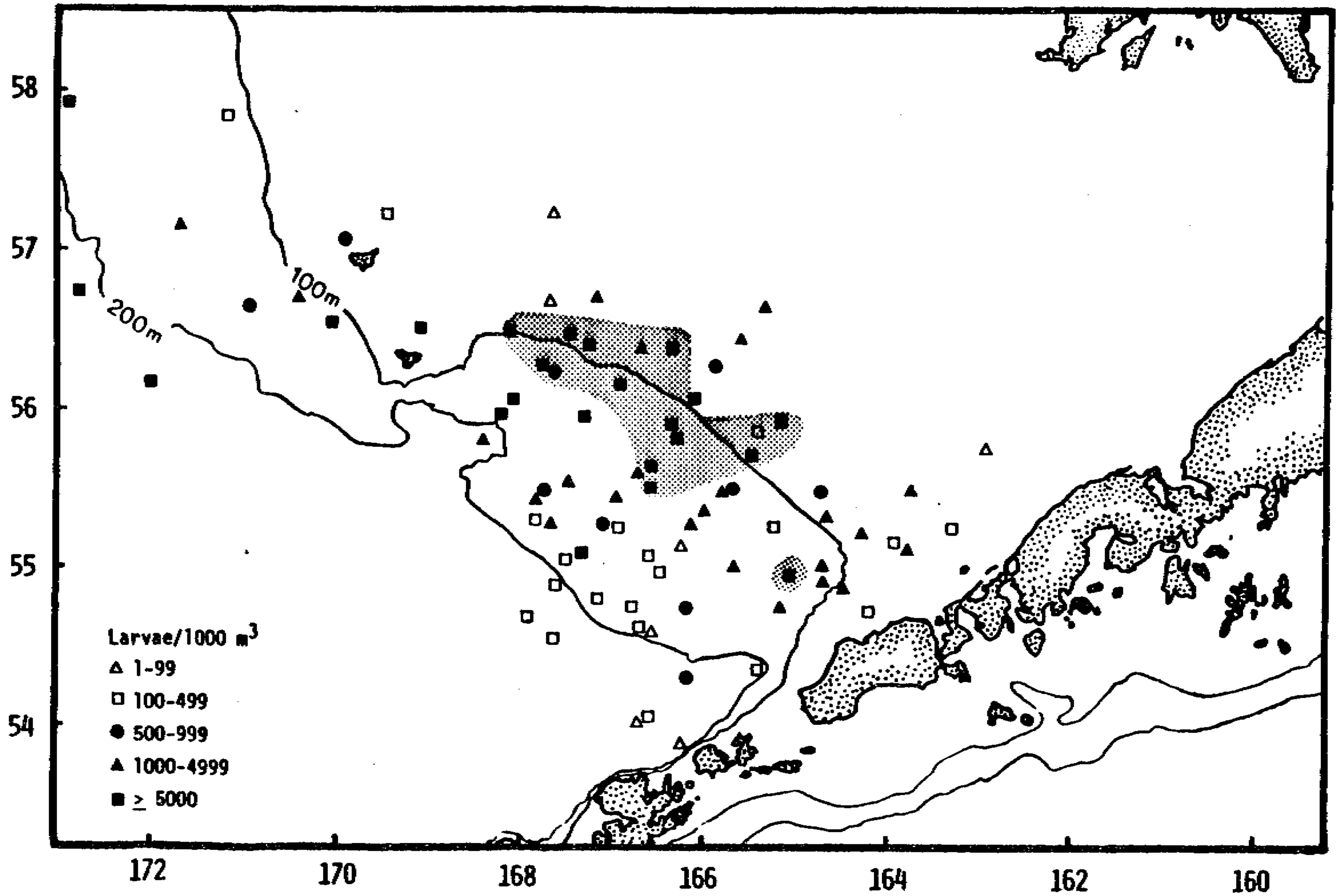

Fig. 4.14. Distribution of C. opilio larvae during May; data from NOAA '76 and '77, PROBES '78. Stippled squares are densities > 10,000 larvae/1000 m^3. Note high abundance along 100 m isobath of entire St. George Basin.

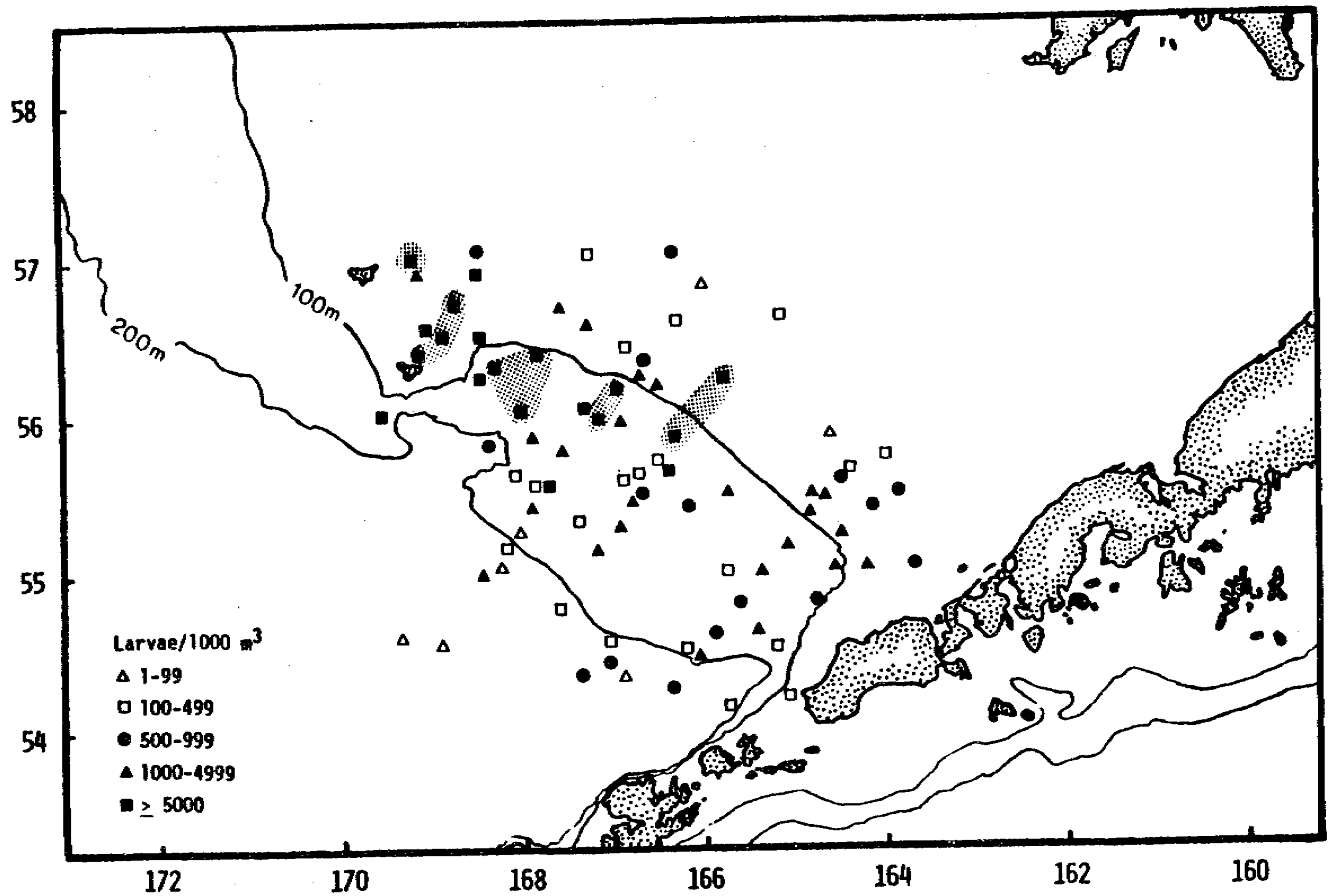

Fig. 4.15. Distribution of C. opilio larvae during June; data from NOAA '79, PROBES '78.

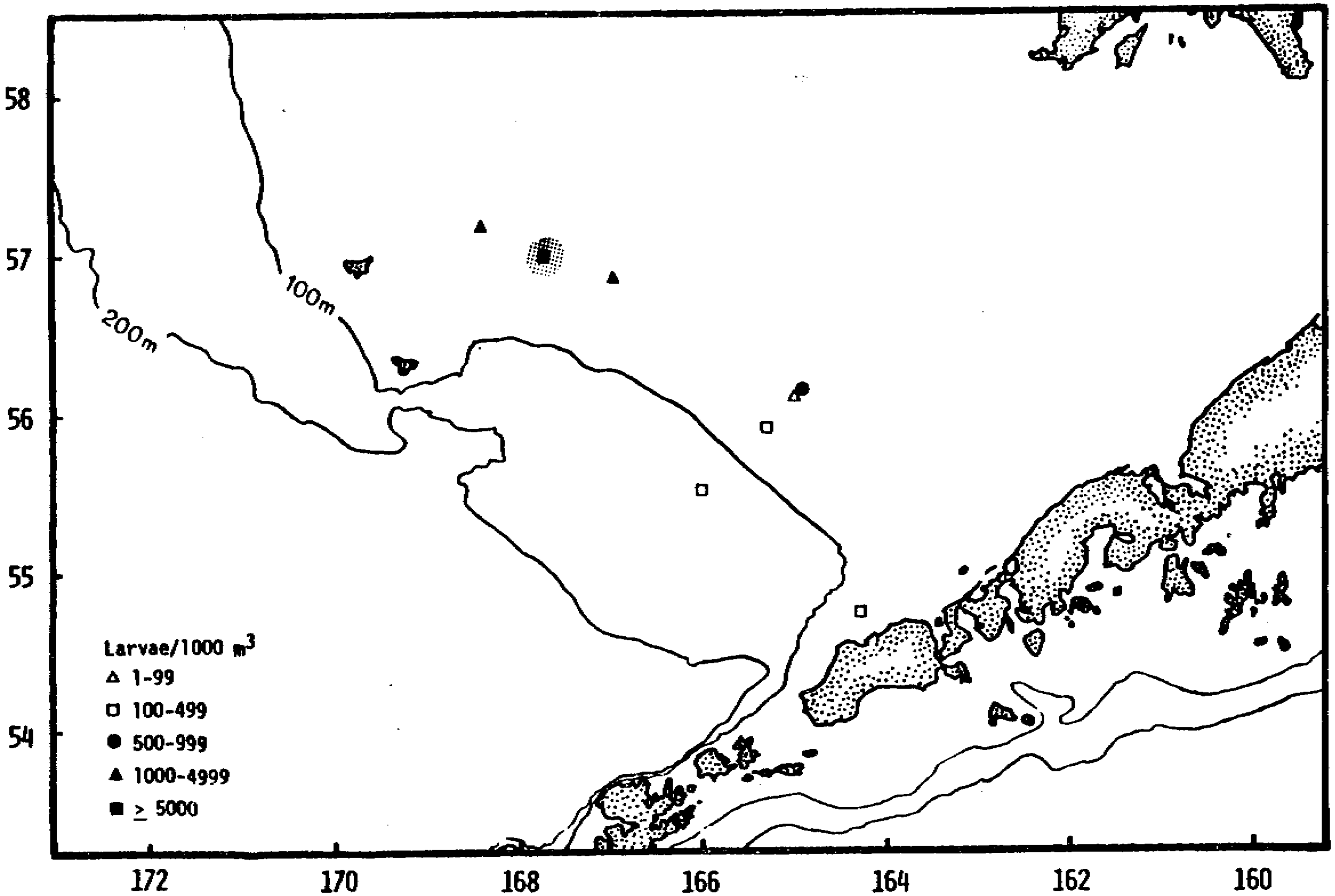

Fig. 4.16. Distribution of C. opilio larvae collected during Leg 4 PROBES 1980 (May 22 to June 8). Distribution and abundance are significantly restricted and reduced compared to previous years (see Figs. 4.14 and 4.15) and suggest anomously low larval C. opilio hatch and/or survival in 1980. Fig. 2.11 shows the extent of sampling during this leg and location of stations where no C. opilio occurred.

2. Stage I zoeae of *C. bairdi* hatch out in late April-early May. Maximum densities of 10^3 per 1000 m^3 are attained rapidly in most years.

3. Stage II zoeae of *C. opilio* appear by late May-early June in the outer shelf. There is some evidence that this metamorphosis may be slightly delayed over the middle shelf.

4. Stage II zoeae of *C. bairdi* appear during the month of June.

5. Megalops larvae of both species appear during middle July.

6. Megalops larvae of *C. bairdi* may be found in large concentrations (10^2 per 1000 m^3) in October. Some megalops apparently over-winter in the plankton, since March and April samples occasionally contain a few. Data for *C. opilio* megalops are not currently available.

7. Two model larval distributions for the two species have been developed from the data (Figs. 4.8a and 4.9). The distribution pattern for *C. bairdi* larvae does not change appreciably for the available data. The model based on 1980 data for *C. opilio* (Fig. 4.8b) appears to be a departure from the other years. If recruitment from the plankton is successful, the 1980 distribution would result in a recruitment pattern consistent with the known distribution of benthic *C. opilio*. The benthonic consequences of larval distributions such as the 1978 model are not currently known, but are being investigated by computer analysis of recruitment patterns to the benthos.

8. Most of the St. George Basin and an extensive portion of the North Aleutian Shelf support high densities of larvae of both Tanner crab species in the plankton beginning in April and possible extending into the autumn.

9. Stage I zoeae of both Tanner crab species are most abundant in the upper 40 m of water and more than 95% of the larvae usually can be found in the upper 60 m.

5.0 DISTRIBUTION AND ABUNDANCE OF OTHER BRACHYURAN LARVAE IN THE S. E. BERING SEA WITH EMPHASIS ON *ERIMACRUS ISENBECKII*

Deborah Wencker

5.1 Introduction

There is little literature on the life histories, distribution, and abundance of Brachyura belonging to families Atelecyclidae (hair crab), Cancridae (Cancer crab), Majidae (spider crabs other than *Chionoecetes bairdi* and *C. opilio*, in this section), and Pinnotheridae (pea crab) known to inhabit the S. E. Bering Sea (see Tables 5.1, 5.2 for summary). Species without commercial value have not been studied in any detail even though they are often caught incidentally during groundfish surveys. From our own experience onboard such cruises we know that non-commercial crabs and shrimp are often caught in high numbers, sorted to species, and logged in data banks. However, the U.S. National Marine Fisheries Service (NMFS) reports often don't mention these species despite their probable importance in the benthic community; a short-coming that makes correlations between larval distribution and abundance and adult populations tenuous to impossible.

5.1.1 Atelecyclidae

Erimacrus isenbeckii (Korean horse hair crab), a recent target of an American fishery, occurs from depths of 10-360 m from the Bering Sea to the Japan Sea (Table 5.1). Males reach lengths of at least 128 mm, and the largest recorded by NMFS in the S.E. Bering Sea weighed 1.95 kg (Otto et al. 1980). As of July 1981, the Alaska Department of Fish and Game (ADFG) reported that approximately two million pounds of *Erimacrus*

Table 5.1. Size, depth distribution, geographic range and habitat of Brachyura (excluding Chionoecetes bairdi and C. opilio) known to inhabit the S.E. Bering Sea.

Family, species[1]	Adult maximum size	Depth distribution	Geographic distribution	Habitat
Atelecyclidae				
Erimacrus isenbeckii (Korean horsehair crab)	Male: 130 mm. Female: 80 mm.	10 - 360 m.	Bering Sea to Japan Sea	Mud, sand and gravel
Telmessus cheiragonus (Helmet crab)	60 mm.	Shore - 57 m.	Chukchi Sea to California, Siberia to Japan	Mud, sand and gravel
Cancridae				
Cancer magister (Dungeness crab)	Male: 250 mm.[2] Female: 165 mm.[2]	Shore - 90 m.	Aleutians to Baja California	Sand, mud
Cancer oregonensis	40 mm.	Shore - 272 m.	Bering Sea to California	Sand, mud, and empty shell of Balanus nubulus
Majiidae				
Chionoecetes angulatus	Male: 139 mm.	49 - 3000 m.	Pribilof Is. to Kamchatka and Oregon	Mud, sand
Oregonia bifurca	35 mm.	486 m. - 1375 m.	Western Bering Sea	Sand, mud with broken shell
Oregonia gracilis (Decorator crab)	50 mm.	Shore - 382 m.	Bering Sea to Japan and California	Among algae and eel grass
Hyas lyratus (Lyre crab)	50 mm.	Shore - 650 m.	Bering Sea to Washington	Sand, mud with broken shell
Hyas coarctatus alutaceus	70 mm.	Shore - 400 m.	Chukchi Sea to Japan and and northern coast Siberia, Beaufort Sea to West Greenland to Newfoundland	Sand, mud and gravel
Pugettia gracilis (Graceful kelp crab)	30 mm.	Shore - 80 m.	Unalaska to California	Eel grass and kelp
Mimulosa foliatus	30 mm.	Shore - 40 m.	Unalaska to Mexico	No information
Pinnotheridae				
Pinnixa occidentalis	20 mm.[2]	18 - 430 m.	Unalaska to So. California	Commensal in burrows
Pinnixa schmitti	20 mm.[2]	10 - 150 m.	Unalaska to San Francisco	Commensal in burrows and tubes
Fabis subquadrata	20 mm.[2]	Shore to 80 m.	Akutan Pass to California	Commensal on bivalve molluscs

[1]Table compiled from Rathbun 1918, 1925, 1930; Garth 1958; Kozloff 1973 and Otto et al. 1980.

[2]Measurement of width.

Table 5.2. Early life history information on several species of Brachyuran crabs found in the S.E. Bering Sea.

Species	Seasons female ovigerous	Period of hatch	Number of larval stages: Zoea	Number of larval stages: Megalops	Period of larval development[2]	Total length (mm): Zoea – Megalops	Reference[5]
Erimacrus isenbeckii	NI[1]	Spring	5	1	~5 months	2.7 mm.- 7.2 mm.	1,2,3
Telmessus cheiragonus	June-Oct.	Spring	5	1	~5 months	2.3 mm.- 5.4 mm.	1,2,3,4
Cancer magister	Fall-winter	Early spring	5	1	4-5 months[3]	2.5 mm.- 11 mm.	5,6,7
Cancer oregonensis	NI	Jan., early spring	5	1	4-5 months	2.24 mm. - 7 mm.	6,8
Oregonia gracilis	Mar. - Sept.	Mar., Apr., June and July	2	1	4 weeks	2.5 mm. - 4.3 mm.[4]	2,9
Hyas lyratus	Year round	Apr. - July	2	1	5 weeks	2.5 mm. - 4 mm.[4]	9
Hyas coarctatus alutaceus	Late spring, early summer	May - July	2	1	NI	2.7 mm. - 4.2 mm.[4]	2,4,10
Pugettia gracilis	Year round	May and June	NI	NI	NI	NI	11
Fabia subquadrata	Summer	May - July	4	1	54 days[3]	.75 mm. - 2.1 mm.	12

[1] NI = No information.
[2] Time of development from 1st zoea to megalops.
[3] Time of development from 1st zoea to first benthic instar.
[4] Body length = does not include rostral length.
[5] References: 1) Kurata 1963b, 2) Makarov 1966, 3) Takeuchi 1969, 4) Feder and Jewett 1980, 5) Hoopes 1973, 6) Kendall et al. 1980, 7) Poole 1966, 8) Lough 1975, 9) Hart 1960, 10) Kurata 1963a, 11) Knudsen 1964, 12) Irwin and Coffin 1960.

had been taken for commercial purposes. This is the first year fisherman have targeted on the species and the ADFG predicts an annual catch of ten to fifteen million pounds for 1981 (J. Reeves, personal communication, NMFS, Seattle). The fishery is centered around the Pribilof Islands where the majority of the 1980 estimate of 12.9 million males sexually mature with carapace length greater than 80 mm occur. In years prior to 1980, fairly high concentrations were frequently reported just north of the Alaska Peninsula (Otto et al. 1980). Females which are rarely larger than 80 mm in carapace length (Sakurai et al. 1972 cited in Otto et al. 1980) are not part of the fishery, and accurate abundance estimates and distribution data are not available for them. During a survey of the epibenthos of the Bering Sea in 1975 and 1976, Feder and Jewett (1980) encountered Erimacrus in 25.6% of trawls concentrated between 40 and 100 m and 31.7% of trawls concentrated between 100 and 200 m. Greatest biomass of Erimacrus occurred between 40-100 m depth and was 1.5% (0.073 g wet weight/m^2) of total epifaunal biomass in the Middle Shelf Domain (Jewett and Feder 1981).

Literature on Erimacrus isenbeckii is scarce but Yoshida (1941), studying the "useful" crabs of North Korea, gives the following account of its reproduction. Copulation takes place immediately after the female's first molt to maturity while the carapace is still soft. Eggs are extruded and carried on pleopods under the abdominal flap until zoeae hatch in early spring. Reproduction is inextricably linked to molting in most crabs on an annual basis and likely accounts for large differences in body size between larger sexually mature males and smaller females. Erimacrus females may molt only every other year which slows growth as does the need to put large quantities of energy into egg production.

Telmessus cheiragonus, closely related to Erimacrus but smaller in size (approximately 60 mm in length), occurs in shallow, more northern shelf areas and near river estuaries (Makarov 1966; Table 5.1). It is distributed as far north as the Chukchi Sea. No literature on the reproduction of this species is currently available. Ovigerous females have been found in the Bering Sea from June through September (Feder and Jewett 1980; Lowry and Frost 1981).

Erimacrus and Telmessus are food items of secondary importance to other animals of the Bering Sea. Lowry and Frost (1981) report that Telmessus is often eaten by the bearded seal and they site Cunningham's (1969) statement that Erimacrus is occasionally eaten by the red king crab.

Kurata (1963b) describes the 5 zoeal stages and megalops stage of both species from the Sea of Japan (Table 5.2). Unfortunately, most of the text is in Japanese and it is not known if it contains other valuable life history information.

5.1.2 Cancridae

Cancer magister, currently of commercial importance in the Gulf of Alaska, has been reported to inhabit the Bering Sea (Garth 1958), but species lists prepared from more recent surveys of this area (Pereyra et al. 1976; Feder and Jewett 1980) do not include this species. Dungeness crabs inhabit bays, estuaries and the open ocean to depths greater than 50 m, from Amchitka Island on the Aleutian chain to Baja California. In British Columbia both males and females reach sexual maturity after twelve molts, two years after metamorphosis. Female growth then becomes slower relative to male, and females rarely attain widths greater than 165 mm while males may grow as large as 250 mm wide by a maximum age of ten years. Mating occurs when adults migrate to shallow waters in the spring and the female has molted. Females do not extrude eggs until the following fall. Egg development requires seven to ten months (Hoopes 1972).

Cancer oregonensis, is a small crab 40 mm long, lives on rocky shores and in empty shells of *Balanus nubulus* at greater depths. No information is available in the literature on its growth and reproduction.

Cancer spp. are eaten by the Irish lord (*Hemilepidotus jordani*) and the rock sole (*Lepidopsetta bilineata*) (Feder and Jewett 1981).

Poole (1966) describes the five zoeal stages and megalops stage of *Cancer magister* reared in a laboratory on the coast of California. Lough (1975) discusses these stages of *C. oregonensis* from the plankton off the coast of Newport, Oregon.

5.1.3 Majidae

The family Majidae includes, in addition to *Chionoecetes* spp., several small "decorator" crabs of no commercial importance that are distributed widely throughout the S. E. Bering Sea. *Hyas coarctatus* *alutaceus* is found on the northern shelf, as it's range extends through the Artic and *Oregonia gracilis* and *Hyas lyratus* occur in more southerly areas. During epibenthic assessment of the S. E. Bering Sea in 1975 and 1976, *H. lyratus* occurred in 22.1% of trawls taken between 100 and 200 m, while *H. coarctatus alutaceus* was encountered in 47.8% of the trawls concentrated between 40 and 100 m (Feder and Jewett 1980). Wet weight biomass of this species was 0.028 g/m^2 and comprised only 0.6% of total epifaunal biomass in the Middle Shelf Domain (Jewett and Feder 1981). The kelp crabs *Pugettia gracilis* and *Mimulosa foliatus* inhabit the area near Unalaska Island (Rathbun 1925).

Accounts of reproduction of these species are scant or non-existant but most mating appears to be associated with females molting (Knudsen 1964). Ovigerous females of the species *Oregonia gracilis, Hyas coarctatus alutaceus* and *H. lyratus* have been reported from the S.E. Bering Sea in the late spring and early summer (Feder and Jewett 1980). Fecundity in Puget Sound was reported by Knudsen (1964) who found that female *Oregonia gracilis* 17 to 25 mm in length carried 2,800 to 17,400 eggs, while female *Pugettia gracilis* 20 to 25 mm in length carried 6,200 to 13,300 eggs.

Several of these species have been reported as food items for Pacific cod (*Gadus macrocephalus*), sculpins, rock sole (*Lepidopsetta bilineata*), and the sea-stars *Asterius amurensis* and *Pycnopodia helianthodes* (Feder and Jewett 1981). *Hyas coarctatus alutaceus* is an important food item in the Bering Sea bearded seal diet (Lowry and Frost 1981) and of secondary importance for red king crab (Cunningham 1969).

All majid crabs molt through two zoeal stages and a megalops stage (Hart 1971). Hart (1960) described laboratory-reared larvae of *Oregonia gracilis* and *Hyas lyratus* from British Columbia. *Hyas coarctatus alutaceus* larvae were collected from the Sea of Japan and described by Kurata (1963a). Other species of majid crab larvae have not been described (see Table 5.2), but Hart's key (1971) allows easy separation of the sub-families.

Chionoecetes angulatus may attain a carapace length of 139 mm as adults and are distributed on the continental slope and deeper in the S. E. Bering Sea. Several were encountered at depths greater than 140 m during a NWAFC continental shelf groundfish assessment, but abundance estimates were not made (Otto et al. 1979).

5.1.4 *Pinnotheridae*

Unlike other families discussed thus far, pinnotherids are generally commensal crabs that reside in polychaete tubes and burrows or in mantle cavities of bivalves and gastropods. Data on the distributions of pea crabs in the S. E. Bering Sea are not available. Irwin and Coffin (1960) suggest the growth of *Fabia subquadrata* is related to the growth of its host (a bivalve mollusc) and describe the early life history of laboratory-reared larvae from the coast of Washington. The larval stages of *Pinnixa occidentalis* and *P. schmitti* have not been described. There is a conflict in the literature as to the number of zoeal stages for the Pinnotheridae. Irwin and Coffin (1960) report four zoeal stages for *Fabia subquadrata*, while Lough (1975) reports five for the same species and unidentified species of *Pinnixa* from the plankton off the Oregon coast. The S. E. Bering Sea Pinnotheridae zoeae from this study were not staged due to incomplete information.

On the Kodiak Shelf *Pinnixa occidentalis* is a major food item for the red king crab, Pacific cod (*Gadus macrocephalus*), sculpins (*Hemilepidotus jordani* and *Hemilepidotus elassodon*) and Tanner crab (Feder and Jewett 1981).

5.2 Results and Discussion

The samples examined for this study did not have the broad temporal or spatial distribution required to make any conclusive remarks on the relatively rare non-*Chionoecetes* Brachyura known to inhabit the S.E. Bering Sea. Larval abundance, as ascertained to date, is relatively low for these other crab species. Therefore, data has been grouped and presented for all years in Figures 5.1 and 5.8 showing distribution of each taxonomic category and temporal comparisons and contrasts have not been made. An exception is presentation of data for *Hyas* and *Oregonia* spp. that are grouped by month from the PROBES 1978 cruise (Figs. 5.4-5.6).

Larvae of the non-*Chionoecetes* Brachyura consistently appeared in the upper 60 m sampled by the MOCNESS net in 1980, therefore densities of these larvae were corrected for the upper 60 m at deeper stations or left unchanged at stations shallower than 60 m.

5.2.1 Atelecyclidae

Approximately 8 % of the samples examined contained the larvae of *Erimacrus isenbeckii*, although this figure may be low due to damaged

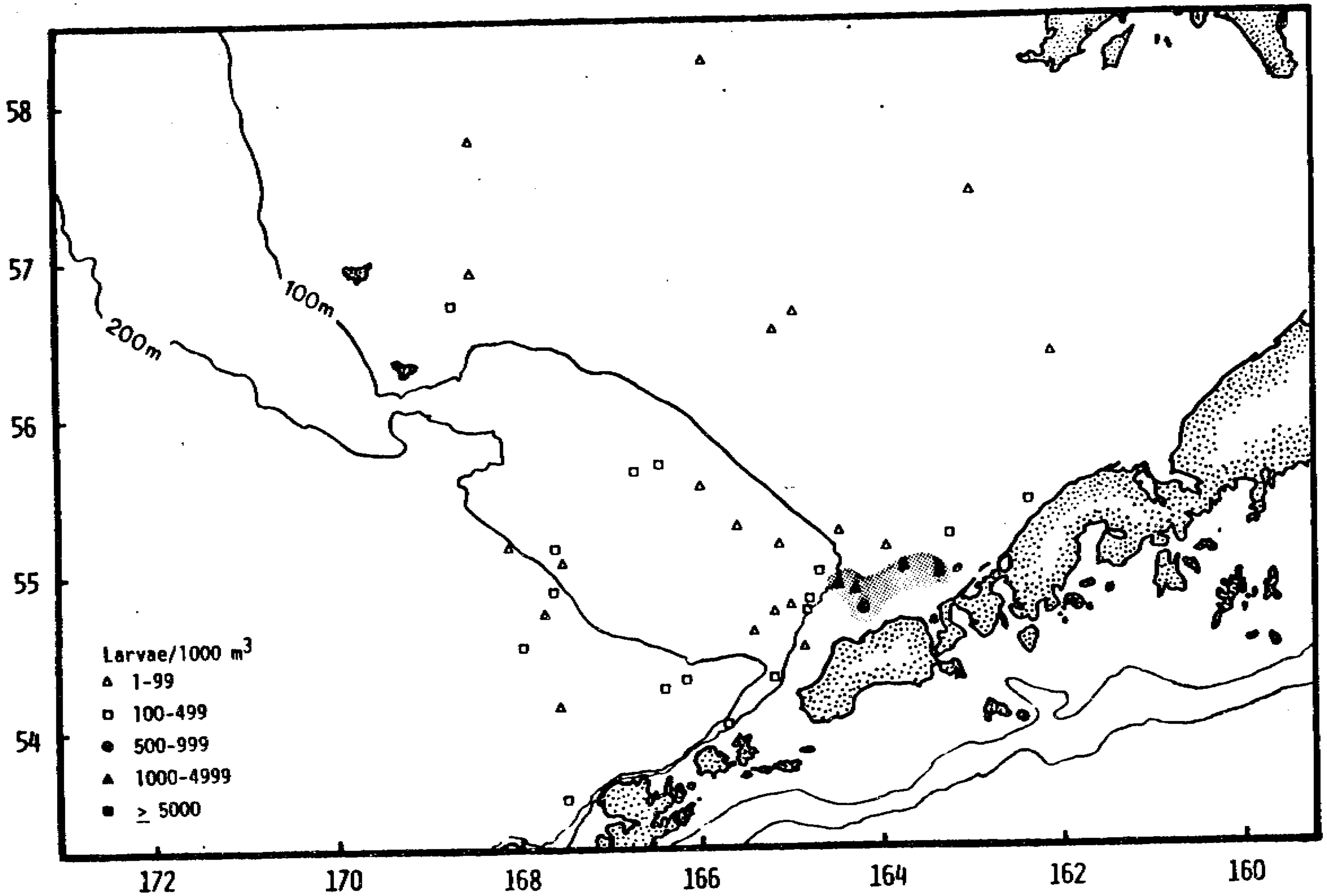

Fig. 5.1. Locations and density of <u>Erimacrus isenbeckii</u> larvae collected in the S.E. Bering Sea from 1976-1980. Densities of larvae were corrected for the upper 60 m. Locations of stations where no larvae were found were omitted, refer to Figures 2.1-2.12 for all station locations.

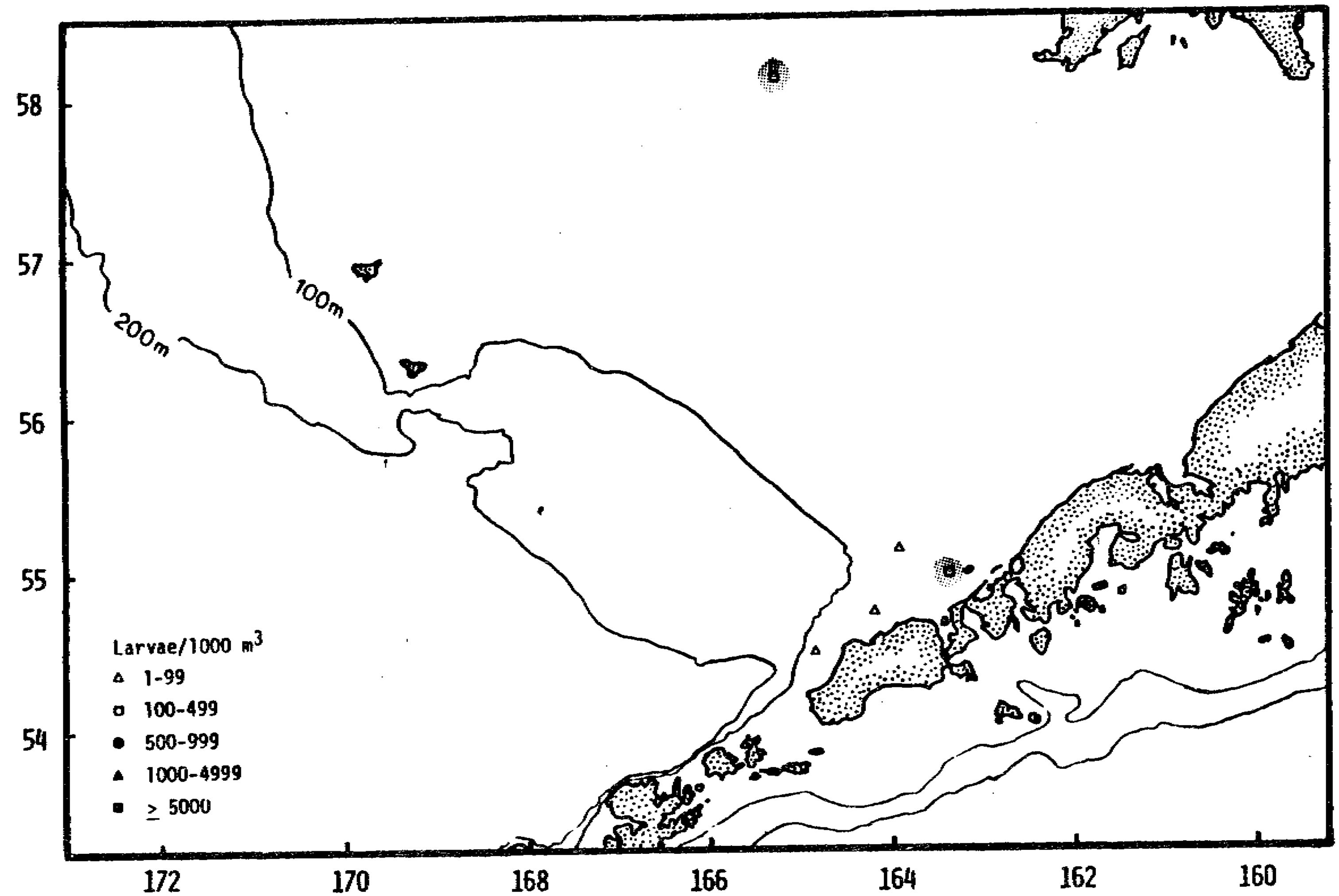

Fig. 5.2. Locations and density of <u>Telmessus cheiragonus</u> larvae collected in the S.E. Bering Sea from 1976-1980. Densities of larvae were corrected for the upper 60m. Locations of stations where no larvae were found were omitted, refer to Figures 2.1-2.12 for all station locations.

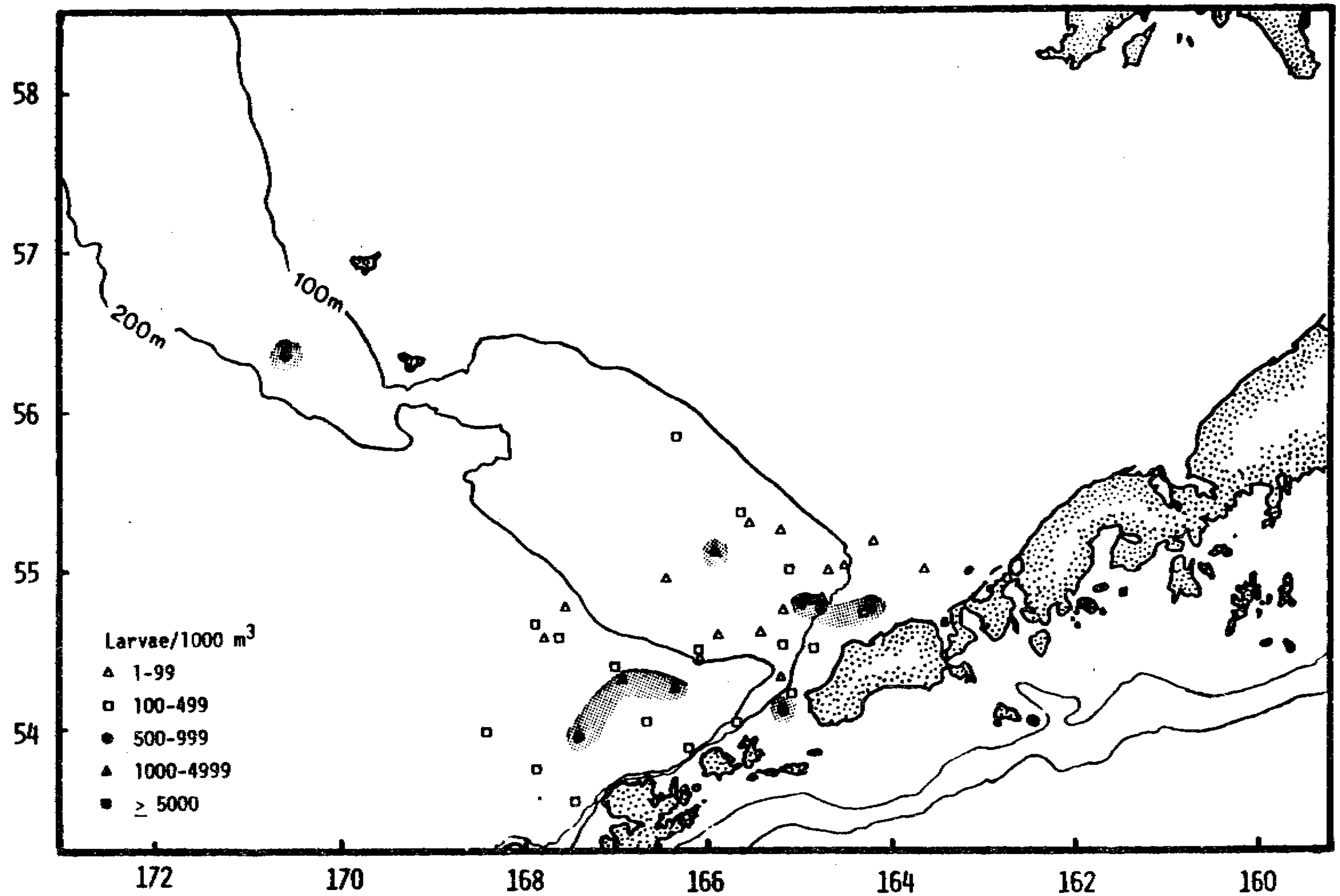

Fig. 5.3. Locations and density of Cancridae larvae collected in the S.E. Bering Sea from 1976-1980. Densities of larvae were corrected for the upper 60 m. Locations of stations where no larvae were found were omitted, refer to Figures 2.1-2.12 for all station locations.

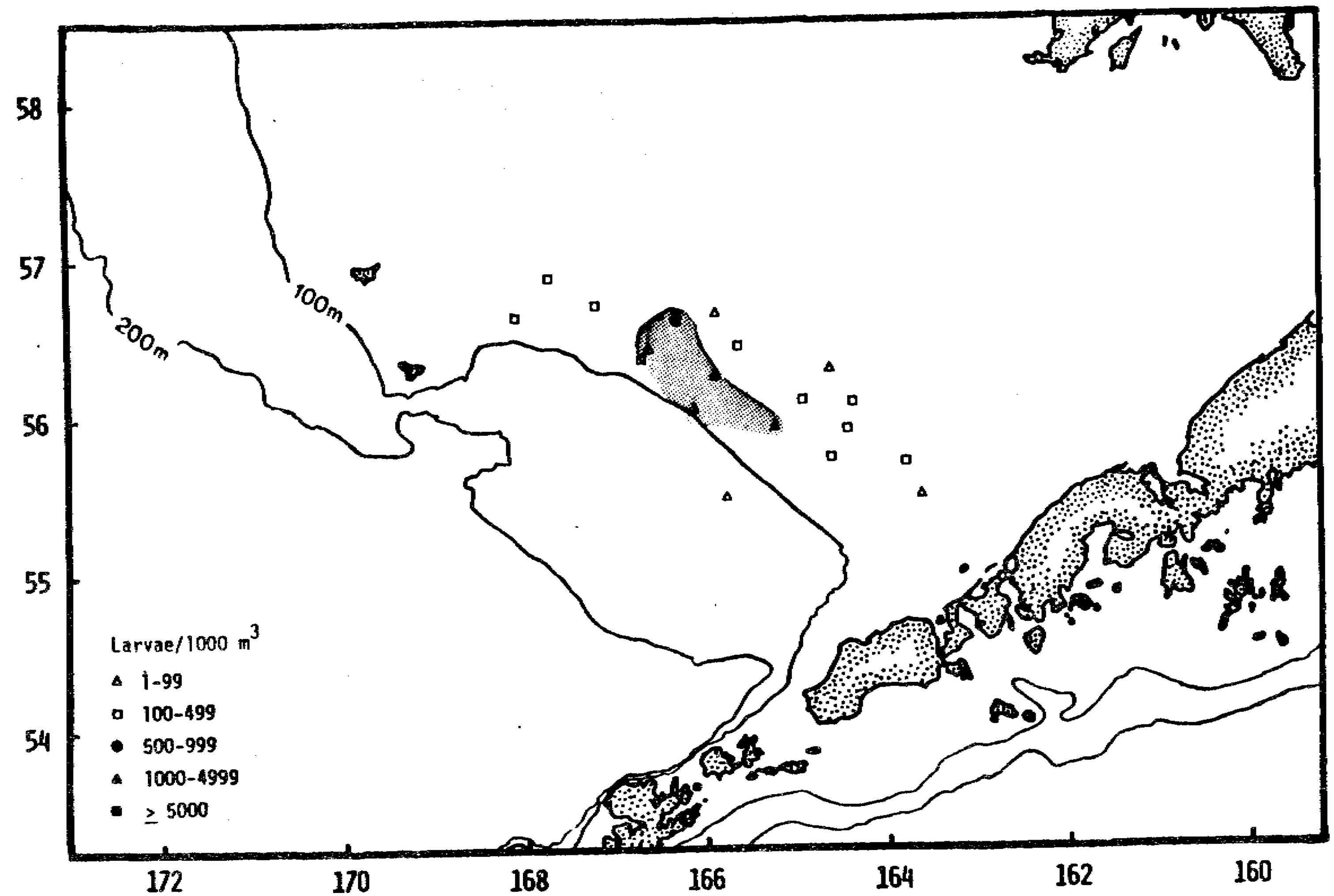

Fig. 5.4. Locations and density of Hyas and Oregonia spp. larvae collected in the S.E. Bering Sea in April 1978. Densities of larvae were corrected for the upper 60m. Locations of stations where no larvae were found were omitted, refer to Figures 2.1-2.12 for all station locations.

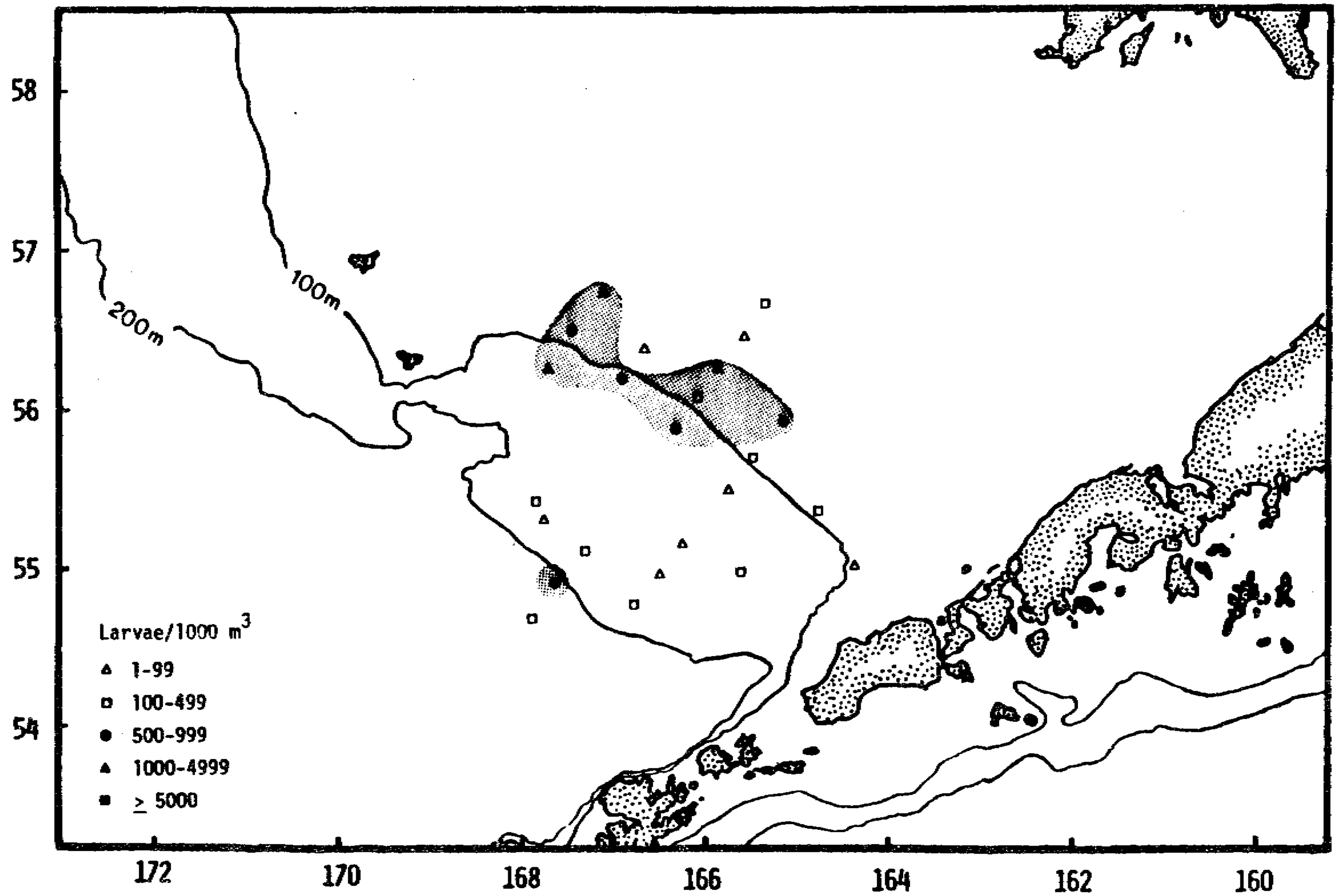

Fig. 5.5. Locations and density of *Hyas* and *Oregonia* spp. larvae collected in the S.E. Bering Sea in May 1978. Densities were corrected for the upper 60m. Locations of stations where no larvae were found were omitted, refer to Figures 2.1-2.12 for all station locations.

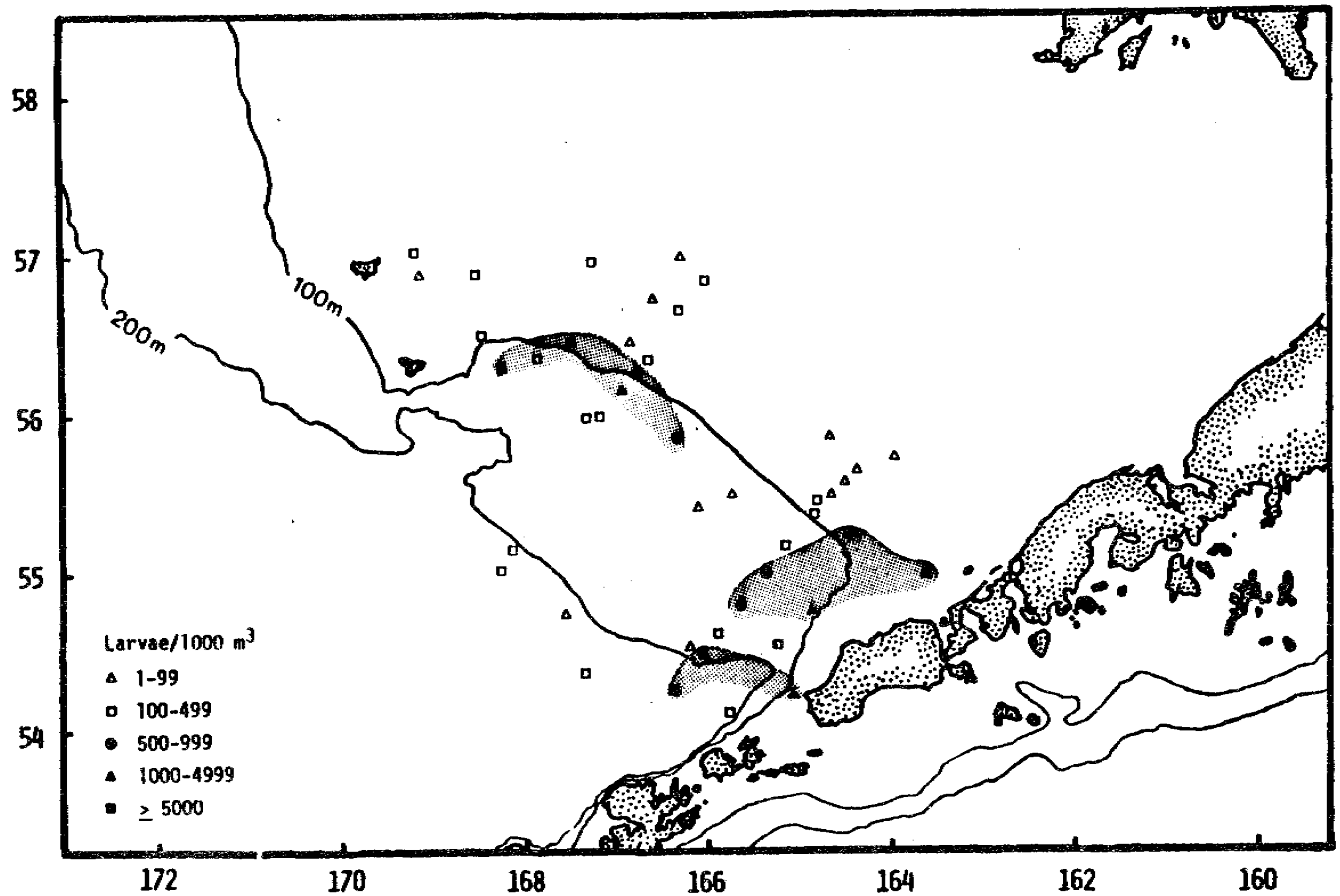

Fig. 5.6. Locations and densities of Hyas and Oregonia spp. larvae collected in the S.E. Bering Sea in June 1978. Densities were corrected for the upper 60m. Locations of stations where no larvae were found were omitted, refer to Figures 2.1-2.2 for all station locations.

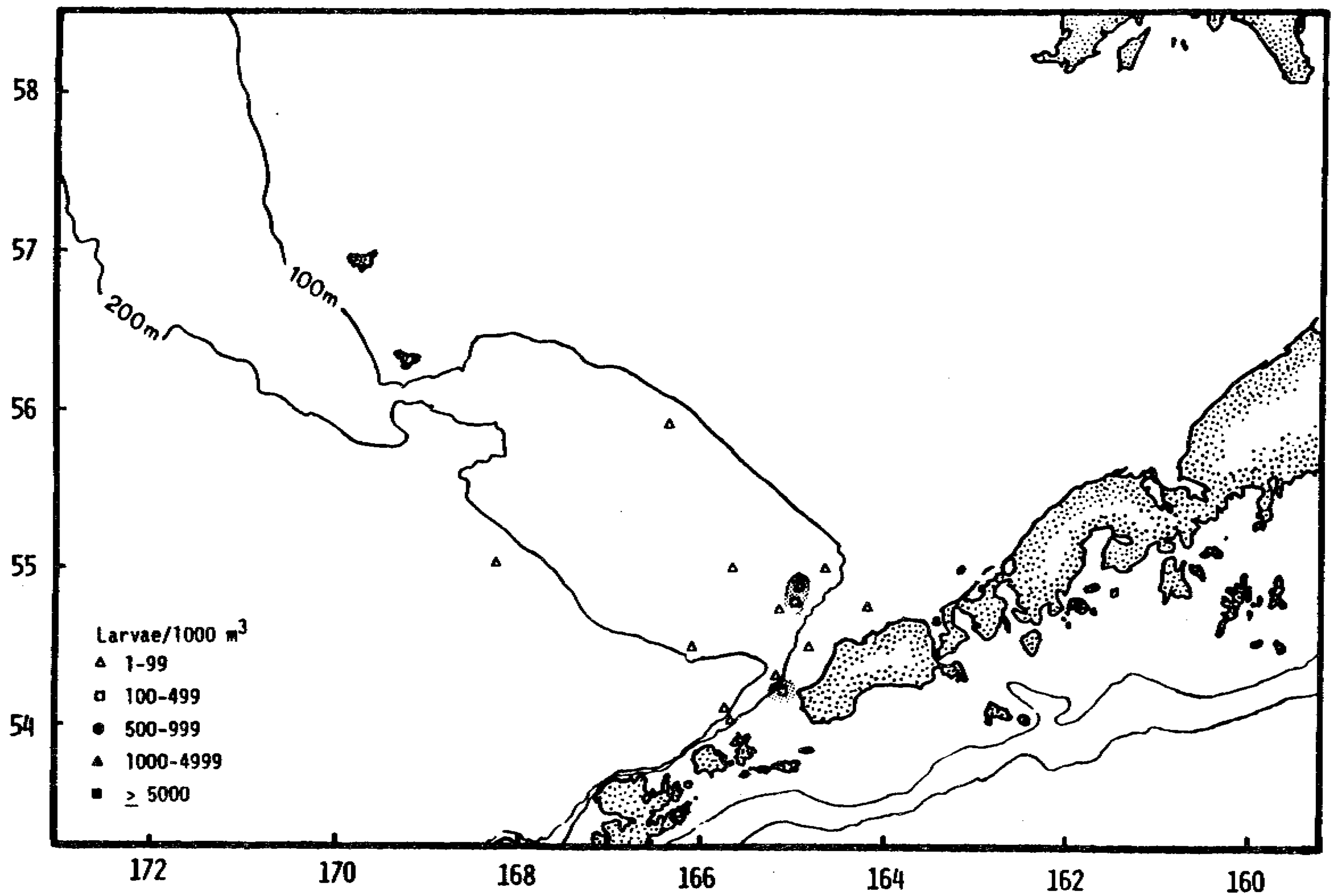

Fig. 5.7. Locations and densities of Acanthonychinae and/or Pisinae larvae collected in the S.E. Bering Sea from 1976-1980. Densities were corrected for the upper 60m. Locations of stations where no larvae were found were omitted, refer to Figures 2.1-2.12 for all station locations.

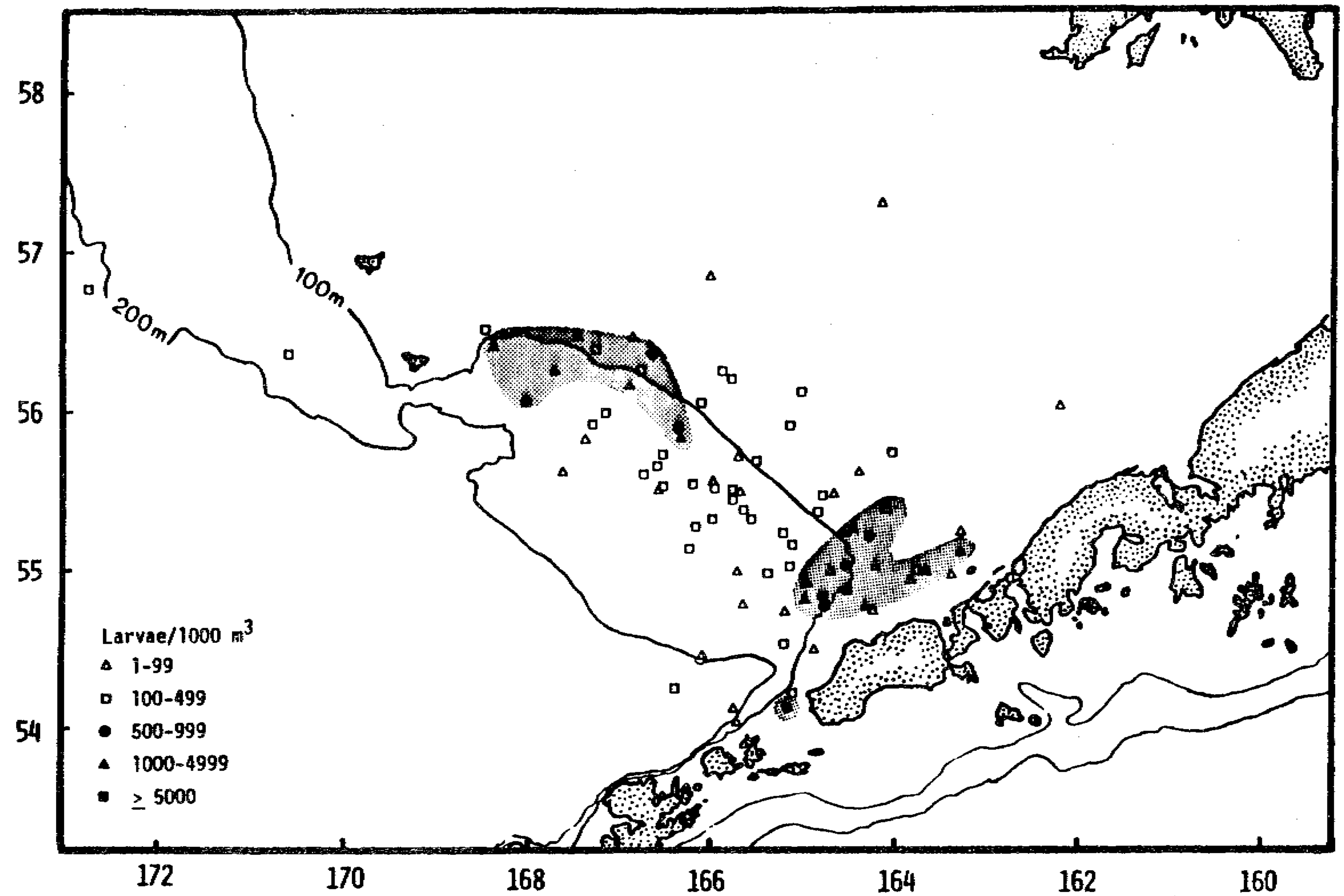

Fig. 5.8. Locations and densities of Pinnotheridae larvae collected in the S.E. Bering Sea. Densities of larvae were corrected for the upper 60 m. Locations of stations where no larvae were found were omitted, refer to Figures 2.1-2.12 for all station locations.

specimens that were not identified to species. These larvae were distributed on the shelf north and northwest of Unimak Island to about 55°30'N latitude with a few scattered across the middle shelf; along the outer shelf to about 166° 30'W longitude and a few were collected on the slope in waters with bottom depths of 200 to 400 m (Fig. 5.1). Greatest densities up to 2462 larvae/1000 m^3 were recorded along the North Aleutian Shelf just north of Unimak Island, but surprisingly few were found around the Pribilof Islands where the commercial fishery is centered (low numbers may simply reflect infrequent collection of zooplankton samples in that area). All five zoeal stages and the megalops stage were represented in the samples examined. Stage I, II, and III zoeae were present in samples collected in April and May, stage IV and V were collected throughout June and megalopae were found in late June between the Pribilof Islands and the Alaska Peninsula.

Larvae of *Telmessus cheiragonus* occurred in fewer than 1% of all samples examined and only in the years 1976, 1977, and 1978. Densities range from 12 to 891 larvae/1000 m^3 in water less than 70 m deep northwest of Unimak Island (Fig. 5.2). Larvae were also collected on the shelf south of Nunivak Island. Only stage I, II, and III larvae were represented in samples taken in late April to late June. Occurrence of larvae in water shallower than 70 m nearshore near Unimak Pass is consistent with patterns of adult distribution.

According to Makarov (1966) the larvae of *Erimacrus* are more numerous than those of *Telmessus* in plankton on the Kamchatkan Shelf.

Stage I zoea of both species appear in the plankton in the spring, all zoeal stages are found in June, and by July all stages disappear. He postulates that the megalops of both species stay nearshore in groups. Erimacrus may migrate inshore to reproduce, since deep water species reproduce later than shallow water species. Kurata (1969) found megalops of both species off the Kuril Islands in July and August.

Similar to Atelecyclidae larvae of the Kamchatkan Shelf, the larvae of Erimacrus are more numerous than those of Telmessus in the S. E. Bering Sea. Stage I zoeae also appear in the spring, but all zoeal stages of Erimacrus were never found together in the plankton at one time (Fig. 5.9) as reported for the Kamchatka Shelf by Makorov (1966). This suggests that populations in the S. E. Bering Sea are more synchronized in time of hatch, and therefore larvae of any year-class are probably separated by no more than three to four weeks in age. It is difficult to estimate when the zoeae disappear from the plankton of the S. E. Bering Sea because stage V zoeae were still present in latest seasonal samples sorted to date (late June 1978). No Erimacrus larvae were present in October 1980 samples. Megālopae of Erimacrus were observed (but not yet quantified) in zooplankton samples collected in mid-July 1981, and first instars likely settle to the benthos during early August. Although megalopae occur offshore based on our samples, isolated specimens have been found which does not preclude Makarov's supposition that this stage congregates nearshore.

5.2.2 Cancridae

Fewer than 9% of all samples thus far examined from the S. E.

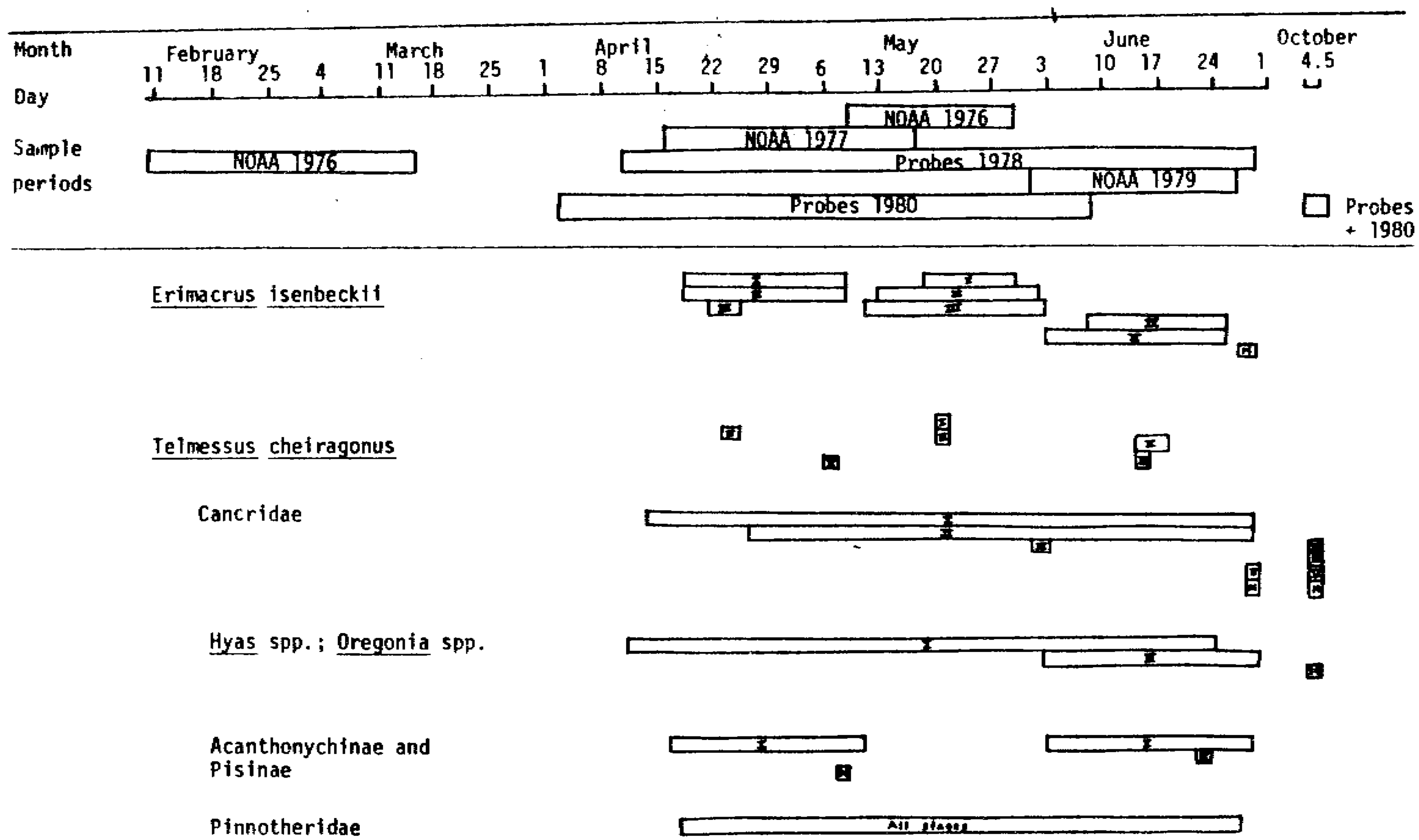

Fig. 5.9. Seasonal occurrence of larval stages of selected brachyuran larvae in the S.E. Bering Sea. Also depicted are the seasons and duration of cruises that collected zooplankton samples from which these data are derived (see Section 2.0, Figs. 2.1-2.11 for more details). Roman numerals designate zoeal stages, M designates megalopae.

Bering Sea contained larvae of _Cancer_ spp. These larvae were distributed on the north of Unimak Island and in the Pass along the 100 m isobath to about 55° 15'N latitude; several samples taken in deep water off the shelf break north of Unalaska Island had high densities of _Cancer_ spp. (Fig. 5.3). Larval _Cancer_ spp. ranged in densities from 32 to 4844 larvae per 1000 m^3, the maximum occurring on the outer shelf north of Unalaska Island (Fig. 5.3).

Based upon available literature most larvae are tentatively identified as _Cancer oregonensis_, but species determination is not definite. All five stages of zoeae were never found in samples of a single year. Stage I and II zoeae were present in samples collected in April, May, and June; stage III, V and megalops larvae were only observed in samples collected in June 1979 and October 1980, and stage IV zoeae were only found in samples collected in October 1980 (Fig. 5.9).

Although no distribution has been reported for adult _Cancer oregonensis_ in the Bering Sea, much of the distribution of larval _Cancer_ spp. agrees with the reported depth distribution for this species (see Table 5.1), but high concentrations also occurred in areas of water depths greater than 400 m. Adult _C. oregonensis_ may be found at depths greater than previously reported, larvae may drift over areas of deeper water or these larvae may belong to a species of _Cancer_ not previously reported from the Bering Sea. Larvae that may belong to _C. magister_ occurred near the Pribilof Islands on the outer shelf, a suitable habitat for the adults of this species, although far north of the known range limit.

During a study of decapod larvae of the Kodiak shelf (Kendall et al. 1980), zoeae tentatively identified as C. oregonensis were found offshore at mean densities of 7071 per 1000 m^3 in summer. Early stages were found inshore in spring and all stages were found in the fall. Larvae of C. oregonensis of the S. E. Bering Sea never occurred in densities as high as those reported for the Kodiak shalf. The times at which the various larval stages were found in the S. E. Bering Sea plankton coincided with those of the inshore plankton of the Kodiak shelf.

5.2.3 Majidae

Subfamily Oregoninae: Due to inadequate larval descriptions of Hyas and Oregonia spp. (subfamily Oregoniinae) that occur in the S. E. Bering Sea, larvae of this subfamily were grouped and not identified to species (see Section 4.0 for discussion of Chionoecetes spp. of the family Majidae). Larvae were present in approximately 30% of the samples examined and were widely distributed throughout the S.E. Bering, primarily along the 100 m isobath and over the St. George Basin (Figs. 5.4-5.6). Stage I zoeae were first found in samples collected during early April, and distribution was centered east of the 100 m isobath at about 56°N latitude and 166°W longitude (Fig. 5.4). In May (Fig. 5.5) distribution had expanded to include low densities over much of the St. George Basin but location of highest abundance was similar to April. Stage II zoeae were found in some June samples and both stage I and II were primarily located at the margins of the St. George Basin along the

100 m and 200 m isobaths (Fig. 5.6). Highest densities of larvae in June were located just northwest of Unimak Pass and north of Unimak Island at about 55° N and 165° W, in addition to the more northerly center of abundance reported for April and May (Figs. 5.4, 5.5). Expansion of the distribution pattern April through June implies that larvae of the several species of _Hyas_ and _Oregonia_ in this region hatched over several months and were not synchronous as a group. Megalopae were found only in October 1980 samples indicating that metamorphosis may not occur until late summer or early fall. Densities range from 8 to 4096 larvae/1000 m^3 over all months, but fewer than 4% of samples with larval Oregoniinae had densities in excess of 500 larvae/1000 m^3.

According to Makarov (1966) the release of larvae belonging to the species _Hyas coarctatus alutaceus_ into the plankton of the Kamchatkan shelf begins in mid May, _Oregonia gracilis_ begins to release larvae in June, and females of both species are found with fully developed eggs in July. He reports the appearance of stage II zoeae of these species in June and July, and the appearance of megalopae tentatively identified as _Oregonia gracilis_, in July. Feder and Jewett (1980) found _H. lyratus_ with well-developed eggs in the S. E. Bering Sea in late spring.

Without more data to evaluate temporal distribution and considering the uncertainty of identifying larval _Hyas_ and _Oregonia_ of the subfamily Oregoniinae, it is difficult to compare Bering Sea data with previous studies on larval appearance. The appearance of stage I larvae during

April in the S. E. Bering Sea (Fig. 5.9) suggests that hatching is earlier there than on the Kamchatkan shelf, or that these larvae are *H. lyratus*. But the appearance of stage II zoea in the S. E. Bering coincides with the timing of their appearance in Kamchatka. The only megalops observed in Bering Sea samples was collected in October 1980, a time of year Makorov (1966) did not sample.

Subfamilies Acanthonychinae and Pisinae: The separation of the larvae of subfamilies Acanthonychinae and Pisinae is not clear in the literature and accordingly they were grouped for this report. Approximately 3% of the samples examined contained these larvae, and most occurred at stations north of Unimak Pass near the 100 m isobath (Fig. 5.7). One sample off the shelf break at approximately 168° W longitude also contained these larvae, but in general, they were relatively uncommon. Densities ranged from 8 to 256 larvae per 1000 m^3, with the highest abundance northwest of Unimak Island. Stage I zoeae were present in April and May of 1977, and June of 1978 and 1980. Stage II zoeae were only found in June 1978 and megalopae were observed in May 1977 (Fig. 5.9).

5.2.4 Pinnotheridae

Pinnotherid larvae were present in 16% of the samples examined. These were distributed mostly in water 80 to 120 m deep from Unimak Pass to east of St. George Island on both sides of the 100 m isobath (Fig. 5.8). Densities ranged from 8 to 22,427 larvae/1000 m^3, the highest (greater than 10,000 larvae/1000 m^3) occurring north of Unimak Island

and False Pass. Densities greater than 1000 larvae/1000 m^3 occurred along the 100 m isobath from 166° W longitude to the Pribilof Canyon.

Pinnotherid larvae appeared in samples from all years. Specific zoeal stages were not determined, but zoeae were present in the plankton of the S. E. Bering Sea from April to late June and megalopae were found in late June (1979) (Fig. 5.9). The consistently high distribution of larvae in water 80 to 120 m deep along the frontal system between the outer and middle shelves suggests the group may be associated with bivalve mollusc, tube, or burrow-dwelling invertebrate hosts in that region.

Densities of Pinnotherid larvae were similar to those reported for the Kodiak shelf (Kendall et al. 1980) where larvae were found in the plankton from spring through fall. Megalopae were not found until September over the Kodiak shelf but were found in June in the S. E. Bering Sea. Metamorphosis and settlement may occur in late July and early August although not yet observed from Bering Sea stations.

6.0 DISTRIBUTION AND ABUNDANCE OF SHRIMP LARVAE IN THE S.E. BERING SEA WITH EMPHASIS ON PANDALID SPECIES

Janet Armstrong

6.1 Introduction

Bering Sea shrimps, suborder Natantia, belong to at least six families of decapod crustaceans. In addition to the commercially important family Pandalidae, represented by 5 species in the S.E. Bering Sea, other families are Hippolytidae and Crangonidae (Butler 1980), and possibly a species of the family Penaeidae (K. Coyle, U. of Alaska, IMS - personal communication). Feder and Jewett (1980) give an extensive list of the adult species found in the S.E. Bering Sea that includes members of he families Oplophoridae and Pasiphaeidae. (From all samples sorted to date only a single oplophorid larvae was found and these families are thus of no consequence in this report.) Butler's monograph (1980) on Pacific Coast shrimp gave ranges for many adults which were added to the Feder list (see Appendix A).

Pandalidae are the only shrimp of direct commercial importance and have thus received most attention in the literature. Thorough larval descriptions for pandalid populations of different geographic locations are given by Berkeley (1930) for British Columbia, Pike and Williamson (1962) for the North Sea, Kurata (1964c) for Hokkaido, Japan, and Rothlisberg (1980) for Pacific northwest (see Appendix B for complete list of references on larva shrimp). For identification of Bering Sea pandalid larvae the following comprehensive species descriptions were used:

Pandalus borealis - Haynes 1979
Pandalus goniurus - Haynes 1978a
Pandalus montagui tridens - Haynes 1980
Pandalus stenolepis - Needler 1938
Pandalopsis dispar - Berkeley 1930

6.2 Pandalidae

6.2.1 Pandalus borealis: Life History and General Biology

Distribution: P. borealis, an amphiboreal specie, ranges from Point Barrow, Chukchi Sea southwest through the Okhotsk Sea to the Sea of Japan and Korea, and southeast throughout the Bering Sea, and Gulf of Alaska to the mouth of the Columbia River. In addition it is found in the Barents Sea, the North Sea, and from the Gulf of Maine to western Greenland in 16-1380 m depths (Butler 1980). P. borealis is thought to be the bridge specie between the Atlantic and Pacific Ocean pandalid groups (Rasmussen 1967). Fishable populations occur between 54-400 m depths (Ronholt 1963), but the species is often dominant between 70-150 m at the outer edge of the continental shelf where bottom temperatures range between 1.8°-3.8°C (Ivanov 1969). Post-larval stages can tolerate a wide temperature range from -1.68° to 11.13°C (Allen 1959) while larvae can survive an upper limit of 14°C (Poulsen 1946 in Butler 1971). Haynes and Wigley (1969) describe P. borealis preference for soft mud, sand and silty substrates with relatively high organic content (0.5-1.5% organic carbon) in the Gulf of Maine. Survival is optimal at salinities from 25.9 to 35.7°/₀₀ (Allen 1959; Butler 1964).

Reproduction: Like all Alaskan pandalid shrimp, P. borealis are protandric hemaphrodites (Berkeley 1930). Animals first achieve sexual maturity as males at age 3.5 years in the Bering Sea and remain breeding males for two seasons. After a transitional period they subsequently develop female characteristics by 5.5 years (Ivanov 1969; Butler 1971). Females can mature early and circumvent the male phase entirely in populations found in southern parts of the range (Allen 1959; Butler 1964), but this event has not been recorded in the Bering Sea (Ivanov 1969). Rasmussen (1967) give comparative reproductive data for Norwegian populations and Haynes and Wigley (1969) summarize this information adding data on ovigery for Maine shrimp. Sexual development is hormonally controlled and has been studied by Carlisle (1959). Table 6.1 compares life history data of _P. borealis_ and other pandalid species.

Colder water temperatures of the Bering Sea slow growth and development, extend the ovigerous period, and greatly determine the seasons of spawning and hatching (Butler 1971). The normal life span for _P. borealis_ in the S.E. Bering Sea can be up to 6 1/2 years (Ivanov 1969) compared to 3 1/2-4 years for populations in the lower latitudes (North Sea, Allen 1959; British Columbia, Butler 1964).

Ovarian development occurs in mature females (age 5 years) in the summer followed by spawning from August to mid-September in the S.E. Bering Sea. Eggs are extruded, fertilized and carried on the pleopods through the winter and hatch from April through mid-May (NPFMC 1978). The average ovigerous period lasts from 7.5 to 9.5 months. Females from Kachemak Bay, Alaska carry approximately 914 eggs per clutch but a range of 300-3400 eggs, with an average weight of 1.4 gm (Haynes and Wigley 1969), has been noted for different _P. borealis_ populations world-wide

Table 6.1. Comparison of life history and reproductive information for pandalid species.

	Depth preference (m)	Sexual maturity[1] Male (mm) Size	Age	Female (mm) Size	Age	Maximum age year	Reproduction Fecundity Eggs/clutch	Ovigerous period	Larval hatch
P. borealis [2,3]	90-120	120 TL 19.5 CL	3 1/2	150 TL 25 CL	5 1/2	6 1/2	914 1631 2150	Nov.-Mar.	Apr., May
P. goniurus [4,5]	38-124	62 TL 13 CL	1	78 TL 16.5 CL	2	2 1/2	2000	Nov.-Apr.	
P. tridens [4]	200-470	83 TL 15 CL	1 1/2	123 TL 22 CL	2 1/2- 3	4		Nov.-Apr.	Apr.
P. stenolepis [4]		76 TL 14 CL		82 TL 18 CL				Nov.-Apr.	
Pandalopsis dispar [2,3,6]	>200	182 TL 31 CL	1 1/2	208 TL 36 CL	2-4	4	1129, 4150	All year	Mar. Apr.

References:

1 Data represent average length and age.
2 NPFMC: Fishery Management Plan and E.I.S. for the shrimp fishery in the Bering Sea, November 1978.
3 McBride 1974 - Kachemak Bay Ak. stocks (unpublished).
4 Butler, T. 1980 - Strait of Georgia, B.C. stocks.
5 McLaughlin, P. 1963 - S.E. Bering Sea stocks.
6 Hynes, F. 1930 - S.E. Alaska stocks.

(Rasmussen 1953 from Butler 1971; Allen 1959; Haynes and Wigley 1969). No fecundity data is available for th S.E. Bering Sea. Stickney and Perkins (1980) are currently studying the fluctuating fecundity of Maine stocks of P. borealis which, after declining in the early 1970's, seem to be rebuilding. Horsted and Smidt (1956 from Butler 1980) report that a parasite Hemiarthrus abdominalis can cause as much as 50% reduction in the number of eggs carried by P. borealis females in the North Atlantic Ocean.

Larval Development: P. borealis has 5 planktonic zoeal stages and one megalops stage before molting to a juvenile (Haynes 1979). Larvae grow from 6.7 mm mean total length at Stage I to 18.5 mm at the megalops stage. The average mean growth increment per molt is 2.36 ± 1.04 mm total length. Duration of planktonic life is approximately 3 months according to Berkeley (1930). In the North Sea, Allen (1959) found P. borealis molts as many as 14 times from larval metamorphosis to the male phase (from 21 to 93 mm total body length). At age 1.5 years, the Pribilof stocks are all immature males with a carpace length (CL) of 12-13 mm (Ivanov 1969). At age 2.5 years (CL = 18-19 mm) some shrimps become sexually mature males and participate in autumn breeding for the first time. Allen (1959) found that 5 molts are necessary before males exhibit mature sex characteristics. Most shrimp in the 3+ and 4+ age classes (CL = 22 mm and 25 mm, respectively) are breeding males with a small proportion as females. By 5.5 years of age (max CL = 27-32 mm) all shrimp are females. Few shrimp survive to 6.5 years and according to Ivanov (from NPFMC 1978), all at this age are non-reproducing or sterile females. Usually females undergo 3 molts between ovigerous periods (if they produce more than one brood) but do not molt from the time the eggs are extruded until 2 weeks after the zoeae hatch. The majority of Bering Sea P. borealis have only one brood (Ivanov 1969) and it is this last age class (5.5-6.5 yr) that supports the fishery.

Food Habits: Food habits of zoeae were studied by Stickney and Perkins (1980). Preliminary findings indicate that diatoms are a major food source for newly hatched zoeae in Maine and the timing of phytoplankton blooms may be crucial for early stage survival. Older larvae rely more on a zooplankton diet. Paul et al. (1978) performed prey density and feeding response experiments with Stage I P. borealis. Juvenile food habits received little attention. Adult diets consist of both benthic molluscs, detritus, small crustaceans, polychaetes, echinoderms, and protozoa, and pelagic copepods, euphausids, mysids and other shrimp and crab larvae (Barr 1970; Butler 1971). Pelagic organisms organisms are caught during diel vertical migrations when shrimp leave the bottom at dusk, disperse throughout the water column, and return to the bottom by dawn (Barr 1970).

Ontogenetic Migrations: Life stage and seasonal migrations in S.E. Bering Sea stocks are also assumed to occur. Stage I-III zoea remain generally within the area of hatch out but thereafter migrate to shallower water (46-64 m) where metamorphosis occurs and they spend their first summer as juveniles (Berkeley 1930, for Canadian stocks). Thereafter they move to deeper water to join the adults. Ovigerous females in the Gulf of Maine were found to move into shallower water as eggs developed

(Haynes and Wigley 1969). Pribilof populations effected by winter cooling migrate 30-40 miles toward the outer shelf from 85-100 m depths to 95-120 m depths where temperature is warmer and more stable (Ivanov 1969).

Predators: Principle predators include many commercial fish species: Pacific cod, white pollock (Feder 1978), sand sole (Miller 1967), silver and white hake, halibut and dogfish (Butler 1980). Grey and humpback whales, marine birds (NPFMC 1978) and harbor seals (Lowry et al. 1978) also prey on pandalid shrimp.

Competitors for the same habitat include *Pandalus tridens* and *Eualus macilentus*. It was theorized in "A Review of the First Northern Hemisphere Pandalid Shrimp Workshop" held in Kodiak, Alaska (Frady 1981), that after large-scale commercial depletion (i.e., Japanese overfishing the Pribilof area stocks 1961-63) or by predators, *P. borealis* shrimp stocks may be replaced by other competitor species of fish and shrimp.

6.2.2 Commercial Fishery

Historically the S.E. Bering Sea fishery has been dominated by Japan and the USSR. After catches of Japanese flounder trawlers indicated large populations of *P. borealis* in 1960, the Japanese targeted on shrimp stocks northwest of the Pribilof Islands and in 1961 took 14,000 metric tons (MT). Catches peaked in 1963 at 30,000 MT and declined thereafter until the area was abandoned in 1969 (NPFMC 1978). Overfishing of Bering Sea stocks during the early 1960's caused severe depression and slow recovery of stocks and there has been no significant fishery since 1966 (Paul Anderson - NOAA Cruise Results, Cruise No. 79-02, R/V Sunset Bay). In 1975 and 1976 3,500 and 1,700 MT of shrimp were taken by the Japanese from along the 100 m isobath on the continental shelf edge. Biomass estimates in 1978 stood at 30,600 MT (69 million lb) for an area of 24,000 square nautical miles (nm^2) northwest of the Pribilofs (NPFMC 1978). The maximum sustainable yield (MSY) from this population was estimated to be 11,000 MT but the current Allowable Biological Catch (ABC) has been set at 1,000 MT. This low quota reflects the current management goals of giving these stocks time to rebuild, and encouraging the maintenance of a healthy resource at historic levels which then could promote the development of a strong domestic shrimp fishery. The current ABC level will allow the management agency to assess annual catch per unit effort and collect biological specimens to construct age-class structure of the population.

Stock estimates for P. borealis population surveyed in 1979 over an extended area of 30,400 nm^2 (Pribilofs to St. Matthew Is. and out to the U.S. - U.S.S.R. convention line) indicate a mean biomass estimated at 63.56×10^6 kilograms (140 million lb with an 80% confidence interval of 120.5 - 159 million lb; P. Anderson, NMFS, Kodiak AK correspondence, Oct. 1981).

The above biomass estimates are based on an area northwest of the St. George Basin. Other estimates close to the St. George Basin come from 1979 NOAA/NMFS Cruise Results (Cruise No. OR-79-03 R/V Oregon) of a shrimp survey conducted in Unalaska, Makushin and Pavlof Bays. Biomass estimates for Unalaska Bay for 1979 were 0.95 million lbs for P.

borealis compared to 8.1 million lbs in 1978. Population estimates for 1979 were only 10-35% of 1978 estimates indicating a substantial decline.

No biomass estimates have appeared in the literature recently for the St. George Basin shrimp populations, and no commercial shrimp fishery is presently centered in that area.

6.2.3. Other *Pandalus* spp.

Other pandalids in the S.E. Bering Sea include *P. goniurus*, *P. tridens*, *P. stenolepis* and *Pandalopsis dispar*. Figure 6.1 shows frequency of occurrence of pandalid species from PROBES 1978 cruise. The range of *P. goniurus*, the flexed pandalid, is from the Chukchi Sea and Bering Sea to Puget Sound in 5-450 m (Butler 1980). In S.E. Bering Sea this shrimp prefers depths of 38-124 m and a mud to coarse sand bottom habitat at -.3° to 6.4°C (McLaughlin 1963). No zoea of this species have been found in our samples thus far, contrary to expectations.

P. tridens, the yellow leg pandalid, ranges from the Bering Sea to San Nicholas Is., Calif., in 5-1984 m (from Butler 1980). Adults prefer depths of 200-470 m and rocky habitats. The reproductive biology for *P. tridens*, also a protandric hemaphrodite, has been studied for Canadian populations (Butler 1964) but remains fragmentary for the Bering Sea. Haynes' (1980) study of *P. tridens* larvae show growth from 3.2 mm TL for Stage I to 13.0 mm TL for Stage VII and megalops. No data is available for age and size at maturation for males and females in the Bering Sea

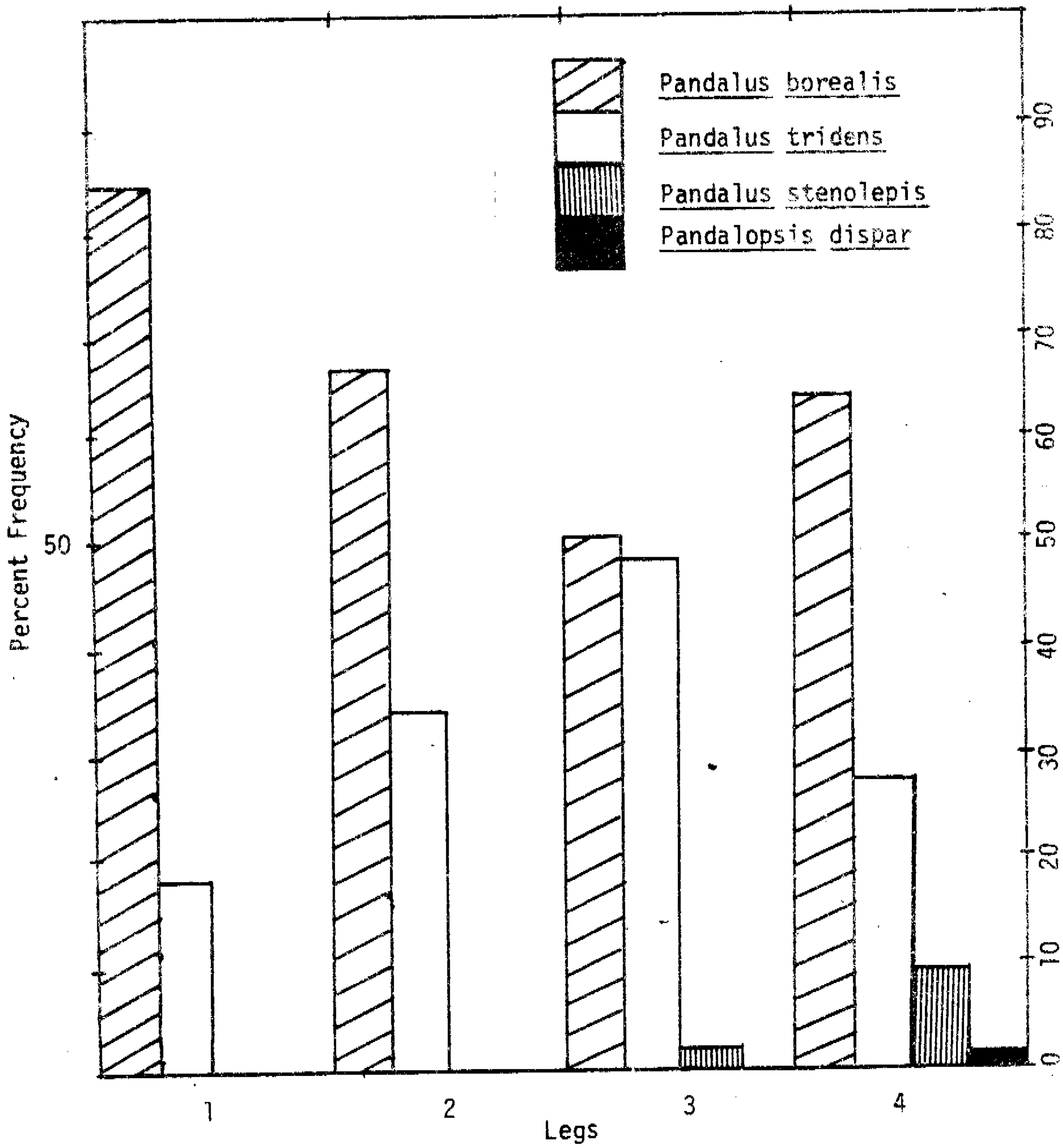

Fig. 6.1. Frequency of occurrence of pandalid larvae species from PROBES 1978 (11 April - 29 June).

but Butler (1980) gives this information for a Canadian population (see Fig. 6.1). _P. tridens_ was caught incidentally at only one station during the 1979 pandalid survey cruise in the S.E. Bering Sea from the Pribilof to St. Mathew Island group and out to the U.S. - U.S.S.R. convention line (NOAA 1979, Cruise Results No. 79-02, R/V _Sunset Bay_).

The rough patch shrimp, _P. stenolepis_, is known to occur from Unalaska Island to Hecata Bank, Oregon in 49-229 m depths over muddy bottoms (Butler 1980). Reproductive biology is poorly known for Canadian populations (Butler 1964) and unstudied for S.E. Bering Sea but it is assumed to follow a typical pandalid pattern. Needler (1938) gives descriptions of 6 larval stages plus a first postlarvae. Larvae grow from 5 mm TL at Stage I to 14 mm TL at Stage VI in British Columbia. The ovigerous period lasts from November until April in Canadian waters (Butler 1980). No commercial concentrations of this specie are known to occur in the North Pacific.

The side-stripe pandalid, _Pandalopsis dispar_, prefers greater depths (>200 m according to Butler 1980) than _P. borealis_, and ranges from the Pribilof Is. to Manhattan Beach, Oregon (Butler 1980). Growth and reproduction were studied for Canadian populations (Berkeley 1930; Butler 1964) but no information is available for Bering Sea stocks. Berkeley (1930) describes 5 or 6 larval stages of _P. dispar_ growing from 10 mm TL at Stage I to 30 mm TL at Stage V. In Canadian populations males matured at 18 months and were reproductively active for two seasons. Transition to females occurred by age 3 yr and death followed the hatching of a single brood (Berkeley 1930). It is assumed that the colder waters of the S.E. Bering Sea retard growth and maturation and prolong the life span. Harris et al. (1972) studied the relationship between carapace length and egg number. Puget Sound *P. dispar* were found to have a mean egg count of 904 eggs/clutch versus 4,150 eggs/clutch found by Hynes (1930) in a S.E. Alaskan population (Table 6.1). Also, *P. dispar* females were found to be smaller at the same age in Puget Sound than in S.E. Alaska. Commercial quantities of *P. dispar* have been taken by trawlers off the British Columbia coast but usually *P. dispar* occurs in mixed catches with *P. borealis* in Alaska.

Comments on Bering Sea Pandalids: The ecological and potential commercial importance of pandalids in the S.E. Bering Sea is difficult to ascertain and the following points should be stressed.

1. NMFS groundfish trawl surveys routinely underestimate sizes of shrimp stocks due to the large mesh size of their nets.

2. Little attention has been given these families in studies of benthic ecology since they are not found in commercially exploitable quantities or sizes.

3. An underestimation of the importance of these groups has resulted and scant attention has been given to the crucial trophic role they play in the diet of commercial fish, and marine mammals.

6.3 *Hippolytidae*

The Hippolytidae are the largest family of shrimp with respect to number of species in the North Pacific Ocean (Butler 1980) and are represented by 17 or more species in the S.E. Bering Sea (see Appendix A). As a group they are generally small to medium sized shrimp dominating the 40-80 m depths of the continental shelf (Ivanov 1969; Table 6.2). Larval descriptions appear in the literature for five species (Williamson 1957; Haynes 1978b; Pike and Williamson 1960; Appendix B) while mention of the others is either incomplete or totally lacking. There is a wide range in number of hippolytid zoeal stages from 2 in lebbeids to 5-9 in eualids (Table 6.2). No complete larval series is available for *Heptacarpus*.

Adult descriptions are given by Butler (1980) for *Eualus avinus*, *E. barbatus*, *E. fabricii*, *E. pusiolus*, *E. townsendi*, *Heptacarpus camtschatica*, *H. moseri*, *Lebbeus grandimanus*, *L. groenlandicus*, *Spirontocaris arcuata*, *S. lamellicornis*, *S. ochotensis*, *S. prionata*, and *S. snyderi*. Additional species of hippolytids may have been overlooked in compiling the list in the appendix. The most abundant of these species are probably *E. gaimardii belcheri*, *Eualus macilentus*, and one of the spirontocarids in our study area.

The crucial role these species play in the food web of the Bering Sea is reflected in such studies as Lowry et al. (OCS 1981 report). They showed *Eualus gaimardii belcheri* to feed upon ostracods, euphausids, copepods and phytobenthic plankton. In turn, *E. belcheri* comprised 20-38% by volume of the total diet of ringed seal pups and was the major summer food for spotted seals. Feder and Jewett (1981) depict small, miscellaneous shrimp as food items for several species of fish (cod,

Table 6.2. Life history information for hippolytid species.

	Depth (m)	Range	Total length Male (mm)	Female (mm)	Number of larval stages
Eualus avinus	46-642	Pribilofs - Oregon	29	44	I-V or I-IX then megalopa
E. barbatus	82-507	" "	76	95	
E. fabricii	4-255	Circumboreal	27	42	
E. g. belcheri[1]	5-55	" northern form			
E. macilentus[2]	50-100	No data			
E. pusiolus	0-1381	Circumboreal			
E. stoneyi[1]	No data	-			
E. suckleyi[1]	No data				
E. townsendi	38-630	Pribilof < Sea of Japan Puget Sound	35	44	
Heptacarpus moseri	0-1100	Pribilof - Wash.		43	No data
H. camtschatica	0-108	Chukchi < Sea of Japan Str. of St. George	32	45	
Lebbeus grandimanus	6-180	Bering Sea - Sea of Japan San Juan Is.	36	45	I, II and megalopa
L. gröenlandicus	11-518	Bering Sea - Sea of Japan + N. Atl., Wash.	58	107	
Spirontocaris arcuata	5-641	Chukchi - Sea of Japan Wash.	22	46	I - V and megalopa
S. lamellicornis	3-192	Commander Is. - Pt. Arena, CA.	42	63	
S. murdocki	No data	-	-	-	
S. ochotensis	0-247	Bering Sea < Sea of Japan Vancouver Is. WA.	22	31	
S. prionata	4-163	Bering Sea < Sea of Japan Monterrey. CA	19	28	
S. snyderi	4-141	Bering Sea - Cedros Is., CA	18	24	

References: Butler, T. 1980.
[1]Anderson, P. (personal communication) - common in St. George Basin.
[2]Ivanov, B. 1969 - common in S.E. Bering Sea.

starry flounder) in the S.E. Bering Sea, but quantification of use is not given.

6.4 Crangonidae

Crangonid shrimp are represented by eight or more species in the S.E. Bering Sea (see Appendix A), of which four are common (Crangon dalli, C. communis, Sclerocrangon boreas and Argis dentata). As a group they are generally medium-sized shrimp dominating the 0-50 m depths of the continental shelf (Ivanov 1969; Table 6.3). They are an important food source for demersal fish and invertebrates although they do not support a direct commercial fishery in Alaska. Crangonids eat benthic diatoms, detritus, polychaetes, small crustaceans, crustacean eggs and larvae, gastropods, foraminifera and ophiuroids (Squires 1967), and mysids captured during diel vertical migrations (Sitts and Knight 1979). They are preyed upon by sand sole (Miller 1967), starry flounder (Feder and Jewett 1978), Pacific cod (Feder 1978), yellowfin sole (Feder and Jewett 1981), Belukha whales and phocid seals (Lowry et al. 1981), and Dungeness crabs, tomcod, and sculpin (Stevens and Armstrong 1981).

Very little literature exists on the relative abundance of crangonid stocks. Their shallow, in-shore habitat has not been extensively sampled by suitable methods. These species bury in the sand during the day and thus dredging rather than trawling might yield more complete data. Crangon dalli and A. dentata appeared in 34 and 31% of the OCSEAP 1975 tows and C. communis, A. dentata and A. ovifer appeared in 24, 29, and 21% of the 1976 tows (Feder 1978). Crangon communis is abundant where Pandalus borealis and Pandalopsis dispar are found (Butler 1980),

Table 6.3. Life history information for crangonid species.

	Depth (m)	Range	Max. T.L. (mm) Male	Max. T.L. (mm) Female	Number of larval stages	Fecundity eggs/clutch
Crangon dalli[2,3]	38-110	Chukchi - WA. and Sea of Japan	50	80	I - V and megalopa	4290
C. communis	16-1537	Chukchi - CA. and Sea of Japan	61	80		2200
C. alaskensis	5-50	Bering Sea - WA. and Kurile Is. Japan	52	65	I - V and megalopa	
Sclerocrangon boreas[2]	0-366	Circumboreal	110	108	Direct development	448
Argis alaskensis	18-221	Pribilof - Ore.	44	67		
A. crassa	4-125	Northern Bering Sea - WA. and Sea of Japan	40	56		448
A. dentata[2]	0-2090	Circumboreal	46	83	I - II and megalopa	
A. lar[2]	10-280	Chukchi - Str. of St. George and Sea of Japan	56	79	Larval life <1 month	980
A. ovifer	102-673	Pribilof	38	67		

[1]Data compiled from Butler, T. 1980.
[2]Anderson, P. - personal communication - most common crangonid species in the St. George Basin NMFS surveys.
[3]Ivanov, B. 1969. Most common crangonid specie.

and is commonly found on mixed mud, sand bottoms at depths of 62-95 m at temperatures of 0.5-3.6°C (McLaughlin 1963). Population estimates of crangonids in the S. E. Bering Sea have not been made. Estimates made from trawl surveys in Grays Harbor, Washington, were as high as 38 million shrimp for the bay during summer months, and even this figure was thought to be low because of gear inefficiency (Hoeman and Armstrong 1981). Crangonid populations in the Bering Sea may be substantial. Their ecological and community role both as detrital processors (Rice 1981) and predators, and as prey for commercial fish and crustacea make them an important group to consider in scenarios of oil impact.

Larval descriptions are complete for 3 species; *C. dalli* (Makarov 1966), *C. alaskensis* (Loveland 1968) and *A. dentata* (Squires 1965). Five larval stages and one megalops are known for *C. dalli* and *C. alaskensis*, while *A. dentata* had only 2 zoea before the post-larval stage and *Sclerocrangon boreas* undergoes direct development in which larvae hatch as juveniles (Table 6.3). No information appears in the literature describing the reproductive biology of these species in the S. E. Bering Sea. Allen (1960) reported that hatching occurs from May through August in *Crangon dalli* from North Sea stocks. On the Kamchatkan shelf, Makarov (1967) noted that argids hatched from May to the end of June.

6.5 Penaeidae

Among the plankton collected in the S. E. Bering Sea and sorted in our project is a series of four larval stages from a very distinctive group. Most notable characteristics of this group are long dorsal and lateral spines on the dorsal margins of each abdominal segment and five spines above each eye. Makarov (1967) assigns this spiny larvae to the family Crangonidae, Paracrangon echinata, while Kurata (1964) relegates them to the family Glyphocrangonidae, Glyphocrangon sp. Ken Coyle from the University of Alaska (personal communication) disagrees with both designations and has assigned these larvae to the family Penaeidae since Glyphocrangon sp. do not range to the Bering Sea. These larvae will appear in our summaries as a deep-water penaeid until further clarification reveals otherwise.

6.6 Results and Discussion

6.6.1 Pandalidae

Larval Duration: Stage I zoea of P. borealis were present in early April during first sampling days of the NOAA 1977, 1978 and 1980 PROBES cruises and continued to be taken until mid May in 1978. The zoea required approximately 3 months of planktonic life to accomplish the five molts to the megalopa stage (VI) and settle to the benthos. Although the sampling periods of cruises sorted to data did not extend through late summer, it is apparent that most larvae would probably settle out by mid-August. Figure 6.2 compares P. borealis and P. tridens larval stage occurrence during the PROBES 1978 cruise. Two to three weeks seems to be the normal intermolt period for both species.

P. tridens zoea seemed to follow the same pattern of emergence, appearing first on April 16 (NOAA 1977) and April 23rd (PROBES 1978). No P. tridens larvae were taken until April 27th in 1980 (PROBES 1980

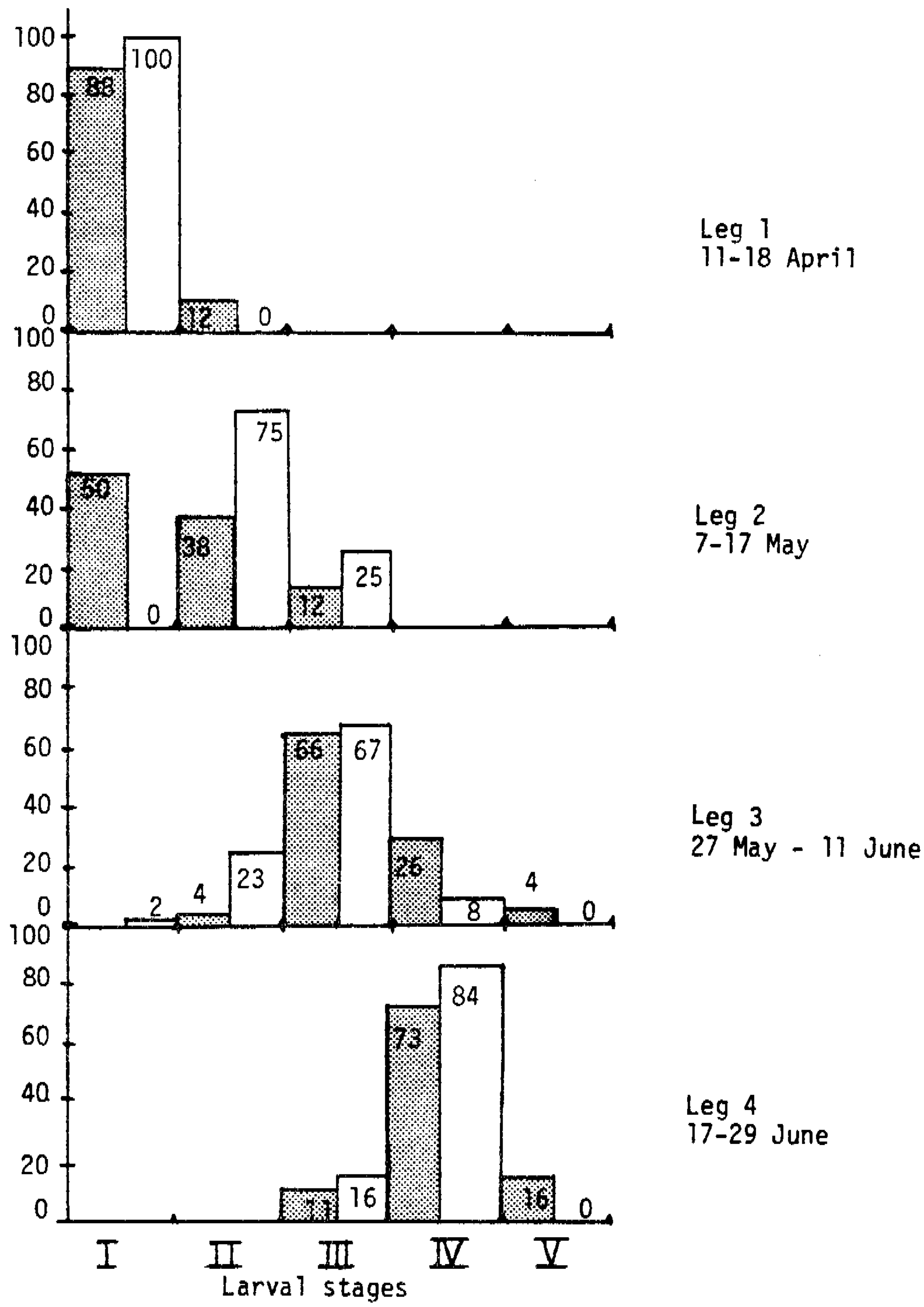

Fig. 6.2. Percent occurrence of P. borealis and P. tridens larval stages from PROBES 1978 cruise (11 April - 29 June).
Dark bars = P. borealis
Open bars = P. tridens

Leg 3). This lag of appearance is undoubtedly due to a geographical factor in the cruise tracts. Sampling over the >200 m depths preferred by P. tridens adults did not occur until late April in the PROBES 1980 cruise. By Leg 4 (late June) in 1978 most pandalid zoea had advanced to Stage IV.

The northern-most range of P. stenolepis is given by Butler (1980) as being Unalaska Island. The NOAA 1977 cruise first took P. stenolepis stage I zoea on April 16 just west of Unimak Pass. No other cruises sampled this area in the month of June. All stages of P. stenolepis larvae were found in Leg 4. The prolonged incidence of early stage larvae in Leg 4, PROBES 1978 sampling, indicates that they may still be in the water column until September.

Pandalus goniurus adults are commonly taken from the St. George Basin (Feder 1978) in 38-124 m depths on a mud to coarse sand bottom. A pandalid larvae type somewhat smaller, with fewer aesthetes on the antennule, and fewer setae on the antennal scale than P. borealis described by Haynes 1978, was found sporadically in the samples from most years. This type agreed with a description of P. borealis, Stage I, from Hokkaido (Kurata 1964). It was significantly different from Haynes (1978) larval description for Stage I P. goniurus from Kachemak Bay, Alaska. Since the colder water temperatures of the Bering Sea may cause significant size differences in larvae compared to populations from the Alaskan Gulf, size alone cannot be used as a definitive characteristic. Setae and aesthetes counts show consistent increases over Kachemak Bay P. goniurus. At this point P. borealis identification will be reported for these smaller early stage larvae with the understanding that some *P. goniurus* larvae may have been combined with *P. borealis* larvae. This problems will receive extra attention in the future and an effort will be made to redefine zoea and extricate larval numbers of *P. goniurus* for a final report. Any *P. borealis* larvae from 40-120 m stations will be re-examined.

Only one *Pandalopsis dispar* zoea, a stage V, was taken June 17 during 1978 PROBES cruise at the western side of Unimak Pass. The northernmost range is given as the Pribilof Islands but no zoea were taken from that area.

Distribution and Abundance: *Pandalus borealis* larvae were found in greatest density between the 100-200 m isobaths over the St. George Basin (Figs. 6.3-6.5). Data from several years were grouped in order to increase the number of stations shown and presented by month for April, May, and June (interannual variation in larval density does not appear to be great but statistical comparisons will be made for the final report in 1982). Larvae of *P. borealis* species were first recorded from samples collected in early April during 1978 and 1979. Zooplankton samples collected February 11 to March 16, 1978 contained no pandalid zoeae and first hatch, therefore, was assumed to occur about April 1. Mean density of *P. borealis* over the St. George Basin was 224 larvae/1000 m^3 (range 40-1032) and 118/1000 m^3 (range 50-300) in 1977 and 1978, respectively (Fig. 6.3). In May, *P. borealis* densities were comparable to April with mean densities of 109 and 110 larvae/1000 m^3 in 1977 and 1978, respectively. Larval *P. borealis* populations were still centered

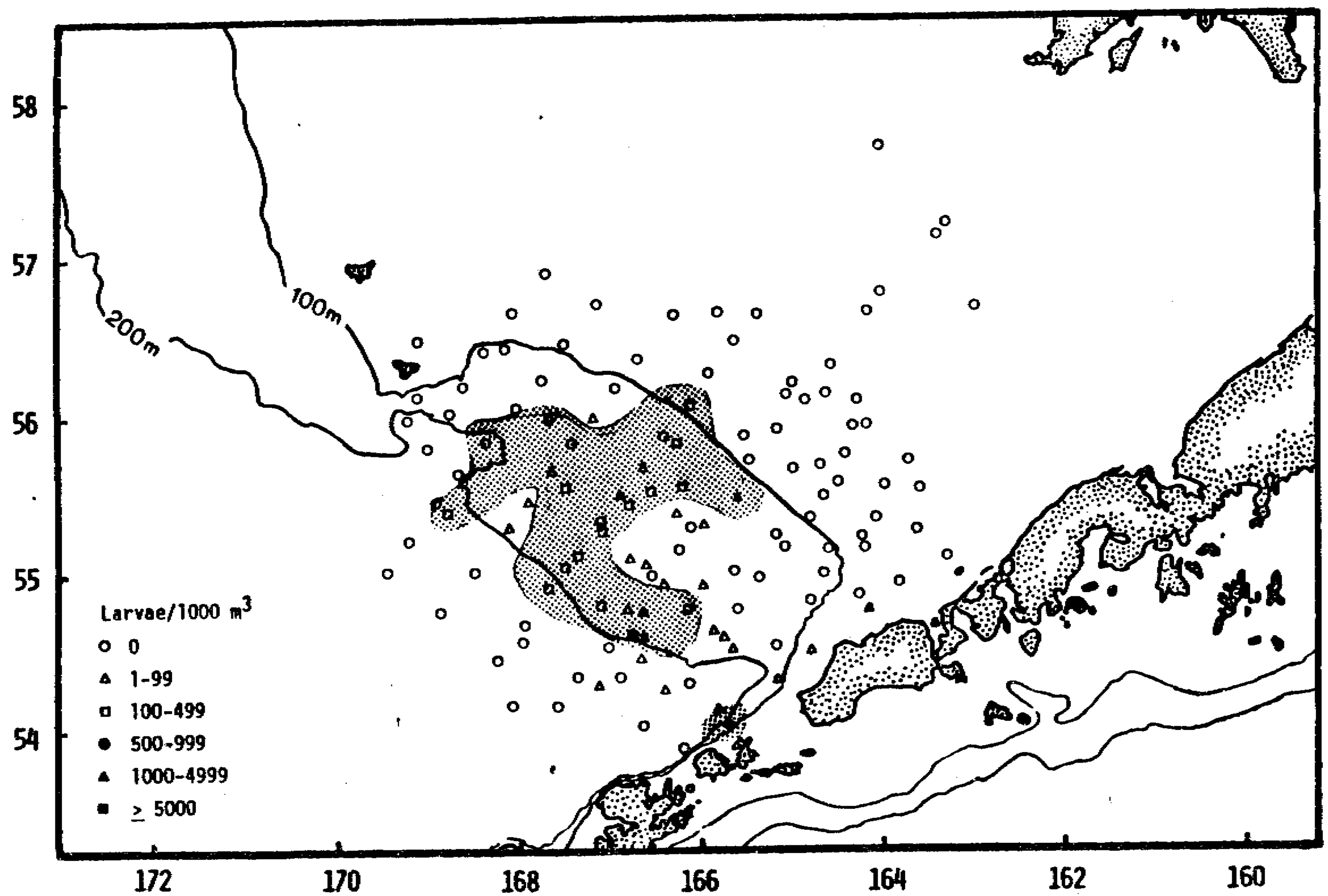

Fig. 6.3. Distribution and abundance of Pandalus borealis during the month of April (NOAA 1977, PROBES 1978 leg 1, Probes 1980 legs 2 and 3 cruises).

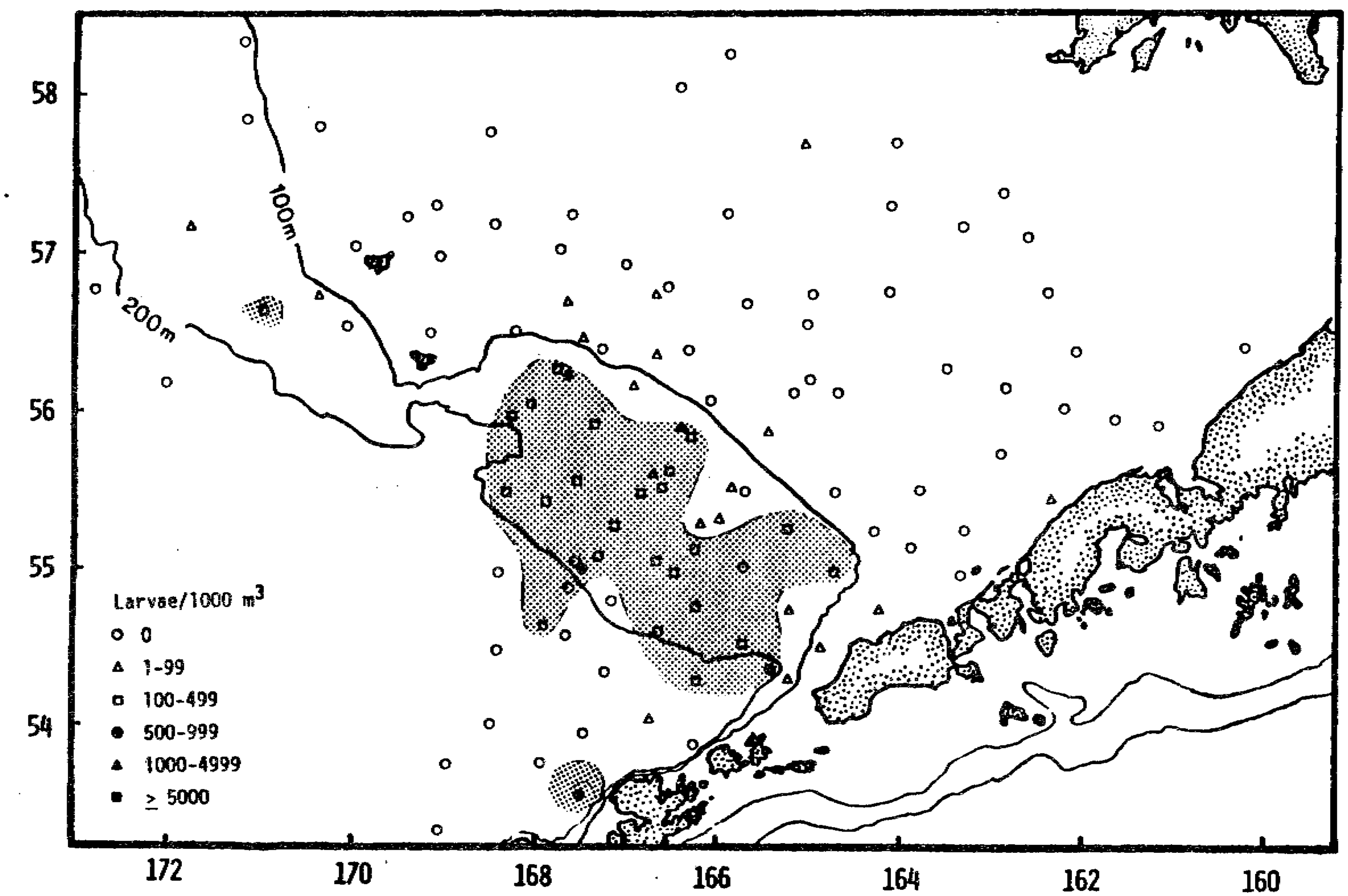

Fig. 6.4. Distribution and abundance of P. borealis for the month of May (NOAA 1976, 1977, PROBES 1978 leg 3, 1980 legs 3 and 4).

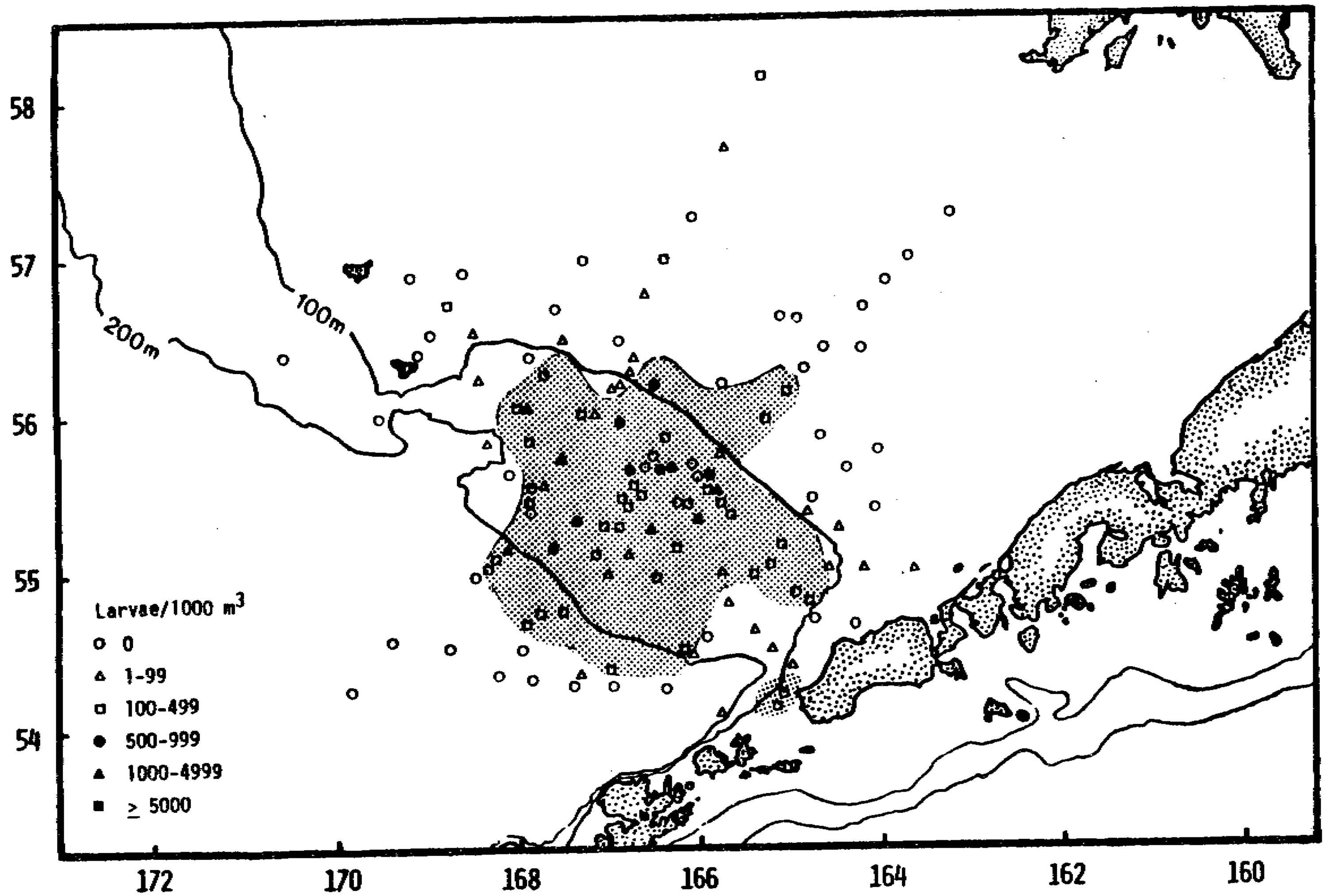

Fig. 6.5. Distribution and abundance of P. borealis for the month of June (NOAA 1979, PROBES 1978 legs 3 and 4, PROBES 1980 Leg 4).

over the St. George Basin in May but more widely dispersed with high densities of 940 larvae/1000 m^3 recorded in the southeast portion of the Basin near Unimak Pass (Fig. 6.4). During June, *P. borealis* are still most abundant over the St. George Basin and virtually absent from the Middle Shelf Domain and the North Aleutian Shelf (Fig. 6.5). Mean densities were 130 (range: 20-430 m) and 236 larvae/1000 m^3 (range: 50-760) in 1978 and 1980, respectively, at stations where this species was recorded.

In summary: 1) Larvae of *P. borealis* apparently hatch in early April. 2) Hatching is not protracted throughout the population and may occur within a 3-week period. 3) Larvae are restricted in distribution to the St. George Basin between the 100 and 200 m isobaths. 4) Mean density in this area is between 100-500 zoeae/1000 m^3 in the upper 60 m of the water column. 5) Larvae molt about every 3.5 weeks and so would progress through six larval stages and metamorphose to the benthos about mid-August.

Larvae of *Pandalus tridens* were first recorded from samples collected in April of 1977 and 1978 (none in February-March collections) near St. George Island. The eastern range of *P. tridens* overlaps *P. borealis* within the Outer Shelf Domain of the St. George Basin, but areas of highest density are southwest of the 200 m isobath at the shelf break and along the convergence of the 100 and 200 m isobaths from Unimak Pass to Unalaska Island (Fig. 6.6; compare to *P. borealis* distribution in Fig. 6.5). Densities at stations where the species was recorded ranged from 40 to 1410 larvae/1000 m^3 and averaged about 140, 350, and 280 larvae/

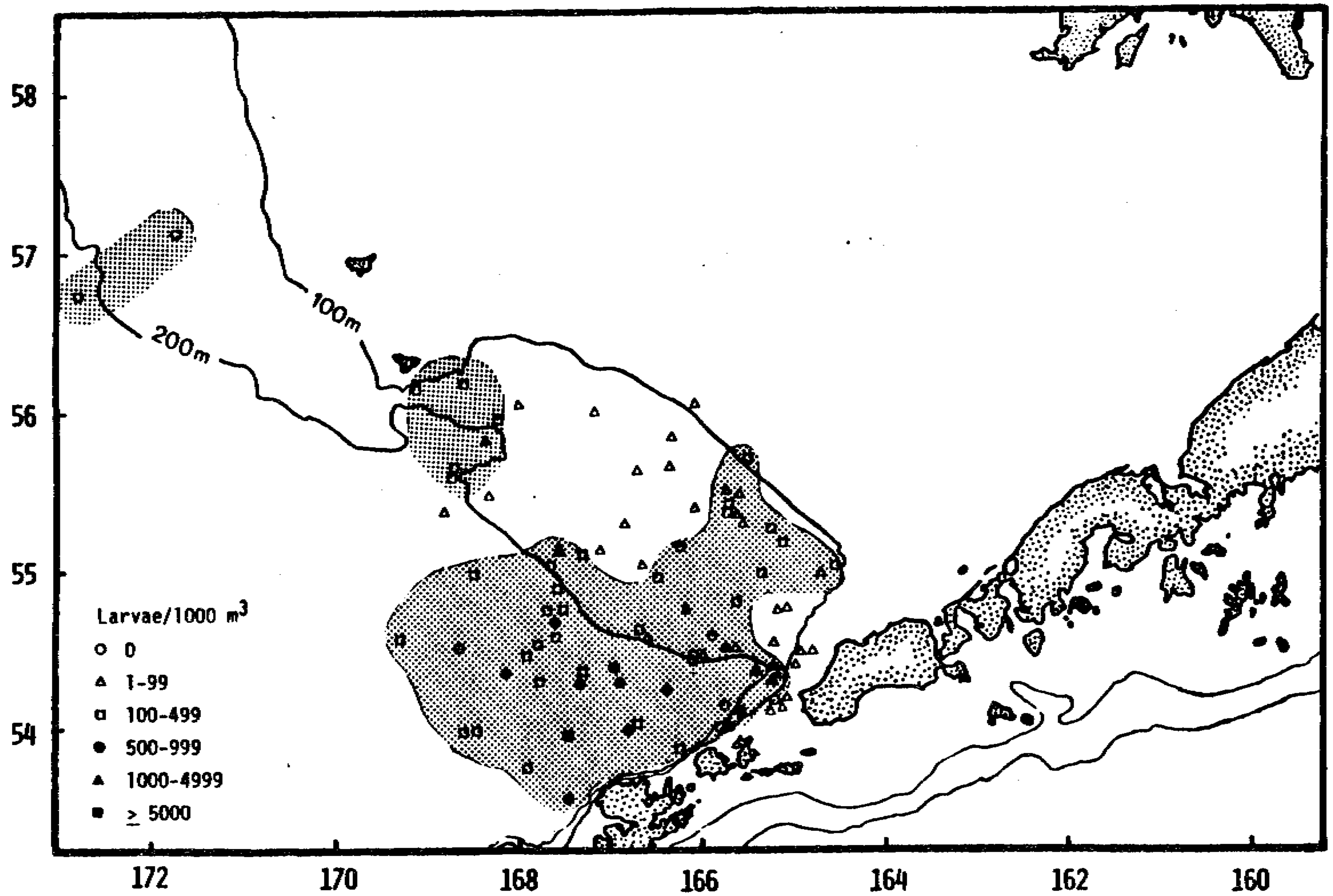

Fig. 6.6. Distribution and abundance of P. tridens, all cruises 1976-1980. Stations with zero larvae omitted but were consistent with cruise tracts from NOAA 1976, 1977, 1979 and PROBES 1978 and 1980 (see Figs. 2.1-2.12 for all station locations).

1000 m^3 in April, May, and June, respectively; densities comparable to those for P. borealis.

Larvae of P. stenolepis were infrequently recorded from all cruises sampled in years from 1976-1980. Specimens were found in early April samples in 1977 only, but not in 1976 or 1978. Larvae are found only in the southeast St. George Basin and along the 100/200 m isobath convergence at Unimak Pass (Fig. 6.7). Densities ranged from 30 to 700 larvae/1000 m^3 and were typically lower than those for either P. borealis or P. tridens. Unalaska Island is the northernmost limit given for P. stenolepis adults (Butler 1980), so occurrence of larvae in the lower St. George Basin may indicate the extent of larval drift in this area with currents coming through Unimak Pass.

Vertical Distribution: MOCNESS samples collected during the PROBES 1980 cruise have been partially sorted to study vertical distribution of species of decapod larvae.

During Leg 2 (April), pandalids in samples collected at the 200 m station on the outer front (A line, Fig. 2.11) were most abundant in the 0-40 m intervals, whereas at a station somewhat east over the St. George Basin zoea were homogeneously distributed through the 20-120 m depth interval. On Leg 3 (early June) highest densities of pandalid larvae were sampled in the 40-60 m interval at the 200 m station. In late June during Leg 4 the highest density recorded was 2120 zoea/1000 m^3 at the 100 m station in the 0-10 m interval. A more detailed computer analysis of vertical distribution will be presented in the final report. No

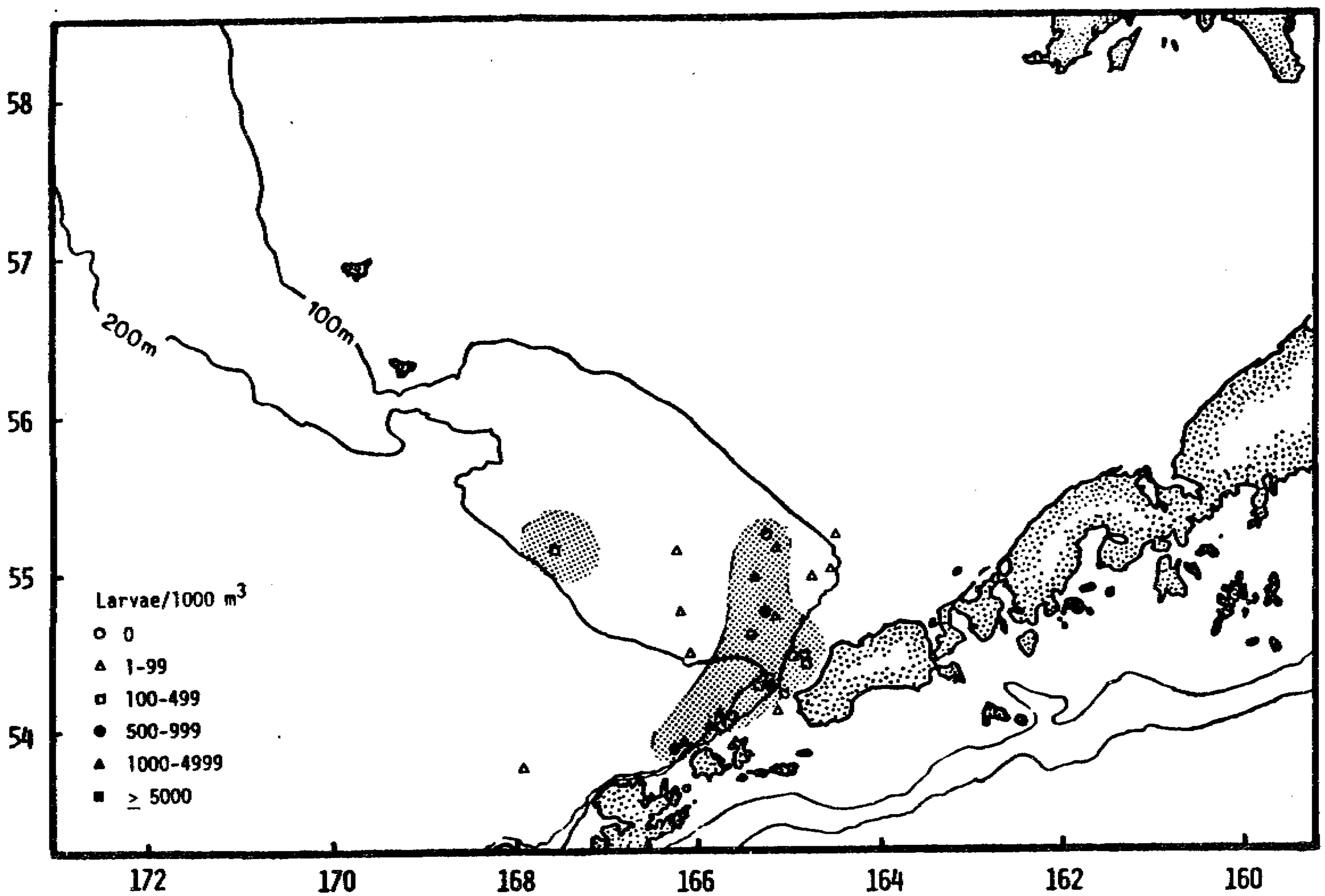

Fig. 6.7. Distribution and abundance of P. stenolepis, all cruises 1976-1980. Stations with zero larvae omitted but were consistent with cruise tracts from NOAA 1976, 1977, 1979 and PROBES 1978 and 1980 (see Figs. 2.1-2.12 for all station locations).

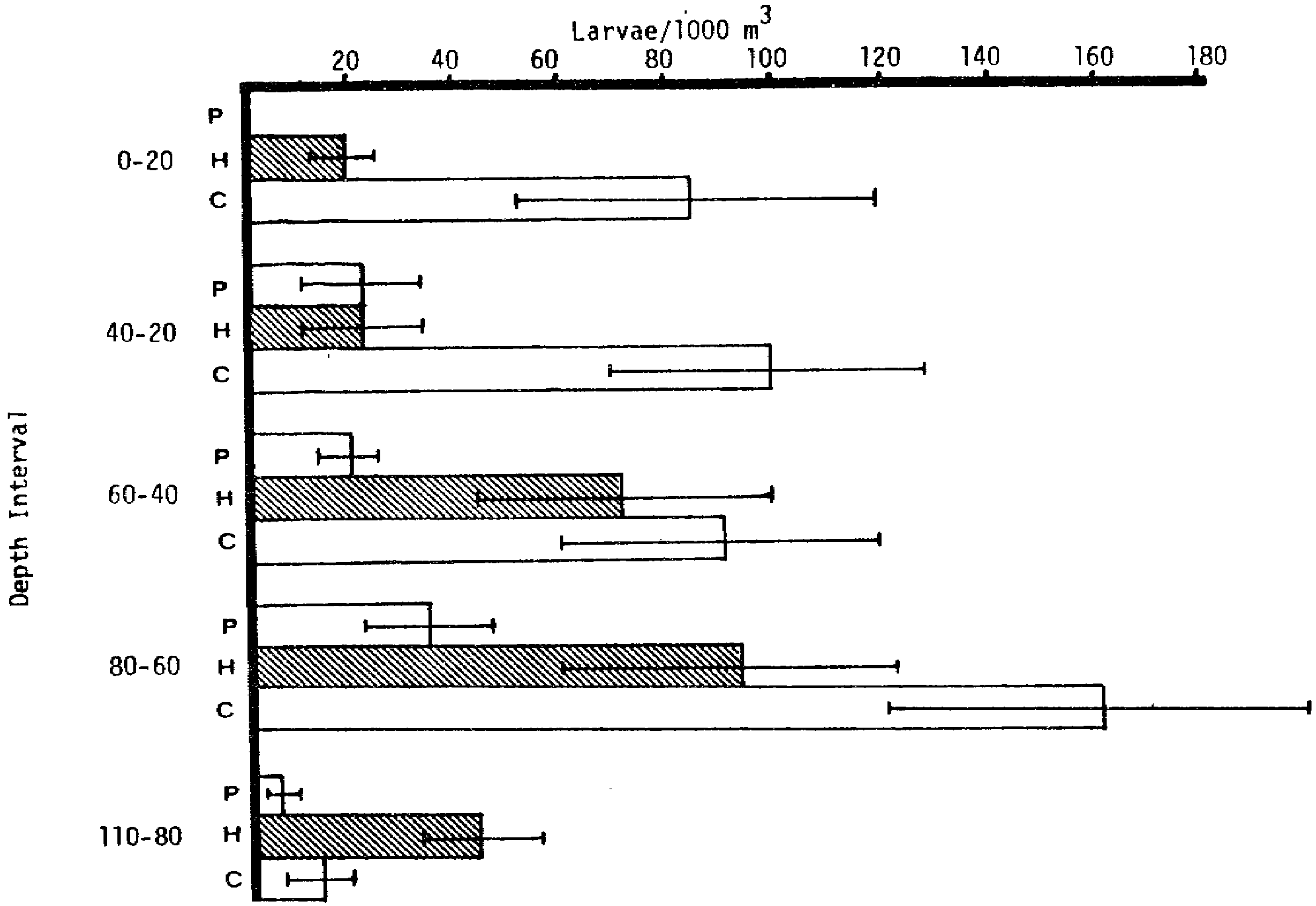

Fig. 6.8. Shrimp vertical distribution PROBES 1980 leg 3. Data taken from one outer shelf location sample 3 times on the same day (Stations: 3062, 4 AM; 3065, 10 AM; 3068, 4 PM). Bars express larvae per 1000 m^3 and lines indicate standard error. P = Pandalidae, H = Hippolytidae, and C = Crangonidae.

discernable pattern of vertical distribution of pandalid larvae is apparent at this time. However, in samples sorted to date, greatest larval density is not always near the surface (Fig. 6.8), or, if so, may be homogeneously distributed to depths of 60 m.

6.6.2 Hippolytidae

Larval Duration: Hippolytid larvae were the only shrimp zoea collected by the early spring (mid-February to mid-March) NOAA cruise in 1978. Stage I zoea were first taken in early March 1978 near Akutan Island. Hippolytids were present in 43% of the samples taken thereafter (see Fig. 6.9, 6.10, and 6.11). Later stage hippolytids were taken in the late June sampling periods of cruises from 1978-1980. Larval series for approximately five types of hippolytids were delineated from 1976-80 samples. The sheer number of possible species (approximately 20) makes further identification impossible at this point. Adults most commonly taken in thi area include *Eualus gamardii belcheri*, *E. suckleyi*, and *E. stoneyi* (Paul Anderson, NMFS, Kodiak Alaska, personal communication October 1981). Assigning definite zoeal numbers to the stages identified is difficult because genera in this family have from 2 to 9 stages. Sequential stages of larval development were found but the frequency of molt associated with these stages is obscured. As with the pandalids, sampling did not continue late enough in the summer to learn when larvae metamoprhose and leave the water column.

Distribution and Abundance: Ivanov (1969) states that adult hippolytids generally dominate the 40-80 m depths. This may very well be true but hippolytid larvae appeared to be a ubiquitous group, as prevalent as

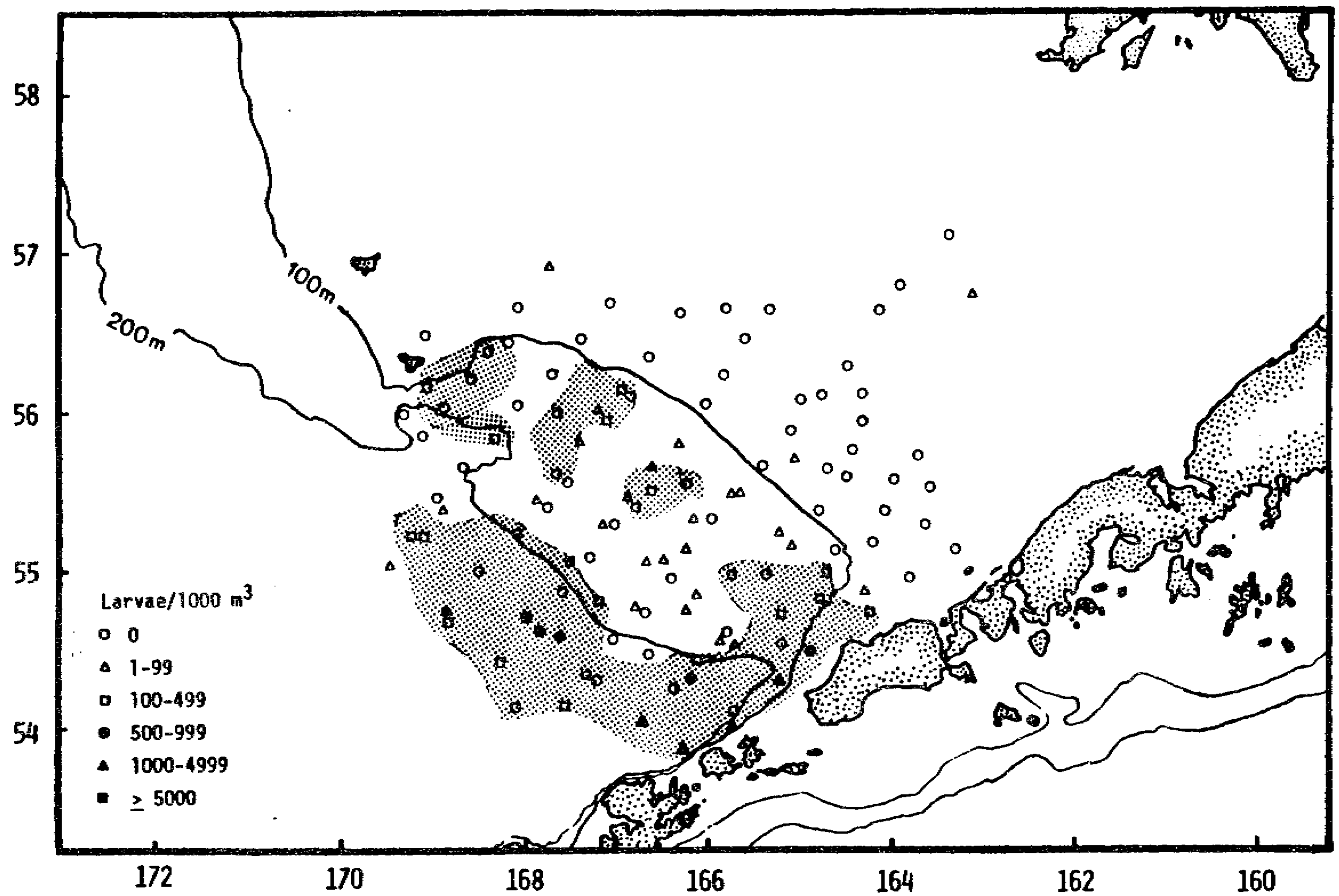

Fig. 6.9. Distribution and abundance of hippolytid shrimp during the month of April (NOAA 1977, PROBES 1978 leg 1, and PROBES 1980 leg 2).

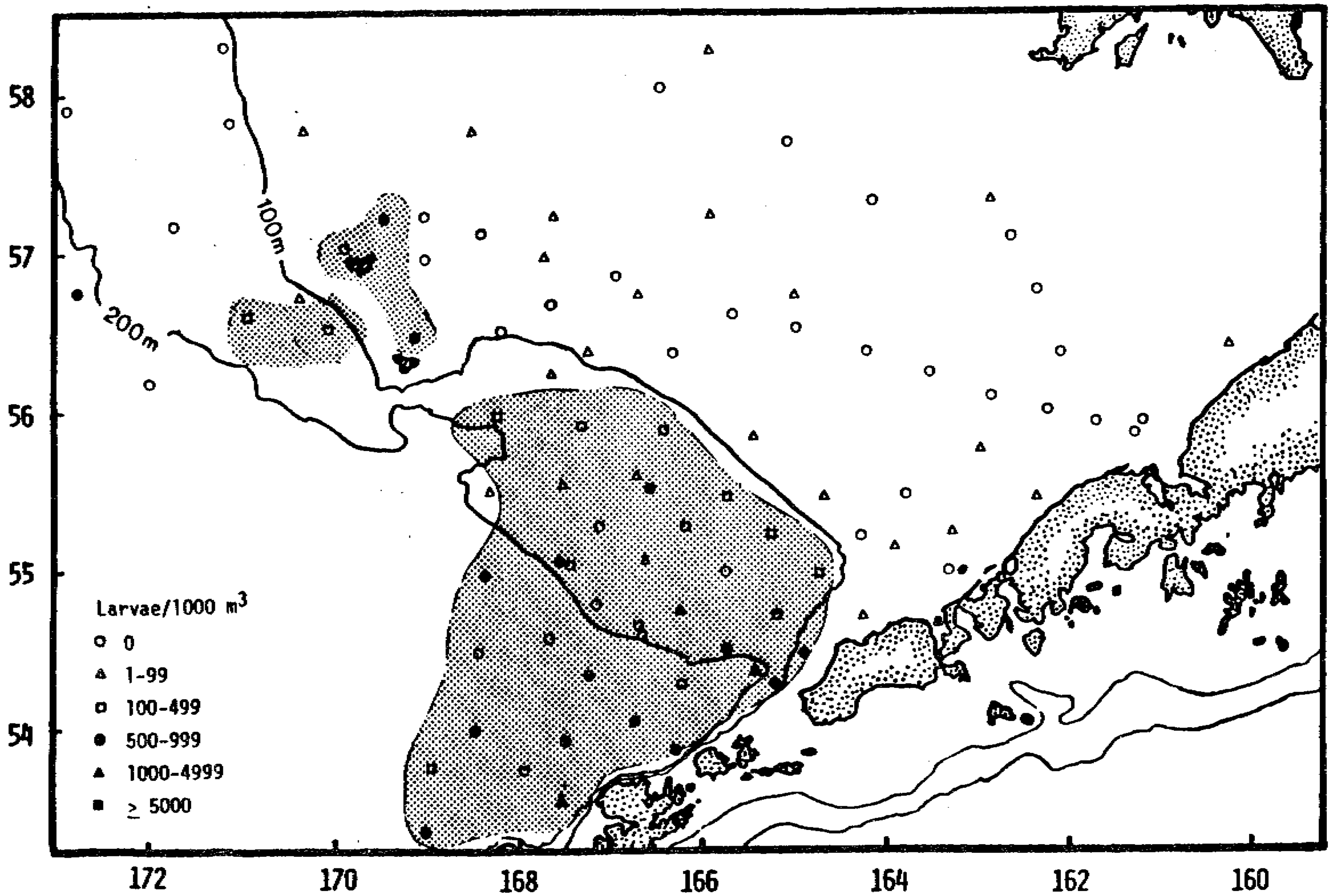

Fig. 6.10. Distribution and abundance of hippolytid shrimp during the month of May (NOAA 1976, 1977, PROBES 1980 leg 4).

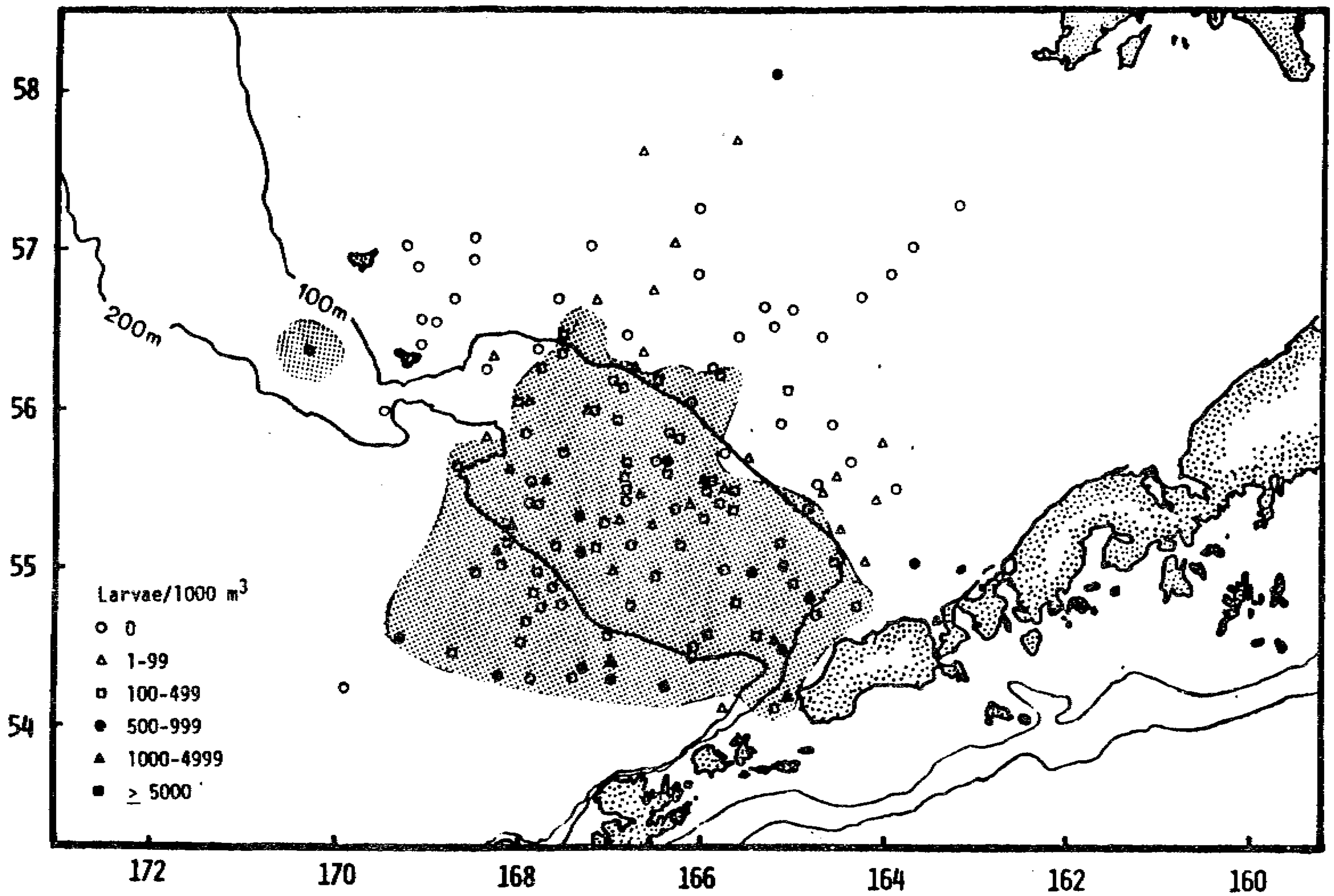

Fig. 6.11. Distribution and abundance of hyppolytid shrimp during the month of June (NOAA 1979, PROBES 1978 legs 3, 4, 1980 leg 4).

the pandalids over the Outer Shelf Domain at stations between 100-200 m isobaths in the St. George Basin. In April, greatest hippolytid densities occur southwest of the St. George Basin 200 m isobath and relatively nearshore from Unalaska Island across Unimak Pass (Fig. 6.9). Abundance exceeded 1200 larvae/1000 m^3 at several stations in April, but generally ranged from 100-500/1000 m^3. High densities of larvae in May were found over a more extensive area that included the St. George Basin, a region about the Pribilofs, and deep water (>200 m) southwest of the 200 m isobath to the Aleutian Islands (Fig. 6.10). This pattern persisted in June and indicates relatively few larvae are hatched over the middle shelf northeast of the 100 m isobath (Fig. 6.11).

Vertical Distribution: Data analyzed for one station (3 replicates during 24 hours) of PROBES 1980 Leg 3 revealed that hippolytids were present at all intervals with highest average densities (90 larvae/1000 m^3) at the 60-80 m interval (Fig. 6.8). The greatest density of zoea caught during 1980 Leg 4 was 1500 larvae/1000 m^3 in the top 0-20 m interval.

6.6.3 Crangonidae

Larval Duration: Stage I crangonid larvae were first found in eary to mid April (1977, 1978 and 1980 cruises) but were still present in the water column by the end of June (1978) indicating an extended period of hatch for the group as a whole. Later stages, IV and V, were sampled during mid to late June in 1978. Planktonic larval life is assumed to span approximately 3 months. Juvenile *Crangon communis* were taken in mid February during the NOAA 1978 cruise.

Distribution and Abundance: Crangonid adults dominate the 0-50 m depth zone of the shelf in the S.E. Bering Sea according to Ivanov (1969), although this region was not sampled during any of the cruises we have used in this study. Four species of crangonids (*C. communis*, *C. dalli*, *Argis dentata* and *A. lar*) are routinely found during the trawl surveys of the St. George Basin (Paul Anderson, NMFS, Kodiak Alaska, personal communication).

Although crangonid larvae were recorded from 65% of stations sampled during April, their density was very low - generally less than 100 larvae/1000 m^3 - and the distribution was essentially limited to the St. George Basin (Fig. 6.12). Crangonids were still centered within the Basin in May even though sampling stations covered a broader geographic area (Fig. 6.13). Densities were about 160 larvae/1000 m^3 near the 50 m isobath along Unimak Island, and about 220/1000 m^3 between the 100 and 200 m isobaths of the St. George Basin. Crangonid larvae were taken less frequently in June samples (Fig. 6.14) and occurred at only 18% and 17% of 1978 and 1979 stations with mean concentrations of 100 and 180 larvae/1000 m^3, respectively. In general, few larvae occurred northeast of the 100 m isobath or southwest of the 200 m isobath.

PROBES 1980 Leg 3 Table of Vertical Distribution indicates crangonids were present at all intervals with highest average concentration (160 larvae/1000 m^3) at the 60-80 m interval (Fig. 6.8).

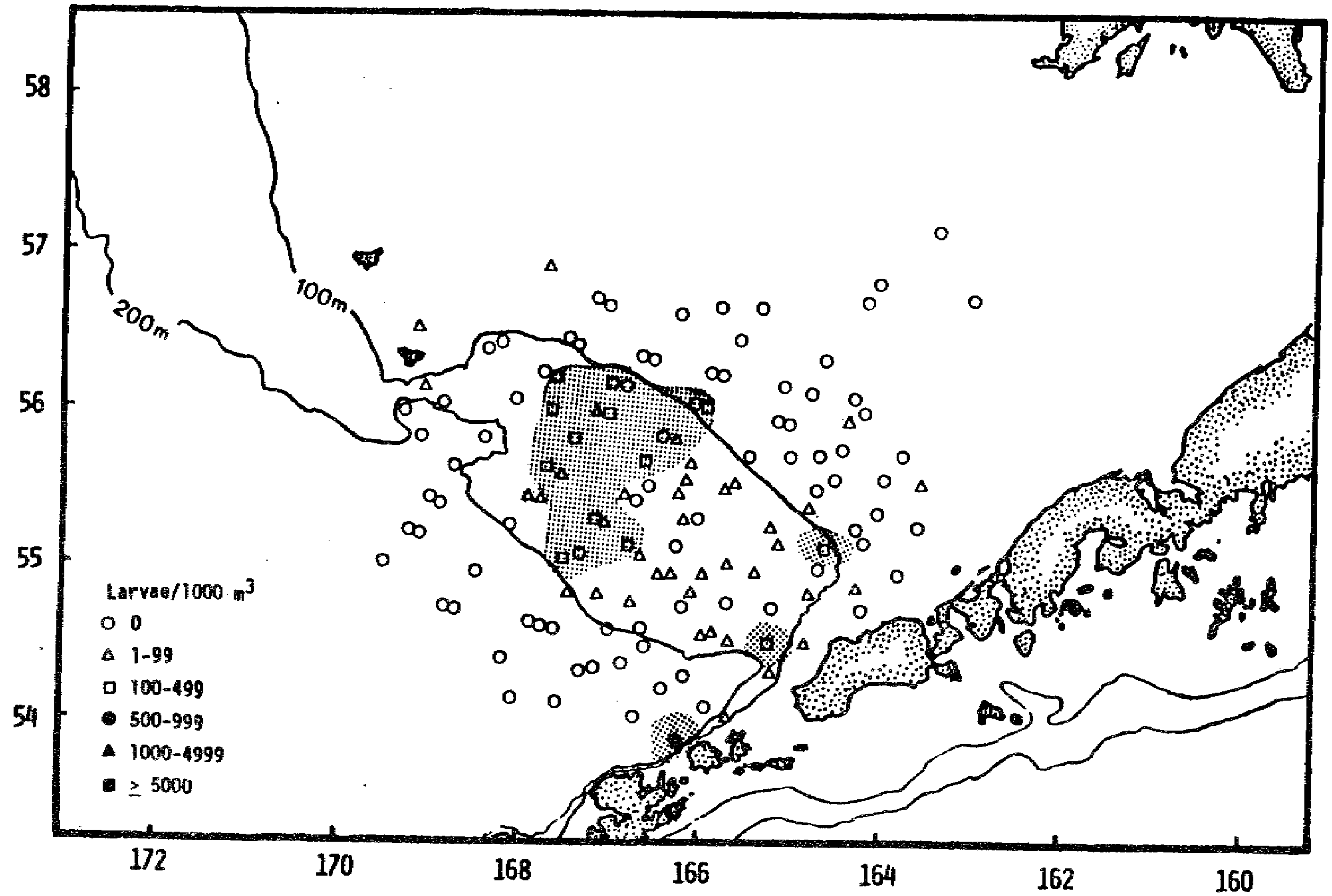

Fig. 6.12. Distribution and abundance of crangonid shrimp during the month of April (NOAA 1977, PROBES 1978 leg 1, 1980 legs 2, 3).

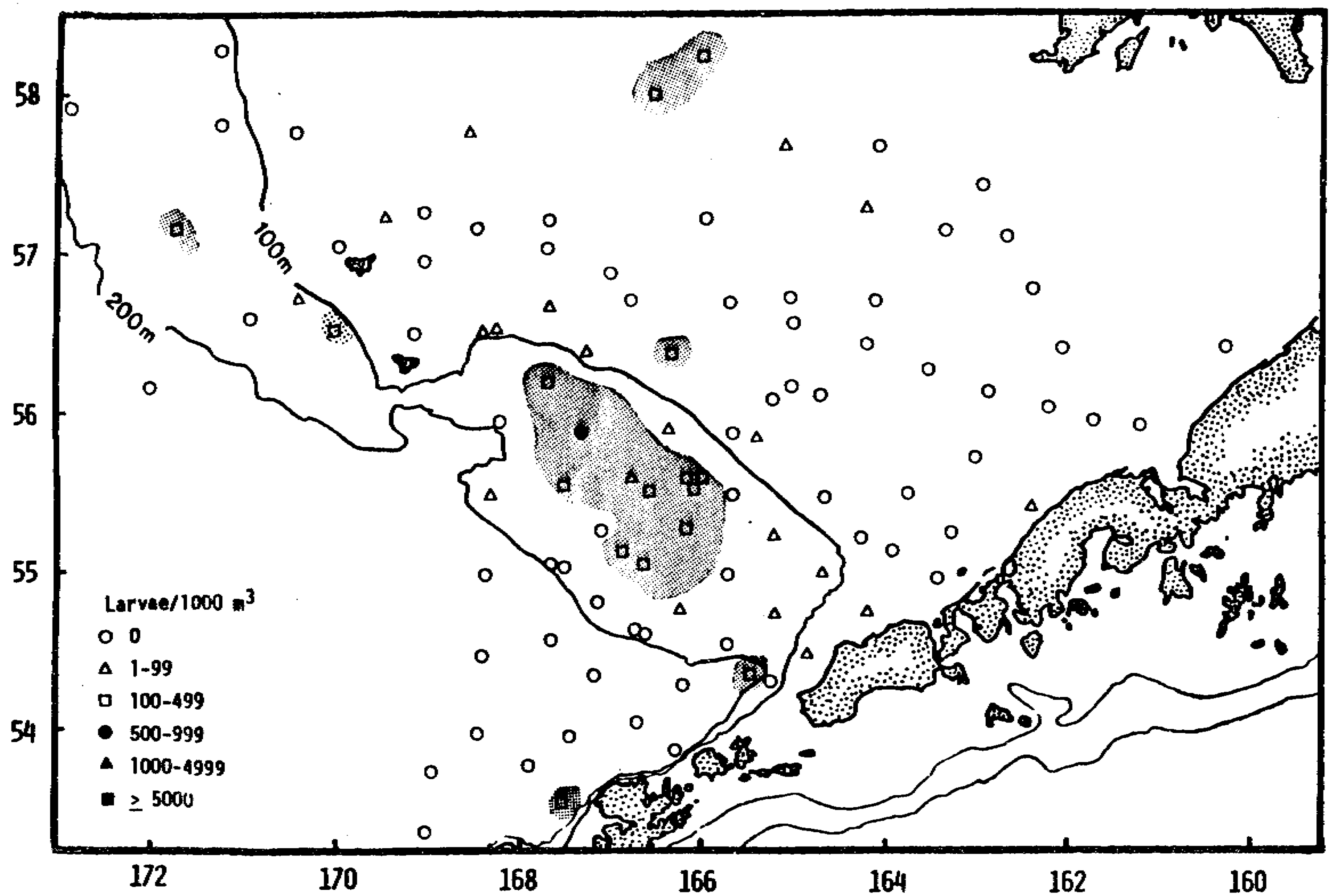

Fig. 6.13. Distribution and abundance of crangonid shrimp during the month of May (NOAA 1976, 1977, and PROBES 1980 legs 3, 4).

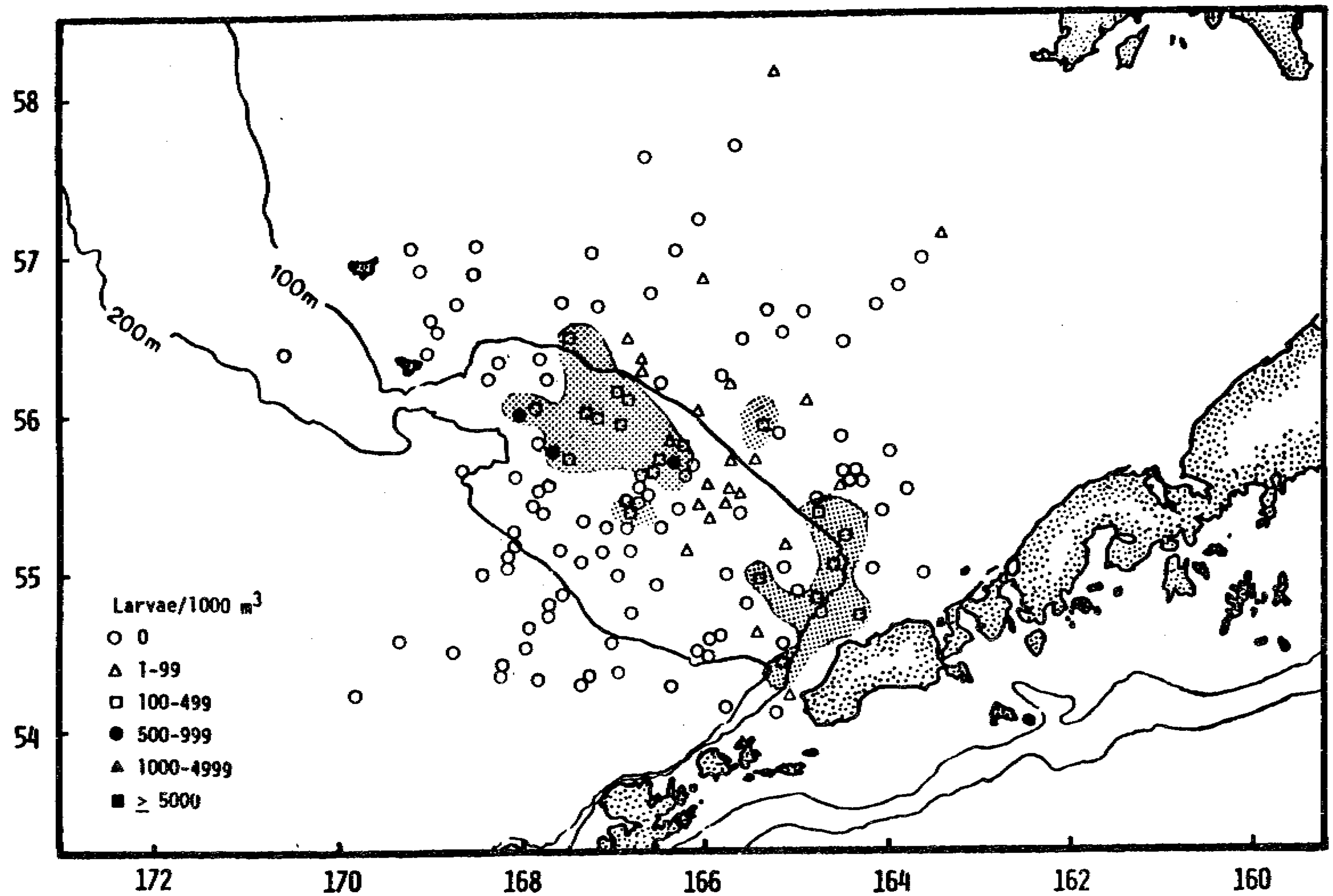

Fig. 6.14. Distribution and abundance of crangonid shrimp during the month of June (NOAA 1979, PROBES 1978, legs 3, 4 and 1980 leg 4).

6.6.4 Penaeidae

The spiny larval form of disputed origins, assigned to the family Penaeidae, is assumed to have a deep water parent since most larvae were taken at stations with depths $\geq$ 200 m over the shelf-break (Fig. 6.15).

Larval Distribution: First appearance of Stage I and II larvae was mid April for 1977, 1978 and 1980. They were found until late June as Stages II, III and IV in PROBES 1978. Later summer sampling would be necessary to determine whether this larvae has more than 4 stages. Kurata (1964) describes Stages VI and VII of a spiny larvae he assigns to *Glyphorcrangon* sp. One sample collected by the Alpha Helix, October 1980, from east of the 200 m isobath contained one late stage larva. Additional material from the Alpha Helix will be requested.

Distribution and Abundance

This larval group is distributed over deep water (Fig. 6.15). NOAA 1976 took the spiny larvae at only one station on the 200 m isobath (no deeper water sampling was conducted that year). Data for April and May (NOAA 1977) showed densities of 100-1500 larvae/1000 m^3 west of the 200 m isobath. These larvae were present at only four deep water stations of the NOAA 1979 cruise. PROBES 1978 Leg 1 data show these larvae occur frequently with hippolytid larvae, generally at stations southwest of the 200 m isobath.

Vertical Distribution: PROBES Leg 4 1980 contained one deep water station (#4001).

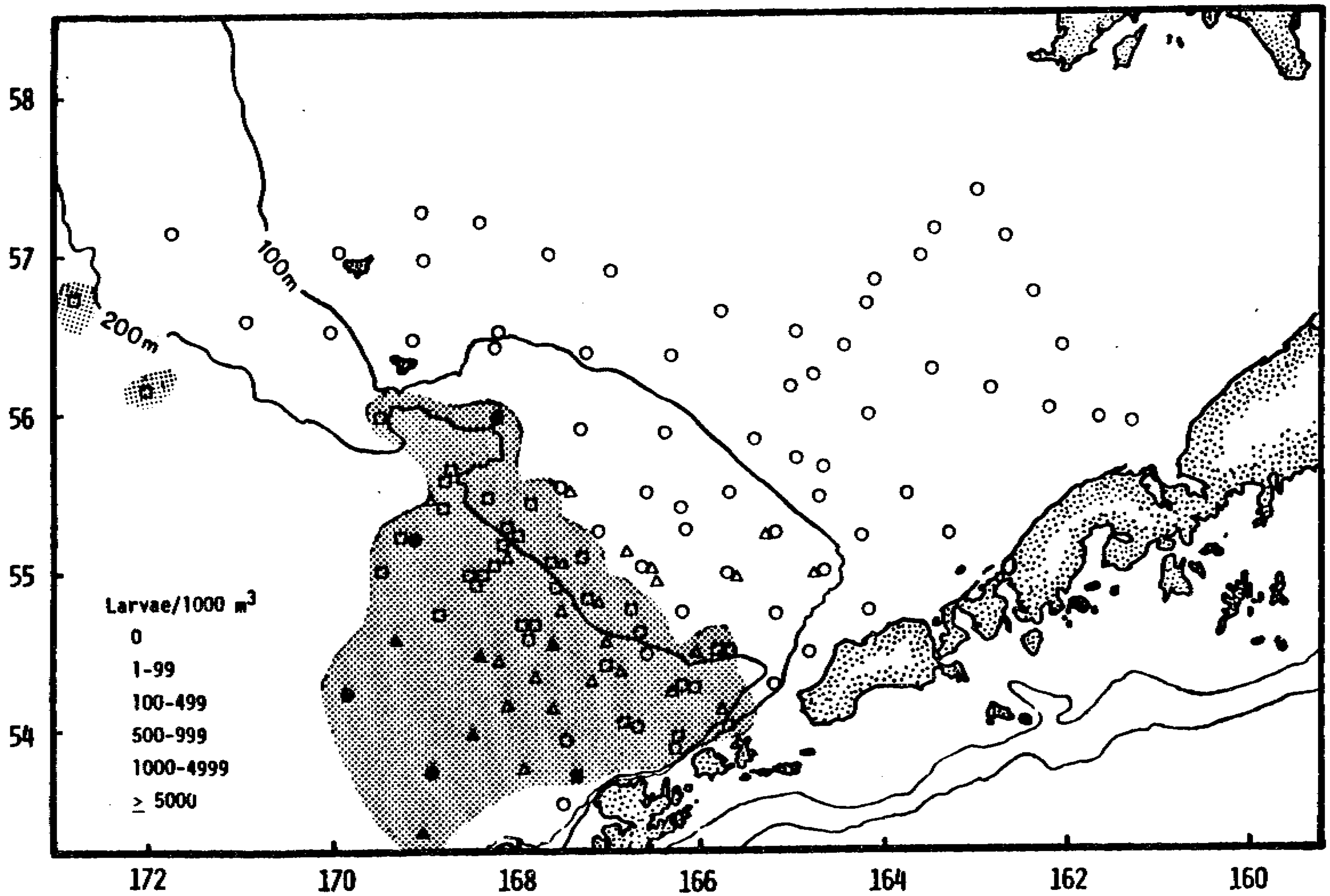

Fig. 6.15. Distribution and abundance of Penaeidae, all months, all cruises. (NOAA 1976, 1977, 1979, PROBES 1978 legs 1, 3, 4, 1980 legs 2, 4).

Depth Interval	# Larvae/1000 m^3
0-20	0
20-40	82
40-60	283
60-80	1210
80-120	25
120-300	0
300-600	0

At least at this station the greatest density of larvae occurred in the 60-80 m interval. More deep water sampling is needed to clarify the identity, range and distribution of this larval type.

6.7 Summary

1. Peak hatch of shrimp larvae in the S.E. Bering Sea occurs in early April for species in the families Pandalidae, Crangonidae, Penaeidae, and Hippolytidae; some larvae of the latter family hatch in early March. First stage zoeae of Crangonidae are present until June indicating that certain species of this family either hatch later in spring or have asynchronous hatch within the population.

2. Zoeal stages molt about every 3.5 weeks and, although zooplankton sampling has never occurred in mid summer, are predicted to metamorphose to benthic juveniles about mid August to September.

3. Larvae of *Pandalus borealis* and other pandalids are most densely distributed over the St. George Basin between the 100 m and 200 m isobath (Outer Shelf Domain), although *P. tridens* larval densities occur beyond the shelf-break in deep water.

4. Hippolytid larvae are distributed throughout the St. George Basin south to Unimak Pass and in deep water southwest of the 200 m isobath to Unalaska Island.

5. Crangonid larvae are least abundant of the three principle families and also are centered over the St. George Basin.

6. Relatively few shrimp larvae are found northeast of the 100 m isobath over the Middle Shelf Domain. Unimak Pass and the area of convergence of 100 and 200 m isobaths is a region of high larval shrimp densities.

7. Data on the magnitude of benthic shrimp populations is scarce because routine sampling gear is thought to inefficiently catch these relatively small crustaceans.

8. Although shrimp have no present commercial importance in the S.E. Bering Sea their role in the benthic food webs of this area should not be overlooked. Shrimp are a major part of the diets of marine mammals, and commercially important fish and crab species. Environmental changes and perturbations caused by pollution that cause major fluctuations in shrimp stocks could have ramifications throughout the benthic community.

7.0 DISTRIBUTION AND ABUNDANCE OF HERMIT CRABS (PAGURIDAE) IN THE S. E. BERING SEA

Brett Dumbauld

7.1 Introduction

At least 21 species of hermit crab from the family Paguridae are reported to occur in the Bering Sea (Appendix 3). Some of these species are found strictly in intertidal areas (e.g. Pagurus middendorffii) while others are found in sublittoral areas, primarily on rocky substrata (e.g. Pagurus beringanus, P. kennerlyi, P. hirsutiusculus, Elassochirus gilli). Only seven of these species are regularly found in benthic trawls from the study area in the southeastern Bering Sea (Table 7.1).

7.1.1 Life History

The life history of hermit crabs in the genera Pagurus, Elassochirus, and Labidochirus includes four planktonic zoeal stages and one megalops stage (termed glaucothoe in the older literature); the latter undergoes metamorphosis and settles as a benthic juvenile (Thompson 1903; Hart 1937; Miller and Coffin 1961; Nyblade 1974; Nyblade and McLaughlin 1975). Four of the species which are commonly found in southeastern Bering Sea trawl samples have been raised from egg to adult in the laboratory (Table 7.2; Nyblade 1974; Nyblade and McLaughlin 1975). Laboratory culture has also been completed for six of the remaining species reported to occur in the Bering Sea (Nyblade 1974) and some studies have been conducted on larvae of Pagurus middendorffii, P. trigonocheirus, Dermaturas mandtii, and other species from plankton samples (Kurata 1964a, b; Makarov 1966).

Table 7.1. Frequency of adult and juvenile pagurid crabs in 1975 and 1976 southeastern Bering Sea benthic trawl samples and preferred habitats (Adapted from Nyblade, 1974; McLaughlin, 1974; Feder and Jewett, 1980).

Species	Depth	% of tows in which species occurred 1975(<80m)	1976(80-200m)
Pagurus aleuticus	15 - 435 m soft bottom	-	34.6
P. capillatus	4 - 431 m mud	46.4	26.9
P. confragosus	68 - 435 m	-	44.2
P. ochotensis	Subtidal - 249 m sand	38.7	-
P. trigonocheirus	Subtidal - 183 m	45.9	36.5
Elassochirus cavimanus	37 - 252 m	-	31.7
Labidochirus splendescens	Subtidal - 411 m soft bottom	32.9	-

Table 7.2. Reproductive data for four species of Paguridae collected in the San Juan Islands, Washington. Species are also common in the Southeastern Bering Sea (Adapted from Nyblade 1974).

Species	Number of broods per year	Time of egg extrusion	Time of larval hatch	Egg dry wt. (μg)	Annual egg production per 100 mg female	Larval duration (days)	
						Zoea	Megalops
Pagurus aleuticus	1	No data	Spring only March-May	2.32	No data	61.2	20.2
P. capillatus	1	Jan.	Spring only March-May	3.09	1.88×10^3	53.9	17.1
P. ochotensis	2-3	Autumn (For spring hatch)	Spring through summer March-Sept.	3.09	1.13×10^3	59.0	21.0
Labidochirus splendescens	1	July-August	Spring only March-April	3.83	7.08×10^2	76.1	21.0

7.1.2 Reproduction

Reproductive season among hermit crabs differs by species and locality (Nyblade 1974). Copulation and egg extrusion usually occur from autumn through spring. Some species have a single brood and release larvae only in the spring, while multiple brooders may release larvae throughout the summer months (Table 7.2). Egg development time from extrusion to hatching has been recorded only for the second brood in multiple brooding species, and varies from 1.5 to 2.0 months in the laboratory (Nyblade 1974). Egg size and number per female also vary with species. Like the larvae of other invertebrates, those of hermit crabs appear in the water column later in more northern waters (Stephenson 1935; Pike and Willliamson 1959). Therefore, with some allowance for latitude, the laboratory and field data of Nyblade (1974) for hermit crabs collected in the San Juan Archipelago (Table 7.2), may be applied tentatively to the same species found in the S.E. Bering Sea. Zoeal duration for most species falls in the range of 50-60 days. Laboratory studies have demonstrated that they are primary carnivores during this period and may feed on copepod nauplii, copepodites, barnacle nauplii, polychaete trochophores, and other small planktonic larvae (Roberts 1974). Duration of the megalops stage is approximately 21 days with little variation among species.

7.1.3 Benthic Distribution

Individual species of adult and juvenile hermit crabs were found in as many as 46% of benthic trawls taken in the S.E. Bering Sea in 1975 (primarily north of the Pribilof Islands and shallower than 80 m) and 1976 (between the Pribilof Islands and Unimak Island between the 80 and

200 m isobaths; Table 7.1). The greatest number of decapod crustacean species were recorded for the genus *Pagurus* (Feder and Jewett 1980), but due to their small size they did not constitute a significant portion of the wet weight sample biomass of epifauna (e.g., 12,302 individuals of *Pagurus trigonocheirus* contributed to only 1.3% of the total wet weight of the 1975 trawl samples). Biomass estimates for pagurids averaged only .043 g/m^2 compared to .665 g/m^2 for *Chionoecetes opilio* and .361 for *Chionoecetes bairdi*, the dominant crab species collected.

7.1.4 Food and Predators

Adult hermit crabs have been shown to be predominately omnivorous detritus feeders and use their chelipids and third maxillipeds to scrape and sort food from bottom deposits. Scavenging and predation have been shown to be accessory and opportunistic behavior patterns (Orton 1927; Roberts 1968; Greenwood 1972). In turn, hermit crabs are preyed upon by king crab (*Paralithodes camtschatica*), tanner crab (*Chionoecetes* spp.), Alaska plaice (*Pleuronectes quadrituberculatus*), Pacific cod (*Gadus macrocephalus*), and starfish (*Asterias amurensis*) (Feder and Jewett 1980, 1981).

7.2 Results and Discussion

Pagurid crab larvae were found in 65.4% of all the samples examined and occured in all months sampled (i.e., April-June) for all five years of data. Several larvae were also found in samples collected on the early Feb-March 1978 NOAA cruise.

7.2.1 Vertical Distribution

Pagurid larvae were primarily distributed in the upper 80 m based on MOCNESS samples (PROBES 1980) but were found down to 120-300 m (Fig. 7.1). Surface waters frequently held no larvae in the interval 0-10 m or 0-20 m (24 of 33 MOCNESS stations contained no larvae in the top sample), indicating they are distributed from about 10-80 m, based on investigations to date. Pagurid larval densities for bongo tows (distribution and abundance) were adjusted for the top 60 m, as they were for *Chionoecetes* and other larvae. Therefore, the data presented here may slightly over represent actual Pagurid larval densities since pagurid crab larvae were commonly found in samples from 60-80 m (data will be adjusted for the final report).

7.2.2 Distribution and Abundance

Although some pagurid larvae were found in February-March samples (NOAA 1978), high densities first appeared in early April. Since Paguridae encompasses several species in the S.E. Bering Sea, it is not surprising that the family is widely distributed from Unalaska Island across St. George Basin, into the middle shelf east of the 100 m isobath (Fig. 7.2). In April and May greatest larval density was along the 100 m isobath of the St. George Basin from the latitude of St. George Island (56°N) to the North Aleutian Shelf near Unimak Island (Figs. 7.2 and 7.3). Densities were typically an order of magnitude greater (10^3 larvae/1000 m^3) east of the 100 m isobath than over the St. George Basin. Distribution was somewhat broader in June and high abundance overlapped the 100 m isobath and extended to Unimak Pass (Fig. 7.4). The region of

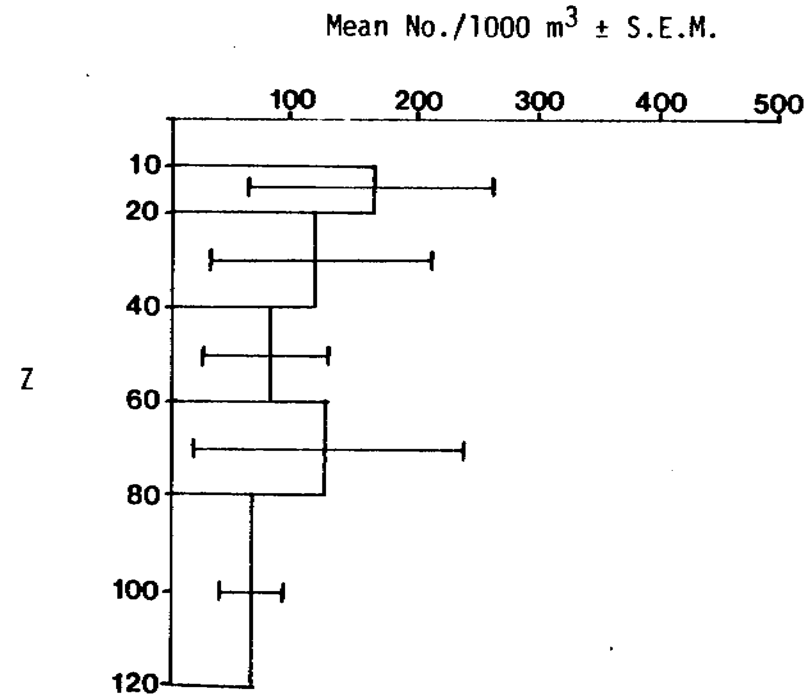

Fig. 7.1. Representative vertical distribution of pagurid crab larvae (all stages combined). Data are mean number of larvae/ 1000 m^3 and one standard error of the mean of 4 MOCNESS collections from one station (A8), revisited during PROBES 1980 leg 3.

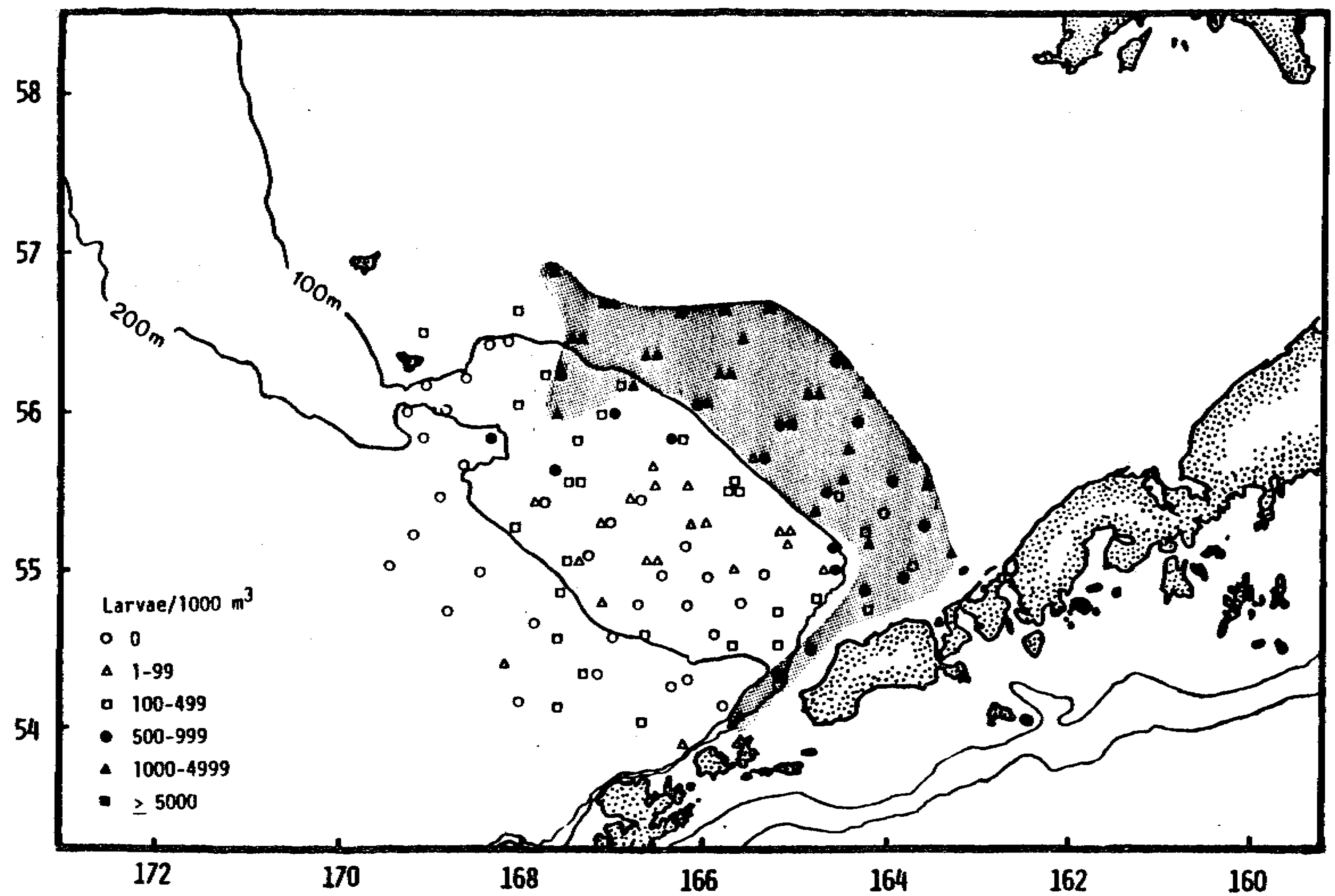

Fig. 7.2. Densities of pagurid crab larvae for the month of April. Data represented are for NOAA 1977 and PROBES 1978 leg 1.

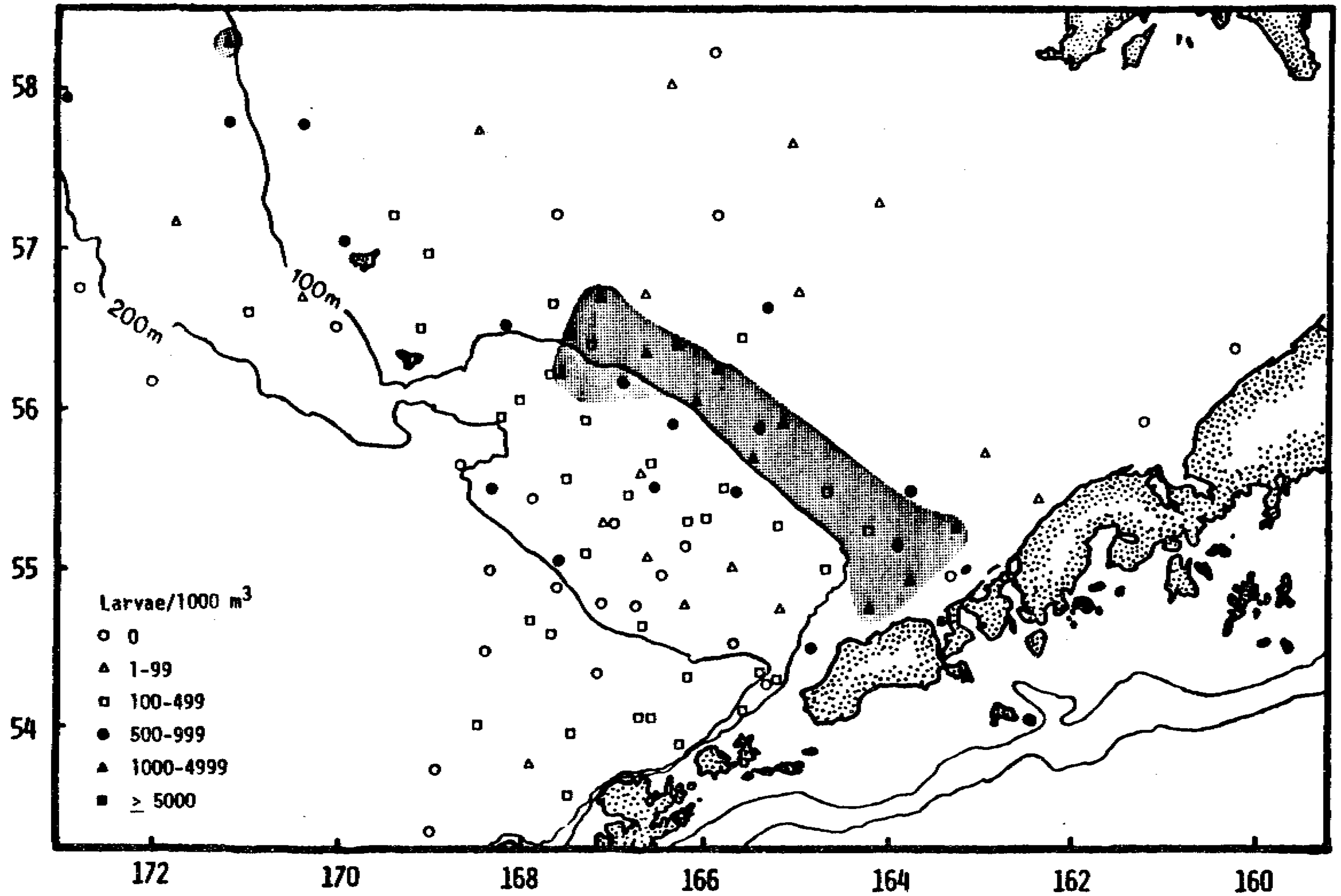

Fig. 7.3. Densities of pagurid crab larvae for the month of May. Data represented are for NOAA 1976, NOAA 1977, and PROBES 1978 leg 3.

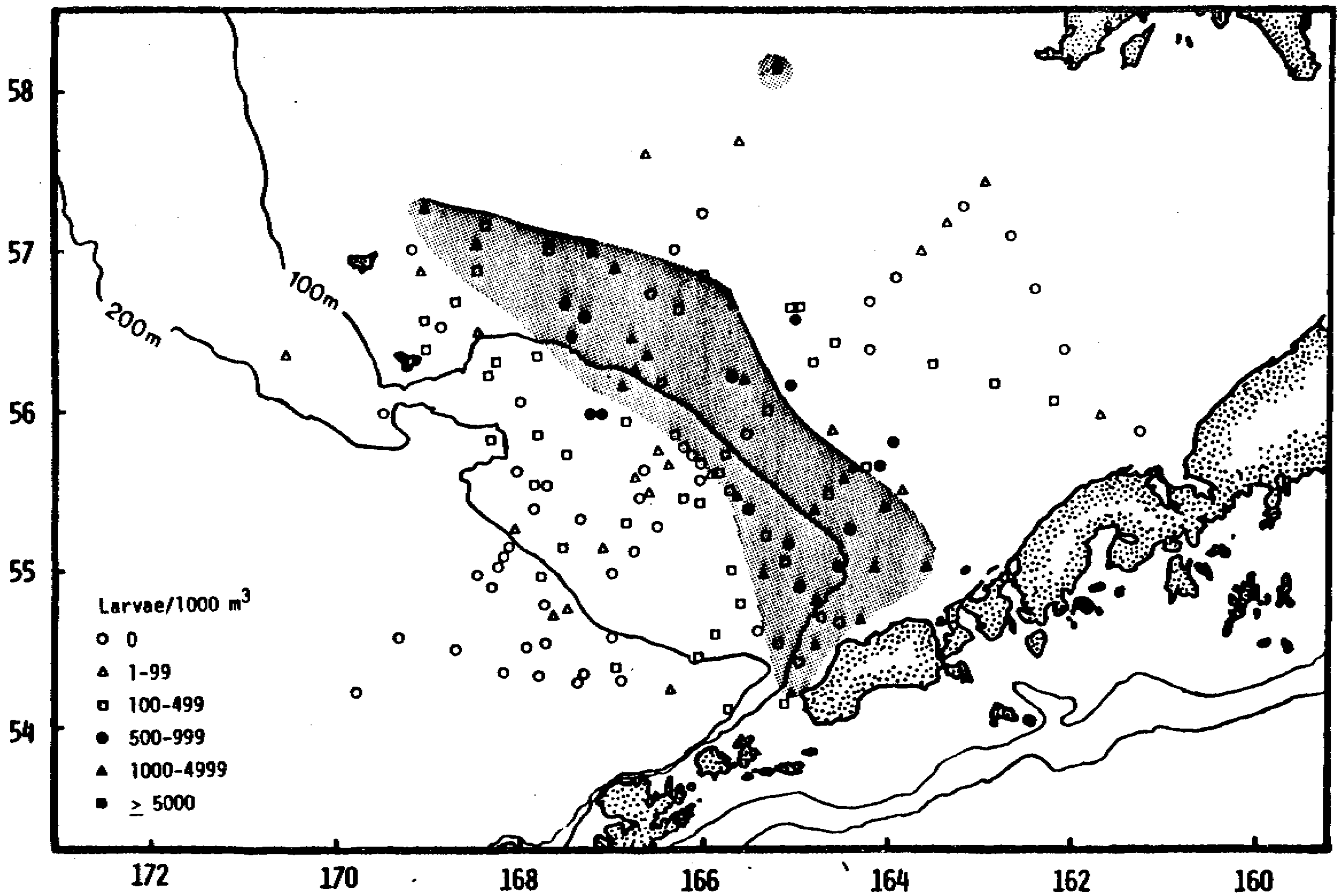

Fig. 7.4. Densities of pagurid crab larvae for the month of June. Data represented are for NOAA 1979, PROBES 1978 legs 3, 4, PROBES 1980 leg 4.

the middle front (100 m isobath) is apparently crucial as regards larval pagurid distribution in the S. E. Bering Sea. Cross-shelf pagurid densities are shown in Fig. 7.5 that depicts a transect line equivalent to the PROBES A-line (beginning about 55°45'N, 167°30'W and going to 57°30'N and 163°W) and highlights the 10-fold increase in pagurid density east of the 100 m isobath.

Pagurid larvae were not identified to species but were separated into individual zoeal (I-IV) and megalops stages. Densities were calculated for each individual larval stage encountered during a cruise leg. Average densities for each leg were then used to examine the relative frequency of the various larval stages encountered during that leg (Fig. 7.6). Molt frequency is difficult to guage from present data since numerous pagurid species are grouped together. First stage zoeae dominated as late as mid-May, and a nearly equal mixture of stage II and III animals were present late May through June (Fig. 7.6). Molting may occur every three weeks and by mid-July megalopae should be present and metamorphosis expected in August.

Like the benthic adults, hermit crab larvae are widely distributed throughout the study area in the southeastern Bering Sea. Stage I zoeae are present in the water column as early as March, but reach their highest mean densities in late April and early May. Stage II zoeae become abundant in late May and early June and the abundances of stage III and IV zoeae increase in mid to late June. Assuming a minimum of 50-60 days as zoeae and 21 days as megalopae (Nyblade 1974), this last larval stage should peak in July. No samples were collected in July, but some of the

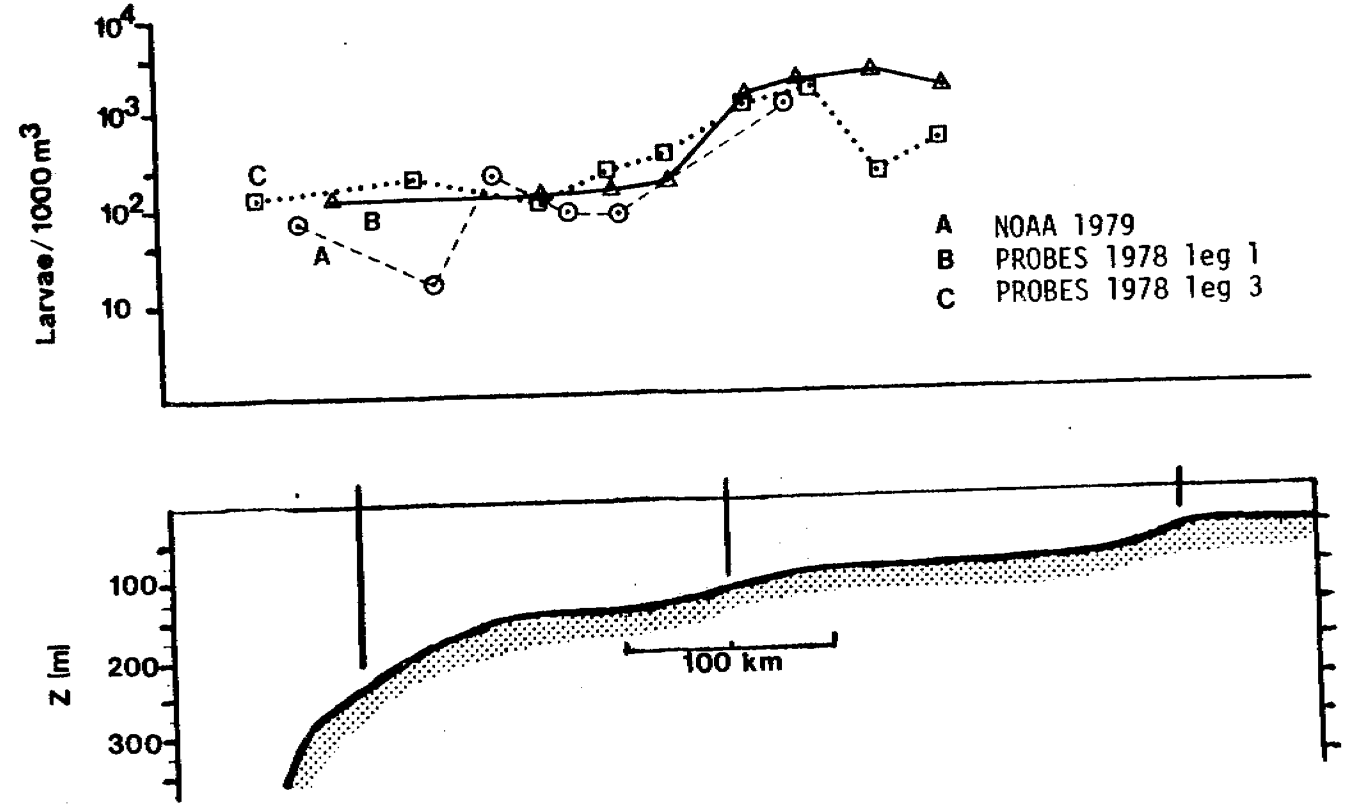

Fig. 7.5. Pagurid crab larvae densities along a cross shelf transect (approximately the PROBES A line, <u>see</u> section 2.0). (Note logarithmic scale.)

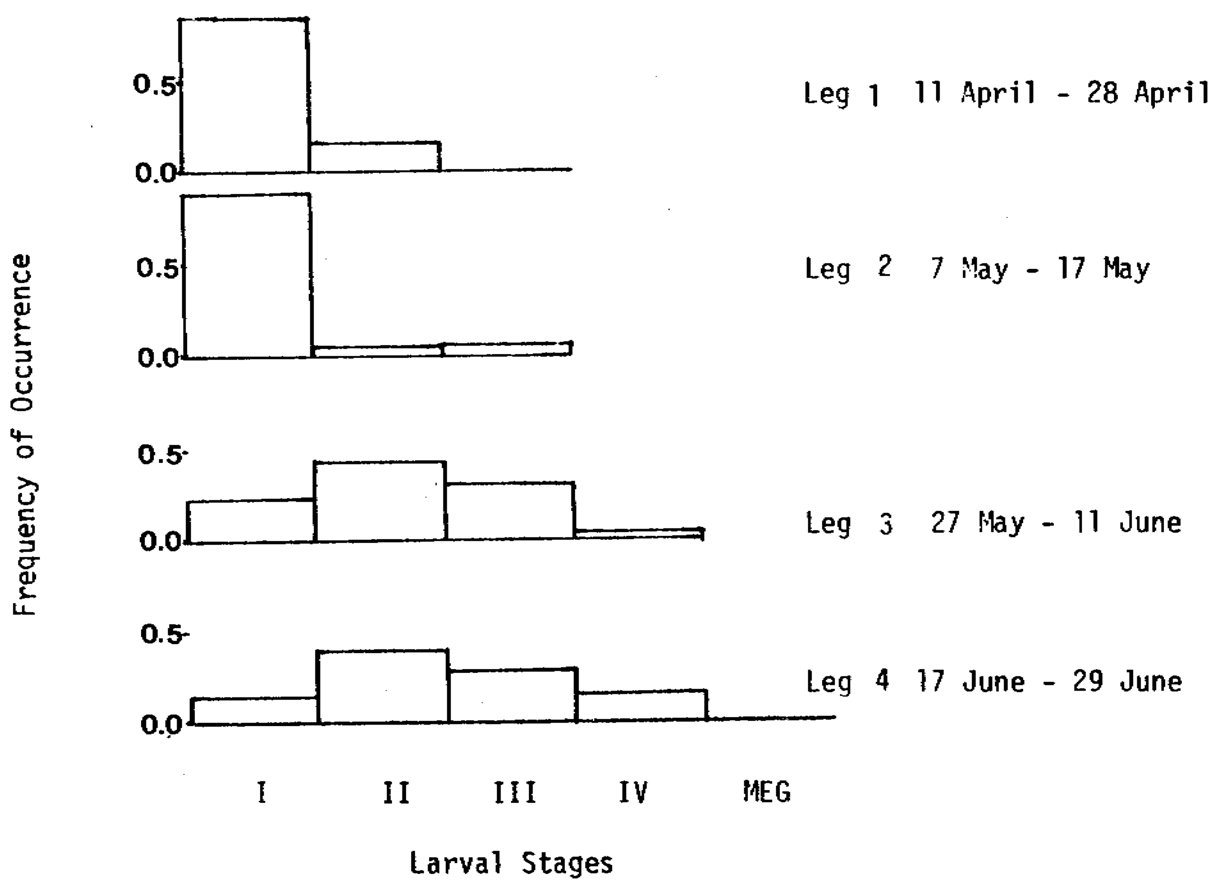

Fig. 7.6. Relative frequency of occurrence of individual pagurid crab larval stages based on mean density of each stage for an entire sampling leg. PROBES 1978 legs 1-4.

samples collected in the latter part of June contained several pagurid megalopae.

Distribution of pelagic pagurid larvae cannot be compared with that for adults since no good information exists on benthic distribution of hermit crabs in the S. E. Bering Sea. This group is routinely undersampled by conventional survey gear and yet their biomass may be substantial and trophic position important to the benthic community that includes several commercially valuable predators of hermit crab. It is expected that populations of adult pagurids are centered along the 100 m isobath as are larvae. A point of interest would be whether different species dominate on either sides of this isobath as seems to occur for *Chionoecetes baridi* and *C. opilio* over the outer and middle shelves, respectively (see Section 4.0).

8.0 POSSIBLE OIL IMPACTS ON DECAPOD LARVAE IN THE S.E. BERING SEA WITH EMPHASIS ON ST. GEORGE BASIN

8.1 A Review of Oil Models

Attempts to predict oil impacts in the S.E. Bering Sea should be based on best possible information available regarding physical and biological processes of the system, and specific life-history and ecological information for the principle species of interest. Often it is necessary to establish rather tenous links between assumptions leading to certain predictions because data is sketchy or non-existent for the system in question, and must therefore come from oil studies on different species or in different oceans.

Two models of physical transport processes, water movements, and biological interactions and responses to oil in the Bering Sea have been constructed by the Rand Corporation (OCSEAP-RU 435) and Sonntag et al. (1980). Following hypothetical oil spills or well blowouts, oil can be moved by winds and currents, mixed by storms, transported to the benthos by several processes, and made to kill target/commercial species by direct exposure, loss of food and over-competition, or accumulation in tissues and gametes. Oil concentrations in the water column and benthic sediments are modeled as a function of the magnitude of initial oil impact and its duration (e.g., 100,000 barrels from a tanker or 5,000 barrels/day from a well for several weeks), time of year, location of the mishap, and loss of oil fractions by processes such a volitalization. Model output shows the trajectory and extent of oil coverage and concentration at various times after the mishap. From data and assumptions on lethal levels, distribution and abundance of animals, sensitive life-history stages and physiological events (e.g., molting of crustaceans), predictions are made on the proportion of a year-class or population killed and eventual ramifications such losses pose to commercial fisheries.

Concerning decapod larvae and in particular crab species, the results of several scenarios modeled at workshops in California (1980) and Alaska (1981) have predicted very slight impacts of oil spills to crab larvae over the St. George Basin (Sonntag et al. 1980) because such small areas, relative to the spatial distribution of larvae, are impacted (Sonntag et al. 1980; Manen and Curl 1981). However, several areas crucial to crab reproduction have been identified at these workshops (Pribilof Islands, North Aleutian Shelf), and oil scenarios have been suggested that could lead to substantial mortality of larvae in these areas (Sonntag et al. 1980; Curl 1981; Manen and Curl 1981; discussed by participants at the St. George Basin Lease Area Synthesis Meeting, April 1981, Anchorage). Predictions from these models may seriously underestimate possible larval mortality caused by an oil mishap (even in the St. George Basin) because of incorrect assumptions concerning larval sensitivity to oil and aspects of larval life history and ecology (these are discussed later in this section).

The approach used in this consideraion of oil impact on larvae is to: 1) discuss literature on toxic concentrations to pertinent species of crustacean larvae as well as sublethal concentrations and effects; 2) consider shortcomings of present models describing fates and effects of oil in the S.E. Bering Sea and suggest further research and application of data that would improve their predictions and utility; 3) consider each major group of larvae presented in Sections 3.0-7.0, reiterate their distribution, abundance, time in the water column, and molting frequency and predict the area, magnitude and duration of an oil catastrophe needed to significantly reduce the larval year-class; 4) discuss whether such a loss could affect benthic populations and, thus, the fishery.

8.2 Oil Toxicity to Crustacean Larvae

8.2.1 Effects on Larvae

A wealth of information has been generated on oil toxicity to marine invertebrates (Malins 1977; Wolfe 1977) and many investigators have been specifically concerned with sensitivity of larval crustaceans (Wells and Sprague 1976; Bigford 1977; Caldwell *et al*. 1977; Tatem 1977; Cucci and Epifanio 1979). Karinen (1981) has reviewed oil toxicity to Pacific Northwest and Alaskan species of shrimp and crab including Dungeness crab (*Cancer magister*), king and tanner crab, and pandalid shrimp. Rice et al. (1975) and Vanderhorst et al. (1976) reported that 96 hr LC_{50} values for juvenile and adult pandalid shrimp ranged from 0.8-11.0 mg/l as water soluble fractions (WSF). Pandalid larvae, however, are more sensitive and have associcated 96 hr LC_{50} value from 1.0 mg/l WSF down to .3 mg/l as single aromatic compounds such as naphthalene (Mecklenburg et al. 1977; Rice tet al. 1975; Rice et al. 1979). Sublethal effects including failure to swim and molt inhibition occurred at concentrations from 0.7 to 0.3 mg/l WSF. A 96 hr exposure of pandalid larvae to 0.6 mg/l WSF caused a 70% reduction in molting from stage 1 to stage 2 zoeae

(Mecklenburg et al. 1977). Dungeness crab zoeae were susceptible to WSF as low as 0.22 mg/l (Caldwell et al. 1977). Laval king and tanner crab are equally sensitive to hydrocarbons. Death of Paralithodes camtschatica larvae or failure to swim is caused by WSF of 0.8 to 2.0 mg/l (Brodersen et al. 1977; Mecklenburg et al. 1977), and Chionoecetes bairdi larvae are immobilized by a 96 hr exposure to 1.7 mg/l WSF (Brodersen et al. 1977).

Studies with other larval decapods indicate that toxic oil concentrations may be even lower than those just discussed when based on assays of single hydrocarbons, longer exposures, or sensitive sublethal criteria. Larval lobster ceased feeding at 0.19 mg/l WSF and had a 30-day LC_{50} value of 0.14 mg/l (Wells and Sprague 1976). Specific compounds such as naphthalene are very toxic and caused narcotization followed by death of pandalid shrimp and of crab larvae at concentrations from 8-12 μg/l during brief exposures less than 24 hr (Sanborn and Malins 1977). Chemoreceptive organs of juvenile and adult Dungeness crab can detect WSF as low as 10^{-4} mg/l (.1 μg/l), a concentration well within the range of oil spill concentrations (Pearson et al. 1980). This may result in behavioral changes affecting feeding and/or mating and ther fore reproduction. The extent of chemoreceptive feeding by crab larvae is unknown but could be seriously impaired by very low oil concentrations and food consumption thereby disrupted for this rapidly growing stage.

Based on these studies the following generalizations can be made: 1) larvae are more sensitive to hydrocarbons than are juveniles and adults (Johnson 1977; Moore and Dwyer 1974); 2) toxic oil concentrations range as low as 0.15 mg/l WSF and may be somewhat lower for specific compounds. Moore and Dwyer (1974) give a sublethal range of oil WSF to larvae of 0.001-0.1 mg/l. Wells and Sprague (1976) suggest a ratio of .03 should be applied to LC_{50} concentrations to establish "safe" levels, which would predict as acceptable concentrations less than 1 μg/l WSF; 3) Molting is an extremely sensitive physiological event for crustaceans that results in greater toxicity of oil compounds when larvae are exposed for periods of the intermolt cycle. Since larvae molt frequently, relatively short exposures of several days may disrupt normal ecdysis.

8.2.2 Effects of Oil on Reproduction

Oil in the water column or benthic sediments could affect reproduction in several ways: 1) sediment and infaunal concentrations of hydrocarbons become so high that feeding of crabs and shrimp is curtailed by either loss of prey (clams, polychaetes, other crustacea) and/or anorexia. Energetic requirements are not met and gamete production is reduced or curtailed. 2) Hydrocarbons are absorbed and/or ingested with food and deposited in eggs and sperm. At critically high (but as yet unknown) concentrations viability of the gametes is impaired and normal development of embryos is arrested resulting in greatly reduced hatching success. 3) Normal gametes are produced, eggs fertilized and extruded, but sediment hydrocarbons are absorbed directly by the lipid-rich developing embryo and remaining yolk mass. Again, at critically high tissue levels (unknown) development is arrested and a year-class is weak by virtue of poor hatch.

The first hypothesis is predicated on the possibility that extensive mortality of epibenthic and infaunal prey would severely restrict feeding by crabs. Scenarios of oil transport to the benthos (summarized by Manen and Curl 1981) predict accumulation of amounts up to 60 g/m^2 and high resultant mortality. Sonntag et al. (1980) predicted that annual benthic productivity ("benthic food growth rate") would reach zero at sediment oil concentrations of 8 to 16 g oil/m^2, well within the range of possible sediment concentrations predicted by participants of the 1981 Anchorage Workshop. In a realistic spill scenario (about 500,000 barrles of oil; Amaco Cadiz lost 223,000 mt = 2.47×10^6 barrels of oil; IXTOC 1 blowout spilled 30,000 barrels/day for several months) several thousand square kiolometers could be so impacted and food resources of crabs reduced on a large scale. In addition to outright loss of prey, food consumption could be reduced by a sublethal, anorexic response to increasing tissue levels of oil as shown for lobster larvae (Wells and Sprague 1976).

Reduction of food intake by either cause could cause an energetic imbalance in which metabolic needs account for the largest expenditure of ingested energy and little remains for tissue and gamete production (Edwards 1978). Sub-optimal temperatures can exacerbate the effect of oil on growth and energy budgets of a species as theorized by Warren (1971). Sublethal oil concentrations can act synergistically with sub-optimal temperatures to reduce energy consumption (Edwards 1978) but at the same time increase respiration even at cold temperatures (Laughlin and Neff 1977), thereby further narrowing the scope for growth (Warren

1971). This same reasoning of impaired bioenergetic demands of adults could pertain to pelagic larvae exposed to sublethal oil concentrations.

The second hypothesized effect of oil on reproduction is caused by translocation of hydrocarbons ingested and absorbed by adults to gametes. Rapid uptake of petroleum hydrocarbons has been demonstrated in several species of crustaceans (Anderson 1975; Cox et al. 1975; Lee 1975; Tatem 1977). Whie both adult and larval stages are capable of rapid elimination of hydrocarbons accumulated via the diet, metabolic products appear to be strongly resistant to depuration (Corner et al. 1976; Lee et al. 1976; Sanborn and Malins 1977). [However, residues amounting to 10% of the initial level were found in adult copepods which had been exposed 34 days earlier as nauplius I to a seawater solution of naphthalene for 24 h (Harris et al. 1977).] Neff et al. (cited by Varanasi and Malins 1977) found rapid accumulation of naphthalene derivatives by penaeid shrimp that reached tissue levels of 100 times greater than those in exposure water. Highest and most persistent residues were found in the hepatopancreas that directly supplies nutrient materials for gametogenesis to the gonads. Transfer of naphthalene to eggs was found to occur in the marine polychaete Neanthes arenaceodentata (Rossi and Anderson 1977). Blue crab (Callinectes sapidus) ingesting radiolabeled hydrocarbons assimilated 2 to 10% and stored up to 50% of this amount in the hepatopancreas, which was the only organ assayed that still contained radioactivity after 25 days of depuration (Lee et al. 1976). Again, a direct translocation to and biomagnification of hydrocarbons in lipid-rich gametes is tenable, although not well studied to our knowledge. Sufficiently high hydrocarbon levels in egg yolk and developing embryos could cause anomlaous development.

The third reproductive effect involving eggs and embryos is uptake of hydrocarbons directly from bottom or interstitial water (female *Chionoecetes* may bury in the sediment while carrying an egg clutch) where sediment levels are high by virtue of processes such as deposition of oil-ladened fecal pellets or storm mixing in shallow waters (Manen and Curl 1981). No studies of direct hydrocarbon uptake by crab or shrimp eggs and embryos could be found, but transferal of naphthalenes to brooding eggs (high in lipids) was reported to occur in the marine polychaete *Neanthes arenaceodentata* (Ross and Anderson 1977) while adsorption from seawater occurred independent of adults in eggs of the Pacific herring (Eldridge et al. 1978). The lethal effect such exposure can have on developing embryos was shown by Tatem (1977) who exposed gravid female shrimps (*Palaemonetes pugio*) to 1.44 mg/l WSF for 72 hr. One week later control females released an average of 45 larvae each while those exposed to oil released only 9 each. Further studies of oil toxicity to developing eggs is warranted in light of possible oil impacts to red and blue king crabs that reproduce in relatively shallow, nearshore areas. Since oil weathers and degrades slowly in the sediments of very cold arctic waters (little change in quantity and composition after one year in tests cited by Manen and Curl 1981), and since female king and tanner crabs brood eggs for eleven months (Sections 3.0 and 4.0), protracted exposure of eggs to hydrocarbons can result from oil spills that reach extensive areas of reproductive grounds.

An additional mechanism of oil-related stress on crustacean reproduction could directly involve impairment of copulation that results in a high proportion of infertile egg masses extruded by females. As described in Sections 3.0 and 4.0, a sexually mature male locates and embraces a female just prior to her molt and they copulate immediately thereafter. Failure to copulte within five days post-ecdysis results in infertile egg masses. Location of a female partner is based on strong pheromone cues that are detected by chemosensory organs. Pearson et al. (1980) demonstrated that Dungeness crab can detect hydrocarbons at a few µg/l. Following an oil spill, water concentrations may exceed 100-200 µg/l (Hood and Calder 1981), and might impair chemosensory location of females or otherwise alter behavior to reduce breeding within the population. Following the Amaco Cadiz spill in the spring of 1978, the numbers of gravid crab and lobster were drastically reduced in that year and 1979 along the affected portion of the Brittany coast (Hood and Calder 1981), suggesting that breeding within the population was impaired.

8.3 Larval Decapod Biology, Sensitivity to Oil, and Oil Scenarios: Misconceptions of Past Models and More Realistic Assumptions

Summaries of biological information and predictions of oil impacts in the S.E. Bering Sea arising from OCSEAP workshops at Asilomar, California (Sonntag et al. 1980) an Anchorage, Alaska (Manen and Curl 1981) were based on available data and best possible assumptions. In reviewing these efforts, several misconceptions and inaccuracies are apparent that, if corrected, may change the predictions of oil toxicity to and impact on pelagic and benthic crab populations. These changes include the following points:

1. An entire larval year-class was assumed to hatch during the 3 months of April, May, and June as proportions of 20%, 60%, and 20%, respectively (Sonntag et al. 1980). Based on molt frequency data of our report for larval king crab (Section 3.0), Tanner crab (Section 4.0), and shrimp such as Pandalus borealis (Section 6.0), it appears that the majority of larvae for these species are hatched in a 3-4 week period of April and not over a protracted period of 3 months. Therefore the entire year-class enters the water column during a relatively brief period of time and is not followed weeks later by other cohorts for that year. First stage king crab zoeae that are killed by oil north of Unimak Island in late April, as an example, will not be replaced by other first stage zoeae hatched in June (perhaps replaced by larvae also hatched in April and transported to the affected area). Since hatching seems to be a well-synchronized event among commercial crustaceans, a major oil spill that kills a significant proportion of a larval year-class will not be mitigated by a later hatch of larvae after oil disperses below toxic levels.

2. An oil concentration of 0.2 mg/l and greater that was selected as toxic to crab and shrimp larvae is too high. Virtually all bioassay literature pertaining to Bering Sea species is based on short 96-hr exposures (Wolfe 1977; Karinen 1981). Models assumed that toxic oil concentrations would persist only one to two months,

and, for such short periods, must therefore be present at relativly high concentrations to be toxic. Based on molt frequency data of this report, decapod larvae molt every 3.5 to 4 weeks and thus over the duration of hypothetical spills could be exposed 2 to 3 times during the physiologically sensitive events of ecdysis. From the perspective of relatively brief larval development time, a chronic and probably stressful exposure to oil would be one of 2 to 4 weeks duration. Given Moore and Dwyers' (1974) suggested sublethal hydrocarbon range of 1 to 100 μg/l, and Wells and Sprague's (1976) application factor of 0.03 from LC_{50} values to "safe" concentrations, we feel that exposure of crab and shrimp larvae to WSF of oil >50-100 μg/l (.05-.1 mg/l) for 2 to 4 weeks during a molt cycle would be toxic. The sublethal effects of such exposure could be manifested as reduced feeding, delay of molt (this results in longer development time and pelagic existence, and therefore greater susceptibility to natural mortality factors such as predation), behavioral anomalies (changes in patterns of geotaxis and phototaxis), that together synergistically reduce viability of the larvae. Obviously, models that were predicated on toxic oil levels of 200 μg/l (.2 mg/l) did not affect areas as large as that might be polluted by concentrations 2 to 4 times lower.

3. Oil was mixed to a depth 50 m in previous models (Sonntag et al. 1980) which is quite feasible but not necessary to effect crustacean larvae. In the biological sections of this report (3.0-7.0) larvae of various decapod groups are shown to be distributed in the upper 60 m of water and often abundant in the upper 20 m. Later

zoeal stages are capable of strong swimming bursts exceeding a centimeter per second. Over several days, larvae can easily move tens of meters vertically and in so doing reach the surface. Megalopae of <u>Chionoecetes</u> spp. were routinely caught after dark in neuston nets sampling the upper 20 cm and apparently these larvae undergo diel vertical migrations that bring the population to the surface (Armstrong and Incze, unpublished data from 1981 PROBES cruise, Leg 4). Thus, if spilled oil is initially mixed less deeply (e.g., to 20 m), but spread over a greater area it will still likely stress all decapod larvae of the water column as they invariably move to the surface, but in this case the spatial effect is much greater and the population more severely impacted. To reiterate, it is not necessary that oil be mixed much below the surface to contaminate and stress crab and shrimp larvae. Megalopae would routinely visit the surface where highest concentrations would usually be found. Models should consider scenarios that spread a given volume of oil rapidly over the surface but only to a depth of 20 m to derive area affected.

4. The model of Sonntag et al. (1980) did not consider any direct toxic effects of oil to benthic crab and shrimp but only indirect effects through losss of food. Manen and Curl (1981) discuss the possibility of some adult mortality in heavily impacted areas, but neither model considers toxicity of oil-contaminated sediments to developing eggs and embryos of benthic crustaceans. We could find no literature on oil toxicity to early developmental stages of crustacean eggs, yet if hydrocarbons pass egg membranes and are

sequestered in the lipid-rich yolk then the risk to rapidly cleaving embryos is probably high. Armstrong and Millemann (1974) found that embryos of the mussel *Mytilus edulis* are most sensitive to an insecticide during early cleavage stages, and they review literature on protein and spindle apparatus poisons that effect both nucleic acid synthesis and normal blastomere division (it is possible that certain oil hydrocarbons act in a similar manner and Malins (1977) reviews literature on toxic deriviatives of hydrocarbon metabolism that affect DNA as mutagenic/teratogenic agents). Eggs of both fish and polychaete absorb hydrocarbons such as naphthalene (Rossi and Anderson 1977; Eldridge et al. 1978), and Tatem (1977) showed the lethal effects of a brief 72-hr exposure of gravid female shrimp to WSF when larval hatch was subsequently reduced 80%.

The longevity of oil bound to sediments in the Bering Sea could result in a chronic exposure of eggs during the 11-month development time for king and Tanner crab as hydrocarbons desorb to interstitial and bottom water. Sonntag et al. (1980) predicted that 8-16 g oil/m^2 would significantly inhibit annual benthic growth rate, and up to 60 g/m^2 could accumulate and would be lethal (Manen and Curl 1981). Since larval stages are invariably more sensitive to pollution than are adults, we consider the same to be true of embryos, especially during chronic exposures. Therefore sediment levels of 5-10 g/m^2 (perhaps lower) could be toxic to crab and shrimp eggs over months of exposure and kill significant proportions of a follow-year-class as eggs, while a current year-class is killed as zoeae in the water column.

5. Both modeling efforts concluded that oil spills so severe as to eliminate an entire larval year-class would not constitute a significant effect on benthic stocks (and in turn the fishery) because longevity and fecundity of the species would mask this loss. We strongly disagree with this hypothesis and believe that any significant reduction or a complete loss of a year-class could adversely affect the fishery 7-8 years later. As noted in Section 3.0, greater than 60% of any year's fishery may be comprised of new recruits from a single year-class. Otto et al. (1980b) summarized population estimates for red king crab over the last 10 years and noted a significant decline in pre-recruit males in 1980. Both the 1981 groundfish survey and commercial fishery have verified the existence of very weak year-classes, and the fishery in this and next year will be very poor. This reduction in commercial stocks results from poor survival during early life-history stages of larvae and new instars that is caused by poorly understood sources of natural mortality (exceptionally cold years of 1975-76 are hypotheszied to be contributory causes; Section 3.0). Large-scale mortality of larvae caused by oil pollution will eventually be just as critical to the fishery as are unusually high losses due to natural causes. Obviously, consecutive years of oil pollution or scenarios described in Item 4 of this subsection where pelagic larvae of one year are killed and benthic eggs for the following year's hatch simultaneously poisoned, would cause even greater harm to the fishery.

Ecological ramifications of one or two very weak year-classes resulting from oil pollution may have important, though unknown, impacts on epibenthic and infaunal communities. Jewett and Feder (1981) reported that commercial crabs comprise 55% and 82% of epifaunal biomass on the middle (40-100 m) and outer (>100 m) shelves, respectively. Reduction of this enormous predator/prey group by catastrophic loss of larvae could radicall alter the community composition, perhaps by an increase of echinoderms (sea stars) that are also abundant. The effect of this may be to slow recovery of crab stocks faced with large populations of competitors that increase to replace one or two years of crabs lost to oil.

8.4 Extent of Area Affected by Oil

Scenarios considered by participants of the 1981 Anchorage OCSEAP Workshop included only spills or blowouts that released 50,000 barrels which, in retrospect, is a quantity far less than might be expected from mishaps involving modern tankers. The Amaco Cadiz released 223,000 mt = 2.47×10^6 barrels of oil (1 barrel = 35 gal; specific gravity of oil about 0.85), of which 660,000 barrels reached the coastline. The Ixltoc blowout spilled 30,000 barrels/day into the Gulf of Mexico, and the eventual 500,000 mt released (Hood and Calder 1981) was equivalent to 2.5×10^6 barrels.

Spill scenarios modeled by the 1980 Asilomar Workshop included both a 100,000 mt (= 1.11×10^6 barrels) spill over two days and release of 5,000 mt/day (55,500 barrels) for 20 days (Sonntag et al. 1980). After mixing oil to 50 m and accounting for loss of a 25% volatile fraction, and area of 7,5000 km^2 was polluted at or above 0.2 mg/l (considered a lethal threshold in that model). If as suggested in this report the same volume of oils is mixed to 20-30 m and 0.05-.1 mg/l is considered toxic, then an area of 15,000 km^2 might be affected. Manen and Curl (1981) predicted that a 50,000 barrel spill would be lethal over a 100-300 km^2 area (0.2 mg/l threshold; mixed to 50 m), and a more realistic spill of 500,000 barrels (half the value considered by Sonntag et al. above) would pollute an area 10 x greater. If these various scenarios are modified by mixing oil less deeply and considering oil concentrations of 0.05-.1 mg/l WSF to be toxic, then water over an area of 10,000-15,000 km^2 might be polluted by concentrations lethal to decapod larvae following a large spill.

Oil contamination of the benthos can also impact crab and shrimp populations by deleteriously affecting egg and embryonic development and stressing all benthic age-classes, especially very young juveniles. In the small scenario of 50,000 barrels, over 100 km^2 received oil levels up to 60 g/m^2 by storm mixing and fecal deposition, and hundreds of km^2 were covered by lesser concentrations (Manen and Curl 1981). After larger spills of 500,000 to one million barrels, several thousand km^2 of benthos could be covered by 5-10 g oil/m^2; a level we previously suggested might be toxic to crustacean embryos during chronic exposures. Extensive coverage would be most likely and most critical nearshore in shallow water.

8.5 Predictions of Oil Impact on Decapod Larvae

Rather than work from a specific oil scenario in this section and ask if larvae would be impacted, each major decapod group will be discussed from the vantage of how severe an oil spill must be to significantly impact a year-class. Figure 8.1 shows proposed lease sale areas of the St. George Basin and serves as reference to the following discussions.

8.5.1 King Crab Larvae

As shown in Figs. 3.7-3.10, there are very few larvae of *Paralithodes* spp. over the St. George Basin proper, and consequently even an extensive oil disaster that is confined to the area between 100 m to 200 m would have no effect on king crab populations. However, it is most probable that an enormous spill or blowout at numerous points within the lease sale area or along future tanker routes from St. George Basin would be spread to areas critical for larval king crab development.

Blue king crab (*P. platypus*) and it fishery are centered about the Pribilof Islands. The Rand model of transport and fate of oil following a spill in the St. George Basin shows that winter-spring trajectories are to the west-southwest. If a major mishap in the northern lease tract (Fig. 8.1) occurs in April or May, then oil will likely reach and surround both St. George and St. Paul Islands and affect waters in between where larvae of this species are abundant. The northern lease area is about 125 km from St. George Island. A 50 x 150 km band of pollution emanating from an area around 56°45'N, 168°30'W would cover an area of 7500 km^2 (feasible in the model of Sonntag et al. 1980) including nearshore waters around the islands. In addition to killing a large percentage of the larval year-class, oil mixed to the bottom and transported to sublittoral areas around both islands would stress and kill

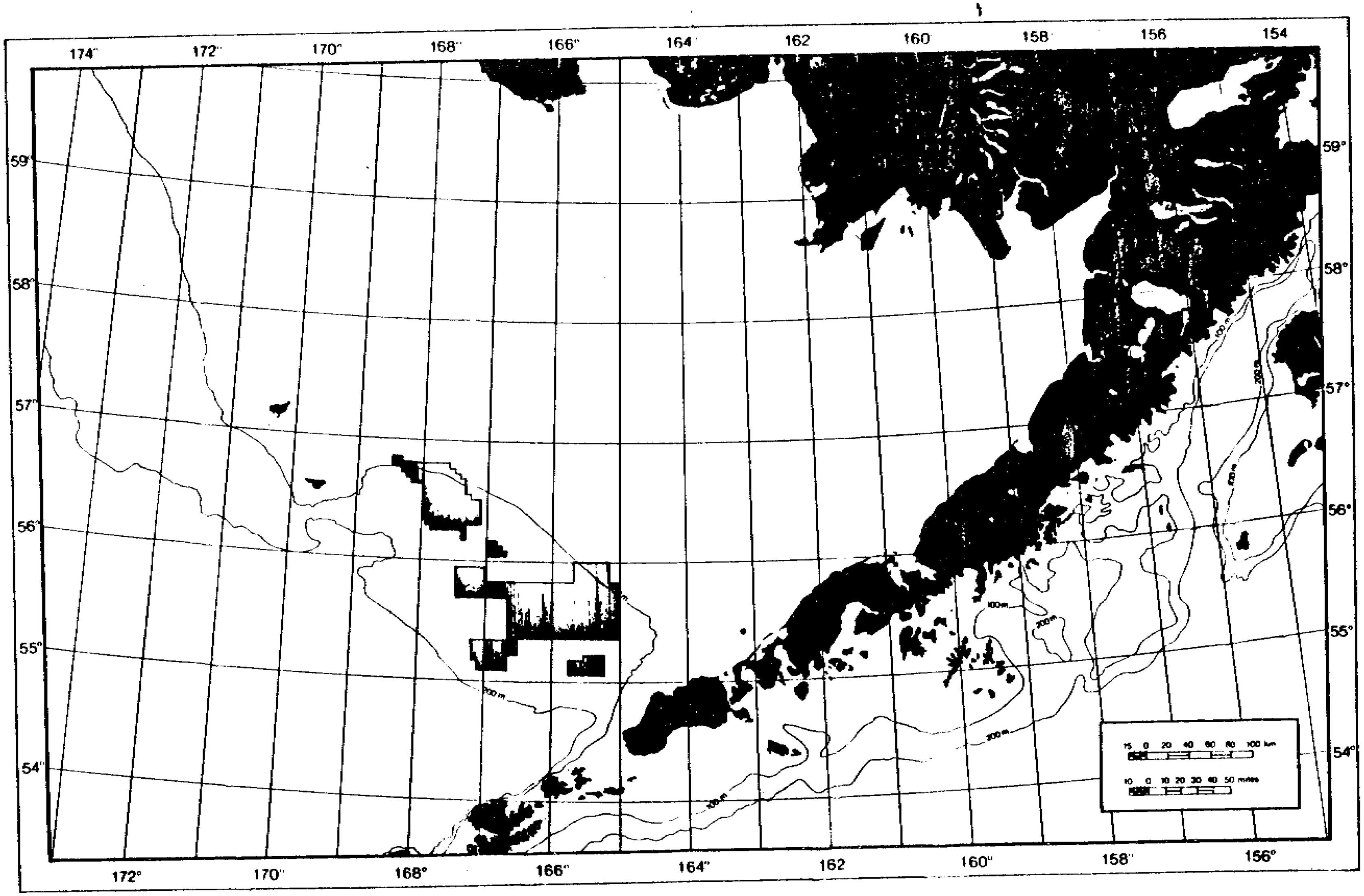

Figure 8.1. Proposed lease-sale area in the St. George Basin.

juvenile crabs and poison eggs as previously discussed. The potential for severe decimation of blue king crab stocks by oil perturbations is high.

Red king crab larvae (P. camtschatica) are distributed along the North Aleutian Shelf (Fig. 3.10). Major oil spills by tankers at Unimak Pass or blowouts in southern lease-sale tracts around 55°30'N, 165°W during summer months would result in oil being transported to king crab nursery areas according to trajectories of the Rand model for this season (see Manen and Curl 1981). The area from the west tip of Unimak Island to the eastern edge of Port Moller out to the 50-m isobath covers about 10,500 km^2. A large spill at Unimak Island could cover most of this region, and, as suggested by Manen and Curl (1981), kill virtually all of the larval year-class in this area. It is known from work by Haynes (1974) that king crab larvae are abundant east of Port Moller up to Port Heiden and into Bristol Bay in July and August. If these larvae escape pollution then the damage done by a Unimak-Port Moller disaster might be somewhat attenuated. However, distribution and abundance of larvae east of Port Moller is poorly known and requires further study.

Large volumes of oil reaching shallow water of the North Aleutian Shelf would be mixed to the benthos and directly affect juvenile and adult crabs, deplete food, and stress and kill developing eggs of gravid females. Because major populations of sexually mature females are invariably found off Unimak Island, in the area of Amak Island, and off Port Moller, and because extensive lagoons and estuaries support abundant bird and mammal populations as well as supply nutrients for productive nearshore pelagic and benthic communities (see discussions in Hood and Calder, Vol. 2, 1981), threats of oil pollution to the North Aleutian Shelf should be considered paramount in future research and management plans. A significant loss of any year-class should be viewed as damaging to the fishery 7-8 years later.

8.5.2 Tanner Crab Larvae

Larvae of both *C. bairdi* and *C. opilio* are ubiquitously distributed over the St. George Basin, and *C. opilio* populations are also large to the north and northeast over the middle shelf (Figs. 4.10-4.15). A very large oil spill might cover 10-15% of the Basin (Sonntag et al. 1980; Manen and Curl 1981) and could have a significant impact depending on the following points:

1. Location. If a large spill was generally dispersed along 200 km of the 100-m isobath in a 50 km wide band, then the high densities of larvae associated with this depth (Fig. 4.7) could result in a higher percentage of the year-class being killed than implied by the ubiquitous distribution.

2. Month. A spill that coincides with the megalops larval stage could be more destructive than an earlier spill when zoeae are present. Larvae of both *Chionoecetes* spp. are megalopae in mid-July to August. As noted previously in this secion, we have evidence of a strong diel vertical migration by megalopae based on neuston catches from which some of the highest densities were recorded for any larval stage (Armstrong and Incze, unpublished data, 1981

PROBES cruise). Nocturnal movement to the surface would frequently expose megalopae to toxic oil concentrations. Further, since megalopae are the last larval stage before metamorphosis, they represent the survivors of larval development during which natural mortality has reduced populations 90% from initial densities of stage 1 zoeae hatched. Extensive mortality to the megalops stage could exacerbate natural mortality rates and threaten recruitment to the benthos.

3. Year. Somerton (1981) shows tht C. opilio in the area of the St. George Basin have successfully recruited juveniles to benthic populations only tree times in 10-11 years. If a major oil disaster occurs in what is otherwise an auspicious year for C. opilio larvae, then extensive mortality could imperil an infrequent, yet crucial year-class for the species' reproductive effort in the area of the St. George Basin.

In general, it seems unlikely that areas large enough to encompass significant portions of larval Tanner crab populations would be polluted by oil. Since females of these species remain in water of 100-200 m to reproduce, the probability of widespread sediment contamination and toxicity to eggs seems low. In turn, the fisheries for Tanner crab will likely not be substantially impacted by oil-related mortality of larvae, although other aspects of oil pollution could imperil the fishery (see Manen and Curl 1981).

8.5.3 Other Brachyuran Larvae

Larvae of Erimacrus isenbeckii are not abundant over large areas of the St. George Basin, and highest densities were found just north of Unimak Island (Fig. 5.1). An oil mishap over the Basin proper would not threaten the species, but oil transported along the North Aleutian Shelf from Unimak Pass would impact areas of high E. isenbeckii abundance. Although the commercial fishery (very small at present) is centered around the Pribilof Island, few larvae were found in that area making it difficult to equate loss of larvae with impact on a fishery.

Larvae of Hyas spp., Oregonia spp. (Fig. 5.6) and of the family Pinnotheridae (Fig. 5.8) are widely distributed over the St. George Basin. Any reduction in benthic populations through mortality of larvae might have some ecological repercussion (no fisheries for these groups). However, as noted for Tanner crab the area affected by even a large spill might be only 10-15% of the Basin and therefore of little threat to populations of these crabs as a whole. Again, if oil from a spill is dispersed along the 100 m isobath (roughly the middle front) for about 200 km than a greater proportion of the larval population might be killed since densities are high in this region (Figs. 5.6, 5.8).

8.5.4 Shrimp Larvae

Larvae of Pandalus borealis and species of hippolytid and crangonid shrimp are ubiquitously distributed over the St. George Basin (Figs. 6.5, 6.11, 6.14, respectively). There is presently no commercial fishery for any shrimp species in this area and so deleterious effects from oil-related mortality of larvae would be ecological in nature. The combined reduction of larvae and, in turn, benthic recruitment of several major shrimp groups could impact the benthic community through predator-prey relationships discussed in Section 6.0. Again, the relatively small area of the Basin polluted by even large spills would preclude imporverishment of benthic communities to the extent various finfish and curstacean fisheries are threatened through loss of food.

8.5.5 Hermit Crab Larvae

Larvae of the family Paguridae were widely distributed over the St. George Basin and middle shelf, and higher densities were usually found east of the 100-m isobath (Fig. 7.4). It does not seem likely that oil would significantly impact hermit crabs as a group because of broad spatial distribution and protracted period of hatch (Fig. 7.6) that would tend to restore larvae in oil-impacted areas after toxic concentrations had diminished.

8.6 Summary of Major Conclusion

As noted in the Introduction (Section 1.0) data and interpretations included in this report are, in some cases, tentative and await further verification from continuation of our own program and other future investigations. Still, several important predications and observations pertaining to oil impact on decapod larvae in the S.E. Bering Sea can be made. These include:

1. Larvae of both red and blue king crab seem most likely to be deleterious impacted by oil pollution because distribution is nearshore and relatively restricted over the expansive shelf. There is a

high probability that significant portions of or entire year-classes could be killed by oil dispersed from a major spill, with a subsequent impact on the commercial fishery.

2. Larval Tanner crab populations could suffer extensive mortality depending on location, magnitude, season, and year of a spill as well as larval stage affected. Further modeling should be done with these species based on modified assumptions outlined in this section. Many oil spills, however, might be relatively benign in their impact since these larvae are densely distributed over large areas of the St. George Basin.

3. Larvae of many species of shrimp, hermit crab, and other true crabs are abundant and widely dispersed over the Basin. Most oil spills would not significantly imperil benthic populations, although the combined loss of all decapod larvae over 10-15% of the Basin could have regional consequences through impacts on predator/ prey relationships in the benthic community.

4. Exposure of developing eggs and embryos of commercial crab stocks to contaminated sediments should be considered an important source of mortality in nearshore, nursery locations. There is no available literature on sensitivity of decapod eggs to ambient oil and research on this topic is warranted.

5. Further modeling of oil impacts to crab larvae should be done using the Rand and/or Sonntag models after modification of certain assumptions have been made including: a) shorter periods of hatch; b)

2-4 week molt cycles; c) greater toxicity of oil with threshold concenrations at 0.05-.1 mg/l; d) shallower mixing (20-30 m) but greater horizontal dispersion; e) stress and death of egg masses when sediment loads exceed 5-10 g/m^2; f) large spill scenarios of $5 \times 10^5 - 1 \times 10^6$ barrels emanating from areas of the proposed lease sale near the Pribilof Islands, along the 100-m isobath, and near Unimak Island during April-May and June-July.

6. Significant reductions in larval populations caused by oil should be expected to adversely affect a year-class and later the commercial fishery when that year-class is recruited to legal size.

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APPENDIX A: S.E. Bering Sea shrimp - Species list.

Order Decapoda
- Family Pasiphaeidae
  - Pasiphaea pacifica
- Family Pandalidae
  - Pandalus borealis Kroyer
  - Pandalus goniurus Stimpson
  - Pandalus montagui tridens Rathbun
  - Pandalus stenolepis
  - Pandalopsis dispar
- Family Hippolytidae
  - Spirontocaris lamellicornis (Dana)
  - Spirontocaris ochotensis (Brandt)
  - *Spirontocaris prionota
  - *Spirontocaris arcuata
  - Eualus macilenta (Kroyer)
  - Eualus gaimardii belcheri
  - *Eualus fabricii
  - *Eualus barbatus
  - *Eualus pusiolus
  - *Eualus avinus
  - *Eualus townsendi
  - *Lebbeus groenlandicus
  - *Lebbeus grandimanus (formerly L. polaris)
  - *Heptacarpus camtschaticus
  - *Heptacarpus moseri
- Family Crangonidae
  - Crangon dalli Rathbun
  - Crangon communis Rathbun
  - *Crangon alaskensis
  - **Sclerocrangon boreas
  - Argis dentata (Rathbun)
  - *Argis lar
  - *Argis alaskensis
  - *Argis crassa
- Family Oplophoridae
  - *Hymenodora frontalis
  - *Hymenodora facialis

This list is based on Feder & Jewett 1980 from NMFS/NOAA 1975 and 1976 survey cruise.
*Additions to list from species ranges given by Butler 1980.
**Larvae attached to adult; not expected to appear in plankton.

APPENDIX B. References used for identification of shrimp larvae in the S.E. Bering Sea, and location of source material used by each author.

Larval Descriptions

Pandalidae Author	Species or group, location
Berkeley, A., 1930	Pandalopsis dispar British Columbia
Haynes, E., 1976	Pandalus hypsinotus Kachemak Bay, Alaska
Haynes, E., 1978	P. goniurus Kachemak Bay, Alaska
Haynes, E., 1979	P. borealis Kachemak Bay, Alaska
Haynes, E., 1980	P. tridens Kachemak Bay, Alaska
Ivanov, B., 1971	P. tridens Kamtchatka
Kurata, H., 1964c	P. borealis and other pandalids Hokkaido, Japan
Needler, A. B., 1938	P. stenolepis British Columbia
Pike and Williamson, 1962	Pandalid sp. British Columbia
Rothlisberg, P., 1980	Pandalid sp. West Coast of U.S.A.
Williamson, D., 1967	Pandlid sp. British Columbia
Hippolytidae	
Haynes, E., 1978b	Lebbeus groenlandicus Kachemak Bay, Alaska
Ivanov, B., 1971	Eualus macilenta, E. barbatus, Spirontocaris sp., and L. groenlandicus (Stage I's) Kamtchatka Penn.
Needler, A. B., 1933	Hippolytid larvae British Columbia
Pike, R. B. and Williamson, D. I., 1960	Spirontocaris and related genera (includes L. polaris = L. grandimanus, L. groenlandicus, E. gaimardii, and E. gaimardii belcheri, E. pusiolus, E. fabricii, British Columbia

APPENDIX B. References used for identification of shrimp larvae in the S.E. Bering Sea, and location of source material used by each author. - Continued.

Larval Descriptions
Continued

Crangonidae Author	Species or group, location
Haynes, E., 1980b	*Crangon franciscorus augustimana* (Stage I) Kachemak Bay, Alaska
Kurata, H., 1964d	*Crangonidae* and *Glyphocrangonidae*, Hokkaido, Japan
Loveland, H. A., 1968	*Crangon alaskensis* San Juan Is., Washington
Makarov, R., 1966	*Crangon dalli*, *Sclerocrangon boreas*, *Argis lar*, *A. crassa*, *Paracrangon echinata* (spiny larvae)
Makarov, R., 1968	*Sclerocrangon* sp. Ochotsk Sea
Squires, H. J., 1965	*Argis dentata* N. Quebec, Ungava Bay
Williamson, D. I., 1960	Crangonid larvae North Sea, Barents Sea
Pasiphaeidae	
Elofsson, R., 1961	*Pasiphaea multidenta* and *P. tarda*, western Norway
Williamson, D. I., 1960	*P. multidentata* and *P. tarda* British Isles
Williamson, D. I., 1962	Oplophoridae and Pasiphaeidae larvae North Sea, British Isles and Barents Sea

APPENDIX C. Paguridae and Lithodidae found in the Bering Sea (compiled from McLaughlin 1963, 1974; Pereyra et al. 1976; Feder and Jewett 1980).

Family Paguridae

- *Pagurus aleuticus*
- *P. beringanus*
- *P. brandtii*
- *P. capillatus*
- *P. confragosus*
- *P. cornutus*
- *P. dalli*
- *P. hirsutiusculus*
- *P. kennerlyi*
- *P. mertensii*
- *P. middendorffii*
- *P. ochotensis*
- *P. rathbuni*
- *P. tanneri*
- *P. townsendi*
- *P. trigonocheirus*
- *P. undosus*
- *Elassochirus cavimanus*
- *E. gilli*
- *E. tenuimanus*
- *Labidochirus splendescens*

Family Lithodidae

- *Dermaturus mandtii*
- *Haplogaster grebnitzkii*
- *Lithodes aequispina*
- *Phyllolithodes papillosus*
- *Placetron woznessenskii*
- *Pristopus verilli*
- *Sculptolithodes derjugini*
- *Paralithodes camtschatica*
- *P. platypus*

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