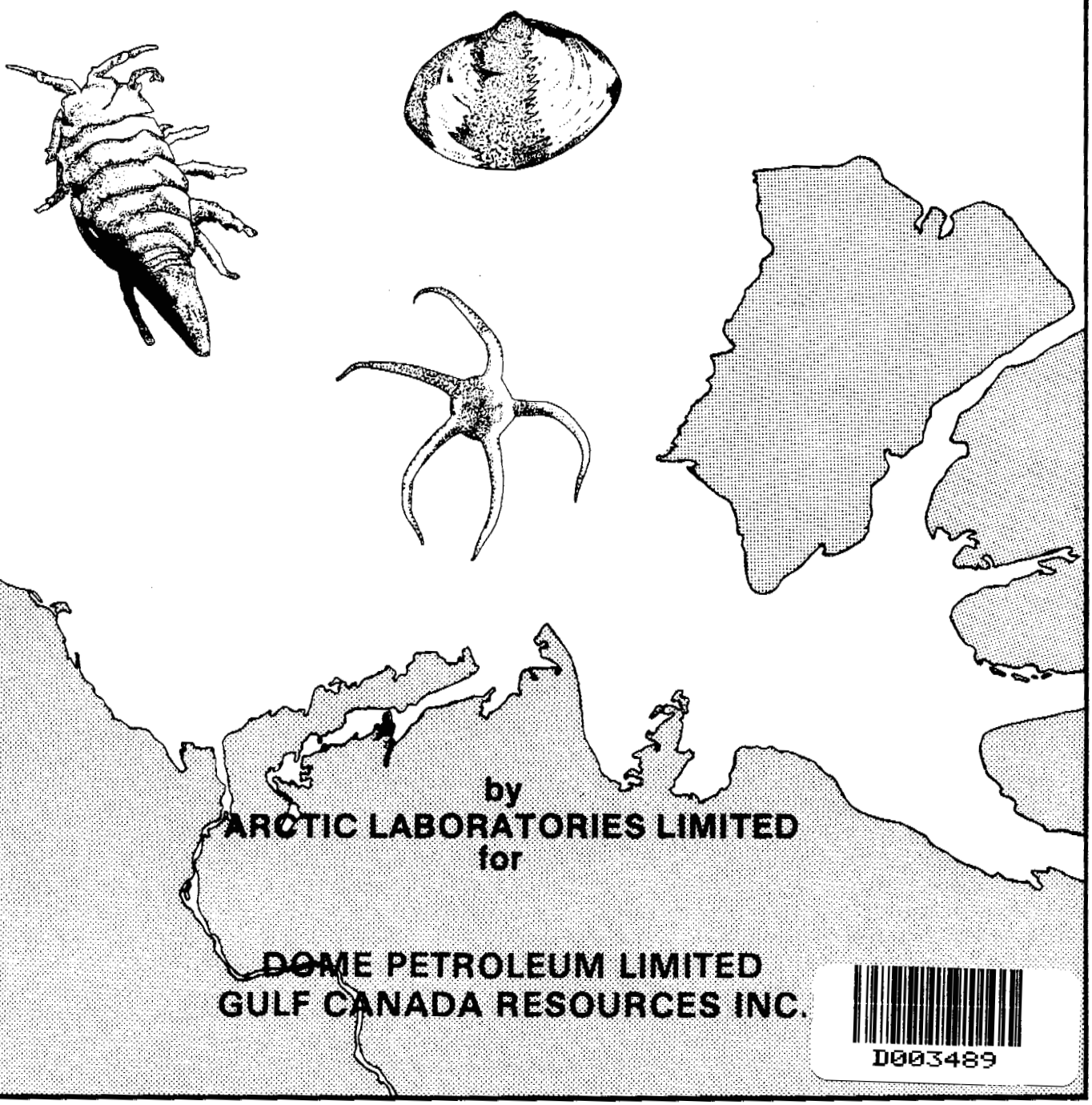
THE IMPACT OF GRAVEL DREDGING ON BENTHOS NEAR BANKS ISLAND, NORTHWEST TERRITORIES, 1981 AND 1983



by
ARCTIC LABORATORIES LIMITED
for

DOME PETROLEUM LIMITED
GULF CANADA RESOURCES INC.

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THE IMPACT OF GRAVEL DREDGING ON BENTHOS NEAR BANKS ISLAND, NORTHWEST TERRITORIES, 1981 and 1983

by

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A Report Prepared for

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and

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SUMMARY

This report describes a study of the impact of gravel dredging on benthos near Banks Island, N.W.T. Baseline surveys of benthos were made at twelve stations in the potential gravel deposit in 1981. Post-impact sampling at dredged and reference stations was performed in 1983, one year after dredging occurred. The objectives of the study were to identify the physical and biological effects of gravel dredging by trailer suction hopper dredge near Banks Island, and to assess the evidence of recolonization of dredge trenches by benthos.

The sampling program in 1983 involved diver-assisted airlift sampling, underwater video recording and still photography of the macrobenthos and benthic habitats at two reference stations and two dredged stations. Side-scan sonar recordings were used to delineate the area affected by dredge scour and to position the sampling stations. Sampling by benthic grabs was performed to supplement airlift sampling of infauna. The airlift and grab samples were analysed for taxonomic identities of benthos, wet and dry biomass, population density and benthic community associations.

Two major aspects of the effects of gravel dredging were examined near Banks Island: (1) direct effects on benthic invertebrates and macroalgae; and (2) effects on benthic habitat (destruction, creation, alteration). Loss of benthos in the immediate vicinity of the dredging trenches ("high impact" zone) due to entrainment and smothering is the most immediate direct effect. This loss, although not observed directly in this study, is not expected to be environmentally significant on a regional scale because only about 0.9 km^2 of benthic habitat was affected by dredge scours. Within a year, recolonization of infauna and epibenthos in and near the trenches, although not quantified, was well advanced. Levels of species diversity, population density and biomass of benthos were similar in samples from dredged sites and in unaffected reference samples.

Effects on benthic habitat were examined in terms of changes in sediment texture and morphology caused by dredging. The benthic habitat or substrate type present in the borrow area before dredging was gravel overlain by (or combined with) silt and clay. Dredging in this situation created the potential for longer-term habitat modification because the exposure of gravel clearly resulted in a shift in sediment texture within the habitat affected. The high rate of sediment (silt) accumulation in the trenches within the year following dredging, however, quickly restored the surficial sediment texture in the bottom of the trenches to the state present before

silt is not the same as gravel.

dredging. The major habitat differences remaining after one year were the presence of gravelly trench edges which were at least partially exposed, and the shallow trench depressions which were receiving the mobile sediments carried by bottom currents.

The possible regional effects due to resettling of silt transported out of the dredging areas by water currents could not be established at the nearby reference stations. Such effects, however, would be offset by natural processes since the entire area is subject to high levels of sediment accumulation. It is also noteworthy that macroalgae and epifauna appear to be coping with this factor.

The main findings of the study were:

1. Dredging by trailer suction hopper dredge in the substrate consisting of gravel overlain by silt/clay was confined to an area of about 0.9 km^2. Hopper dredging excavated shallow (0.2 to 0.3 m deep) paired trenches which were about 4 m wide. Benthos and substrate were stripped from the sea bottom along the parallel trenches.

   The secondary effects of dredging included agitation and resettling of fine sediment particles, such as fine sand and silt. Most of the silt/clay particles tended to be carried away from the dredging area by currents, but appreciable amounts of sand may have resettled in and near the dredge trenches. Evidence of sand deposition in trenches was observed in this study. The high rate of accumulation of silt in the trenches (over 5 cm) within the year following dredging, however, overshadowed the sand deposition and offset the shift in sediment texture from silty to gravelly that was initially caused by the dredging.

2. Recolonization of the dredged trenches by benthic infauna was well established with a diverse assemblage of polychaetes, amphipods, cumaceans and molluscs one year after dredging had ceased. Levels of the faunal indices (diversity, population density and biomass) were similar inside and outside the trenches at dredged stations, and were near or approaching levels at non-dredged reference stations. Kelp and large epifauna were observed at the margins of the dredge trenches.

3. The analysis of faunal indices and community associations of benthos indicated that the dredged sites were part of a benthic faunal assemblage with moderate levels of abundance and diversity. The community structure of the "dredge area" assemblage was intermediate between two other assemblages representing stations with "sandy" and "heterogeneous" sediments, respectively. There were no discernible negative effects of dredging on benthic community structure one year after dredging near Banks Island.

Was the study capable of detecting impacts?

4. Compared to other shallow (< 50 m) areas of the southern Beaufort Sea, the borrow area near Banks Island had relatively high average levels of faunal diversity, population density and biomass. The presence of sessile epifauna and macroalgae attached to scattered rocks are features which link the benthos near Banks Island with that the of the Canadian Arctic Archipelago east of Banks Island. In addition to the members of the infauna, the sessile epifauna and macroalgae adjacent to the trenches appear to have survived or recovered to a large extent from the impact of dredging.

TABLE OF CONTENTS

TABLE OF CONTENTS (continued)

LIST OF FIGURES

LIST OF TABLES

LIST OF PLATES

LIST OF PLATES (continued)

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1. INTRODUCTION

1.1 Background and Scope of the Study

This report describes a study of the biological effects of marine gravel dredging on benthos near the southwest coast of Banks Island, N.W.T. The study compares the results of diving surveys performed in 1981 (before dredging) and in 1983 (one year after dredging) to identify the changes caused by hopper dredges and to assess the process of recolonization of dredged areas by benthos. Previous reports (Heath 1981; Heath et al. 1982a) described the results of the pre-dredging underwater surveys carried out on potential gravel deposits near Banks Island in 1981. The findings of these earlier reports are also discussed in relation to the 1983 sampling results contained in this report. The study was conducted on behalf of Dome Petroleum Limited and Gulf Canada Resources Inc. to fulfill the permit requirements for a dredging operation in the vicinity of Banks Island.

The dredged gravel and rock are required for control of wave erosion on subsea berms of caisson islands used for offshore petroleum exploration in the southern Beaufort Sea (Beaufort 1981). The most economical source of such materials is from offshore gravel deposits accessible to dredging vessels (Hopkins 1978).

The impacts of dredging on the macrobenthos (macroinvertebrates and macroalgae) were examined because the removal of seabed materials directly affects the benthic habitat and biota. Benthos populations tend to have more spatial and temporal stability within the study area than do those of fish, sea birds and marine mammals. It is possible to sample the benthos with reasonable cost and precision due to their limited mobility or sedentary habits (Green 1979). In addition, the benthos are consumed by fish and marine mammals in the nearshore waters of the southern Beaufort Sea (see Section 3.1.4 for a discussion).

1.2 Related Studies

Several other related reports have been presented regarding the environmental effects of artificial island construction and associated marine dredging in the Beaufort Sea. A study of the impacts of island construction and substrate dredging at Tarsiut N-44 island site and South Tarsiut Borrow Area indicated that the

region of altered benthic habitat and depressed levels of benthos was confined to a zone of the island berm extending beyond 50 m but less than 500 m from the island caissons (Thomas et al. 1982, Heath and Thomas 1984a). The upper slopes of the berm were being colonized by sparse populations of benthos which appeared to have affinities for sandy sediments.

At the South Tarsiut Borrow Area, the impacts of dredging could not be distinguished by remote sampling methods from the influences of sediment properties and ice gouging. Differences in community structure of the zoobenthos and lower levels of biomass and diversity were observed at borrow stations and a sandy reference station when contrasted with surrounding reference stations where muddy sediments were present (Heath and Thomas 1984a).

Marine gravel dredging near Herschel Island, Y.T., also appeared to cause substrate disturbance of comparable intensity to that of ice scouring. The initial effect on benthos was the depopulation of narrow parallel strips of substrate, causing discontinuities in faunal distributions and lowered biomass in the dredged area (Heath et al. 1982b). Direct biological effects were confined to the dredge trenches left by the hopper dredges. Recolonization of the trenches began almost immediately after dredging by resettling of survivors and immigration of mobile and drifting benthos from surrounding areas. After one year, recolonization of trenches by a diverse assemblage of polychaetes, amphipods and other epifauna was evident, but abundance of benthos was low. The disturbed habitat appeared to have recovered to a productive state within a year, but development of a mature benthic community such as found at undisturbed reference sites may take several more years.

How could this possibly be measured

- this is an interesting statement
- what does it mean though?

- this is speculation, how will we ever know what will really happen.

1.3 Physical Setting

The dredging area on the southwest coast of Banks Island (Figure 1a) is located off the mouth of the Rufus River in 10 to 25 m of water (Figure 1b). The area is on the eastern margin of the Beaufort Sea, at the entrance to Amundsen Gulf.

Frequent ice scouring occurs on the Beaufort Sea continental shelf as a result of onshore and longshore movements of pressure ridge keels (Barnes and Reimnitz 1974; Pelletier and Shearer 1972). Ice covers the continental shelf until June or July. Landfast ice grows in thickness until the end of May and extends seaward to the 20 to 30 m isobaths where it meets the moving ice of the transition zone, which has a prevailing westerly motion in winter and spring (Marko 1975). Pressure ridge keels in

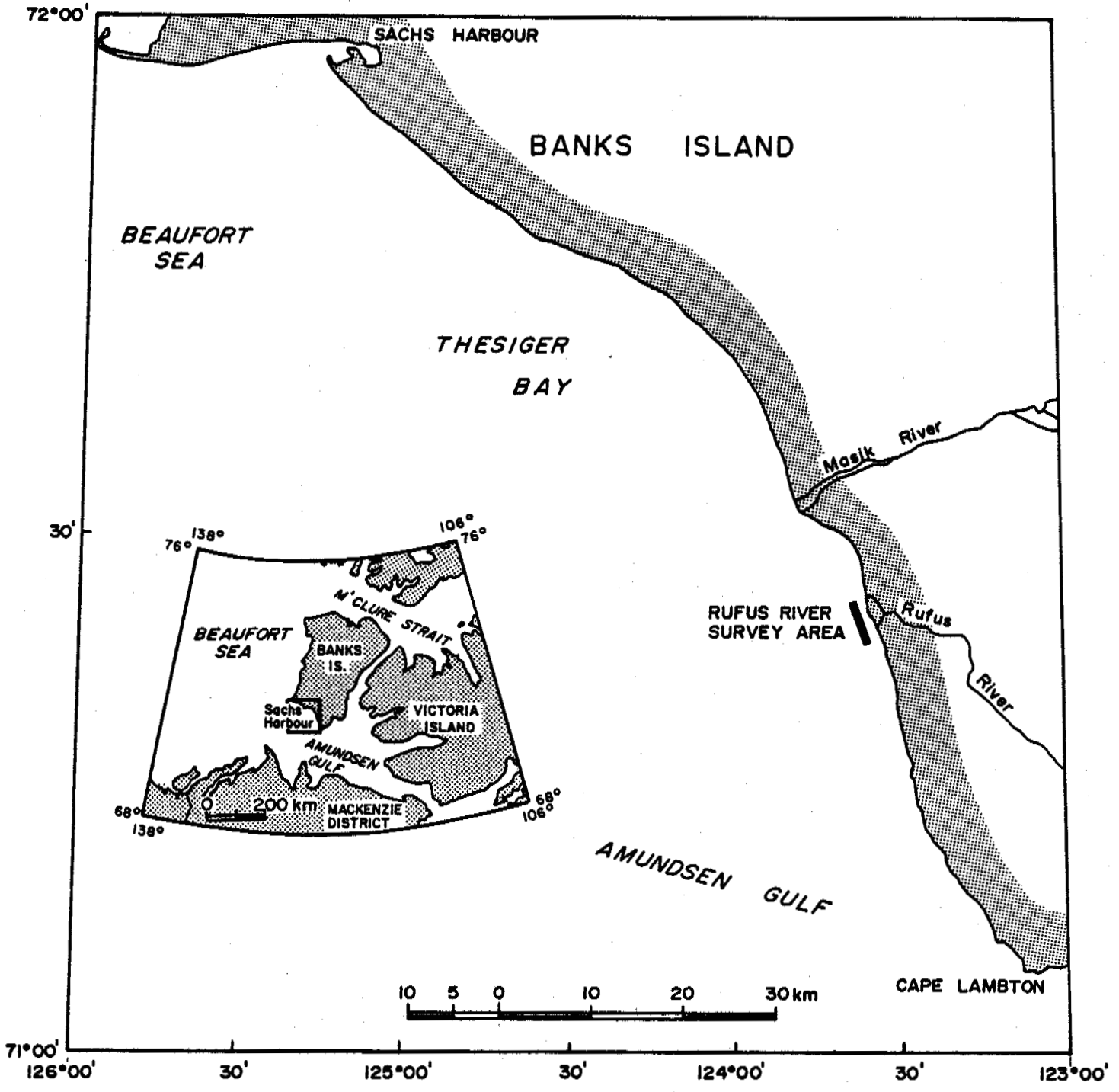


Figure 1a. Location map of Banks Island Gravel Borrow Area off the Rufus River on the southwest coast of Banks Island, N.W.T.

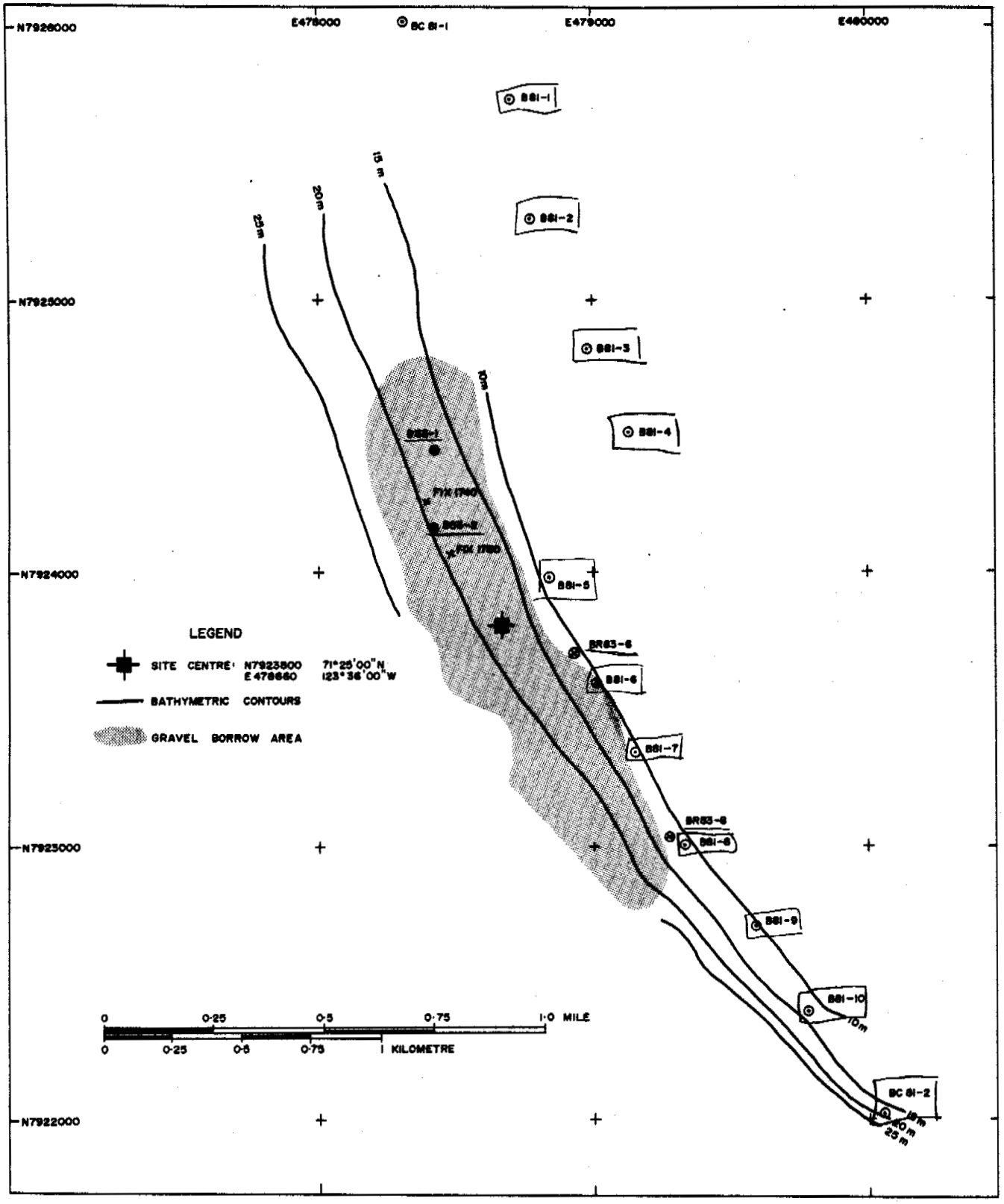


Figure 1b. Banks Island Gravel Borrow Area, showing borrow area (shaded) and benthos sampling stations for 1981 (pre-dredging) and 1983 (post-dredging). Co-ordinates indicated are UTM (Universal Transverse Mercator). Refer to Table 1 for station co-ordinates. (Figure is based on geophysical survey chart by Geoterrex Ltd., Ottawa, Ont.) Fix 1740 and Fix 1750 refer to positions on side-scan sonar track (Plate 2).

this moving ice zone may plow the shelf sediments throughout the winter. The frequency and extent of ice scouring has not been well documented for the southern coast of Banks Island. Heath et al. (1982a) observed shallow ice scours at four of twelve sampling stations in 1981. The ice gouges were found in 10.6 to 14.2 m water depth.

During the arctic summer, the ice breaks up and the edge of the pack ice usually retreats beyond the shelf break. Drifting and grounded ice floes can be present on the continental shelf throughout the summer. Drifting ice floes were present in the dredging area off Banks Island in late July 1983.

1.4 General Information about Arctic Dredging

Artificial islands for offshore petroleum exploration have been constructed in the Southern Beaufort Sea by trailer suction hopper, cutter suction and suction dredges. Only the trailer suction hopper dredge has been used near Banks Island.

Trailer suction hopper dredges (or hopper dredges) loosen the seabed substrate by means of "dragheads" which trail below the moving vessel from both sides. The dragheads are mechanical scrapers equipped with teeth or water jets. A suction pipe extending from the draghead draws in a water-sediment slurry which is loaded by powerful pumps into large bins or hoppers in the ship. A hopper dredge such as the "Geopotes X" can dredge in waters from 10 to 35 m depth, has dragheads approximately 3 m wide, and has a hopper capacity of 8,900 m^3.

Upon reaching the hoppers, the water-sediment slurry is allowed to overflow through ports. The heavier sediments are retained at the bottom of the hopper (Herbich 1981). The finer sediments will leak through the overflow ports and the deposition doors located on the bottom of the dredge during filling and travelling to the construction site. The vessel, therefore, may have less fill to deliver than the amount which was first loaded (Roberts and Tremont 1982).

The main effects on the benthic habitat that may be caused by a hopper dredge are:

(1) disruption of sediments by draghead action (water jets, scrapers etc.) along parallel trenches (Plate 1);

(2) removal of sediments via suction pipe to hoppers;

(3) suspension and redistribution of fine sediments by draghead turbulence (see Figure 2) and leakage from hopper overflow ports and deposition doors. Fine sand will tend to resettle on the sea bed

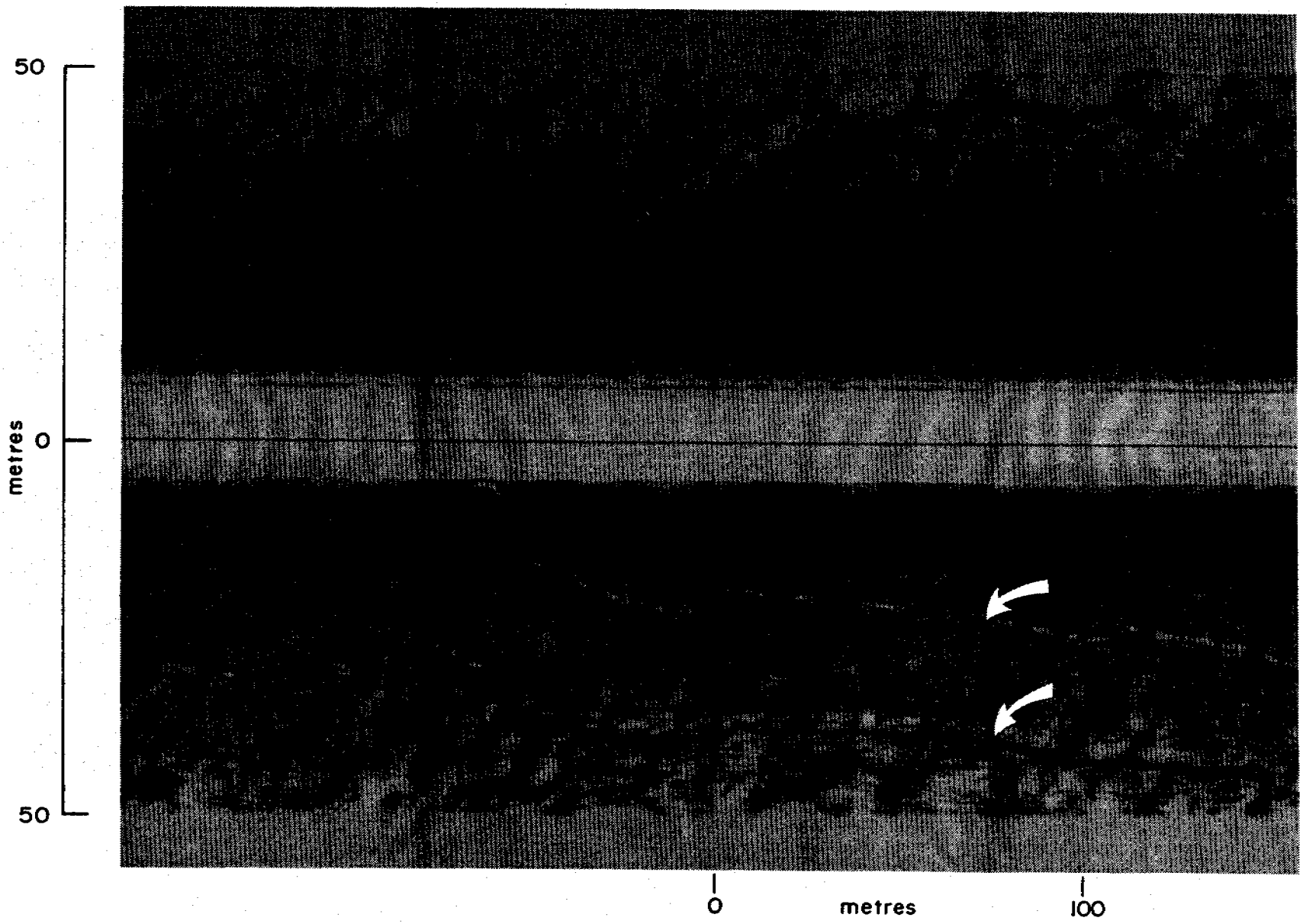


Plate 1. Example of side-scan sonar record indicating a set of parallel dredge trenches (arrows) made by a hopper dredge near Banks Island, N.W.T. (This sonogram was provided by Geoterrex Ltd., Ottawa, Ont.)

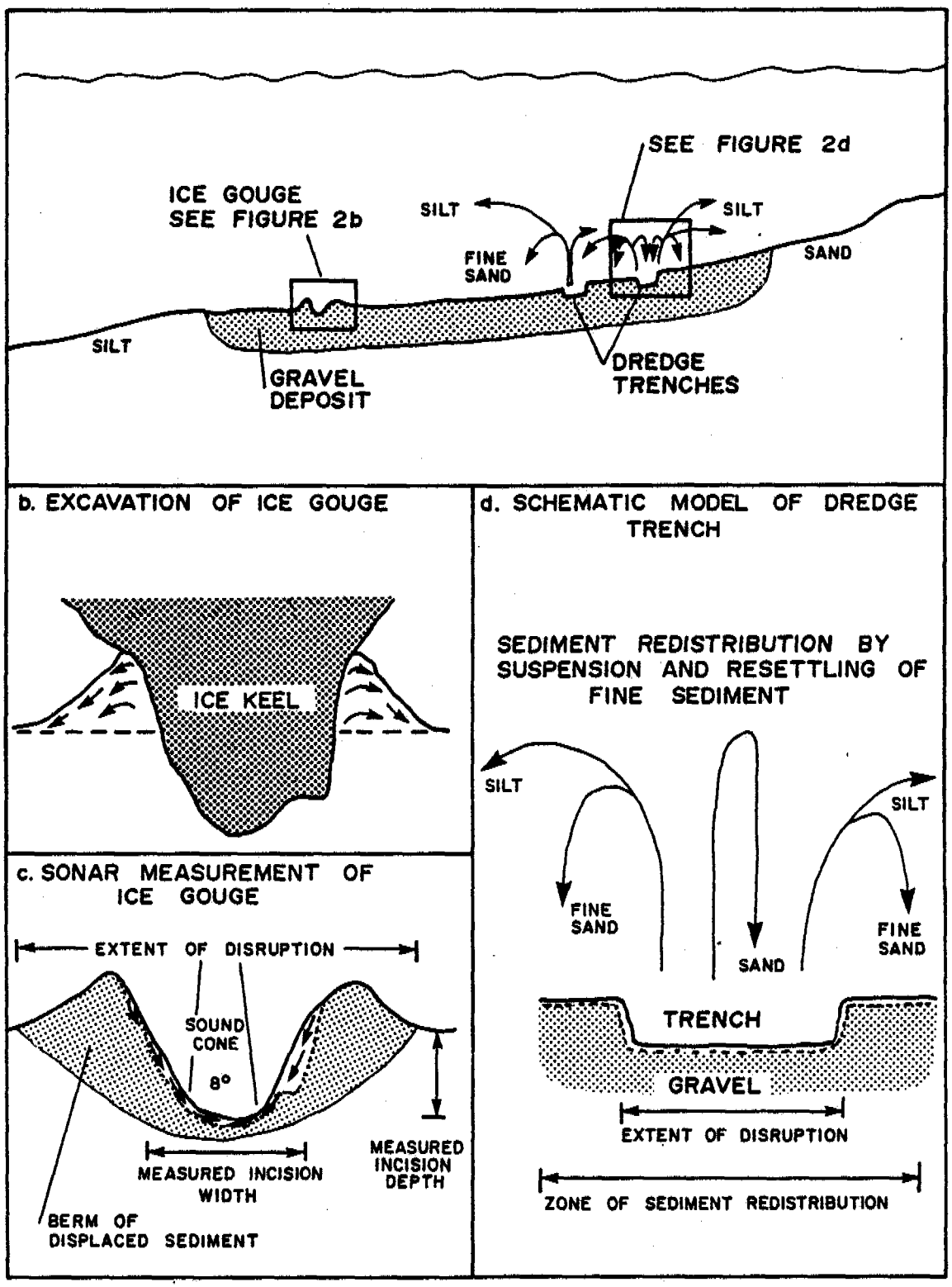


Figure 2. Schematic Diagram of Hopper Dredging and Ice Gouging. (a) Dredge trenches and ice gouges on a gravel ridge; (b) Excavation of idealized gouge by grounding of a pressure ridge ice keel; (c) Same gouge after keel has gone by and inward slumping occurred (b and c after Reimnitz et al. 1977); (d) Idealized dredge trench and schematic representation of sediment redistribution. The dotted line represents sediment surface immediately following dredging; solid line is sediment surface following resettling of fine sediments suspended during dredging activities.

along the path of the dredge, but finer particles may be carried a considerable distance by currents before resettling;

(4) local smothering of benthos and habitat due to occasional rejection of unsuitable substrate from hoppers in areas of poor fill quality during borrow site reconnaissance surveys.

Observations for this study were made only on the first two effects of hopper dredges near Banks Island because a year had elapsed since dredging had taken place in August 1982 off the mouth of the Rufus River. ie. 1. disruption of sediments 2. removal of sediments

1.5 Environmental Concerns at Banks Island Dredging Site

The principal environmental questions at the gravel borrow area near Banks Island are similar to those examined near Herschel Island (Heath and Thomas 1984b), namely:

(1) What is the nature and significance of the effects on the benthos and sea bed due to dredging?

(2) What is the scale of disturbance to the benthos and their habitat in space (local vs. regional) and in time (short-term vs. long-term)?

(3) Will the benthos of the gravel deposit recover to pre-impact levels of diversity and abundance in the dredged areas?

(4) What are the possible implications to higher levels of the marine food chain?

(5) What is the environmental significance of dredging impacts on benthic habitat in relation to natural processes such as ice gouging, current action and sedimentation?

(6) Is the gravel borrow area near Banks Island unique in the Southern Beaufort Sea in terms of benthos and habitat or is it comparable to other substrate borrow areas in the Beaufort?

These environmental questions at Banks Island will be considered by addressing the following topics, with comparisons to the Herschel Island Gravel Borrow area:

(a) the nature of impacts on the benthos and substrate;

(b) the "zones of influence" of impacts, spatial and temporal;

(c) significance of impacts;

(d) recolonization of benthos in affected areas;

(e) possible implications to higher trophic levels of the marine food web;

(f) ecological significance of dredging effects in relation to natural physical processes;

(g) applicability of results obtained in this study area in relation to other Beaufort Sea areas.

These topics are defined below in the context of this study.

(a) The Nature of Impacts on the Benthos and Substrate

The impacts of trailer suction hopper dredging activities on the benthic environment occur primarily in two ways: (i) direct effects on benthic invertebrates and macroalgae and (ii) effects on benthic habitat.

Direct effects on benthos include:

(1) mortality and physical damage associated with entrainment during excavation or overburden stripping;

(2) suffocation and physical damage due to burial beneath resettled sediments adjacent to the dredging area; and

(3) changes in benthic community structure due to habitat disruption (short and long-term alteration of sedimentation rates, sediment mobility, sediment particle size, water quality (turbidity)).

Effects on benthic habitat can include habitat destruction (substrate removal or complete burial), habitat creation (for example, exposure of gravel surfaces in sand/silt environments) and habitat modification (sediment particle size changes, e.g., fine sediment deposition onto sand or gravel surfaces).

Evidence of the effects described above was inspected directly by divers and indirectly by examination for changes in faunal indices such as biomass, population density and diversity (number of taxa present) and in community structure (species composition) at dredging sites relative to reference sites. This study examines the effects which were apparent one year after dredging.

(b) The "Zones of Influence" of Impacts

The "zone of influence" associated with trailer suction hopper dredging operations can be viewed as two zones within which dredging-related impacts on the benthic environment are discernible from background or reference conditions - a "high" impact zone and an "extended" impact zone. The "high" impact zone is associated with the direct removal of the substrate and is the zone within which most of the mortality or disappearance of benthic flora and fauna occurs and within which the most severe impacts on habitat occur. Although mortality can occur within the "extended" impact zone, the main effects in this zone are related to habitat alterations due to particle size modification of substrate. The spatial dimensions of each zone depend on the intensity of dredging activity and local oceanographic conditions. It should be noted that there is also a temporal context to the zone of influence. This refers to the length of time required for the recovery of the benthos and benthic habitat to a productive state.

(c) Significance of Impacts

The "significance" of impacts includes the notions of "statistical significance" and "ecological significance".

Testing an hypothesis for "statistical significance" involves reference to a probability level at which the detected difference between parameter means might be due to chance alone (e.g., $P < 0.05$). If the statistical criteria indicate that the probability of a wrong decision due to chance (Type I error) is less than 5%, then the result is considered to be "statistically significant" at the 5% level.

Assignment of ecological or environmental significance is a more qualitative judgement of possible (or actual) effects on the structure and persistence of biotic communities. An impact which may be "statistically significant" is not necessarily "ecologically significant". Many ecological systems display "resilience", an ability to absorb change to biotic and environmental conditions and still persist (Holling 1973). Resilience is often high in populations which frequently experience periodic extreme fluctuations in numbers due to extreme variations in environmental conditions (Watt 1968).

AGREE

(d) Recolonization of Benthos in Affected Areas

Benthic recolonization refers here to the process of re-establishment of benthos populations in impacted areas through immigration of adults from surrounding areas, via larval or juvenile settlement from other areas, and through reproductive recruitment of early colonizing species within the impacted areas. Recolonization is influenced by the properties of the altered substrate (e.g., texture, stability), the rate of sedimentation or sediment redistribution subsequent to impact (Dunton et al. 1982), extreme fluctuations in depth-associated water properties (e.g., Lee 1973), food or energy supply and biological interactions such as predation, herbivory and competition, and the growth rates of the colonizing species (Dunton et al. 1982). Such factors have been identified as being important in the colonization and development of benthic communities in temperate and arctic regions by Dayton (1971), Foster (1975), Lee (1973) and Dunton et al. (1982).

(e) Possible Implications to Higher Trophic Levels of the Marine Food Web

The benthos in arctic nearshore areas include primary and secondary producers which are consumed either directly or indirectly by fish and bearded seals. The implications of biological effects on benthos to such animals which are used by native hunters will be discussed in Section 3.1.7.

(f) Ecological Significance of Dredging Effects in Relation to Natural Physical Processes

The significance of dredging impacts on the benthic ecology of a borrow area can be considered in relation to sedimentary processes affecting the benthic habitat (e.g., ice gouging and mobile sediment redistribution). Marine dredging by trailing suction hopper dredges disrupts and removes surficial sediments and benthos along the parallel paths of the dragheads (Plate 1). Recent dredge trenches often have steeper and more irregular edges than those of ice gouges. They also lack the berms of displaced sediment which are often associated with ice gouges (Figure 2). During dredging, fine sediment is agitated into suspension by turbulence from the dragheads. Fine sand tends to resettle into and near the dredge trenches. Silt and clay particles may be carried considerable distances from the dredging area by currents (Heath et al. 1982b).

In contrast, when ice keels excavate gouges, they may displace sediments laterally (Figure 2b). The areal extent of substrate disruption by blunt ice keels, especially, may include a zone or berm of considerable width on both sides of the excavation (Reimnitz et al. 1977). Ice gouges may occur individually or in multiple parallel groups characteristic of those produced by the grounding of multikeeled pressure ridges (Reimnitz and Barnes 1974). They are generally most prevalent in water depths greater than 10 m. In the vicinity of the Banks Island borrow area, ice scours were observed by divers at four of twelve stations in 1981, but were not seen during dives in 1983. Side-scan records obtained in 1983, however, revealed a relatively low frequency of ice gouges near the dredging area. Within the dredging area, ice scours could not be distinguished due to the intensity of scarring by dredge marks (e.g., Plate 2).

Gives an idea of natural variability. How does this affect conclusions re benthos.

Do the ice scours recover quicker than dredge cuts?

Although dredge trenches and ice gouges have different characteristics of formation, both of these types of sea bed scouring result in depressions in the disrupted substrate from which benthos has been removed. The scars of dredging and ice scouring will tend to be levelled by various forms of sediment redistribution, such as siltation from rivers, the action of waves and bottom currents on mobile sediments, and the slumping of scour edges (Plate 3). Therefore, there are basic similarities in the environmental significance of hopper dredging and ice scouring.

This sentence does not make sense at all?!

(g) Generality of the Banks Island Dredging Site in Relation to Other Beaufort Sea Borrow Areas

The gravel deposit on the southwest coast of Banks Island is one of the few accessible offshore sources of gravel for island or berm construction in the Canadian sector of the Beaufort Sea. Other gravel borrow sites include the South Tarsiut Borrow Area (Heath and Thomas 1984a) and the Herschel Island Gravel Borrow Area (Heath and Thomas 1984b). Pelletier (1975) reported that gravel was the chief component of sediment samples in only two local areas in the southern Beaufort Sea.

(a) an area northwest of Herschel Island (42 - 62 m depth);

and (b) a small area on the extreme eastern end of the continental shelf off the Baillie Islands.

Area (a) is too deep for extraction by hopper dredges used in the Beaufort Sea.

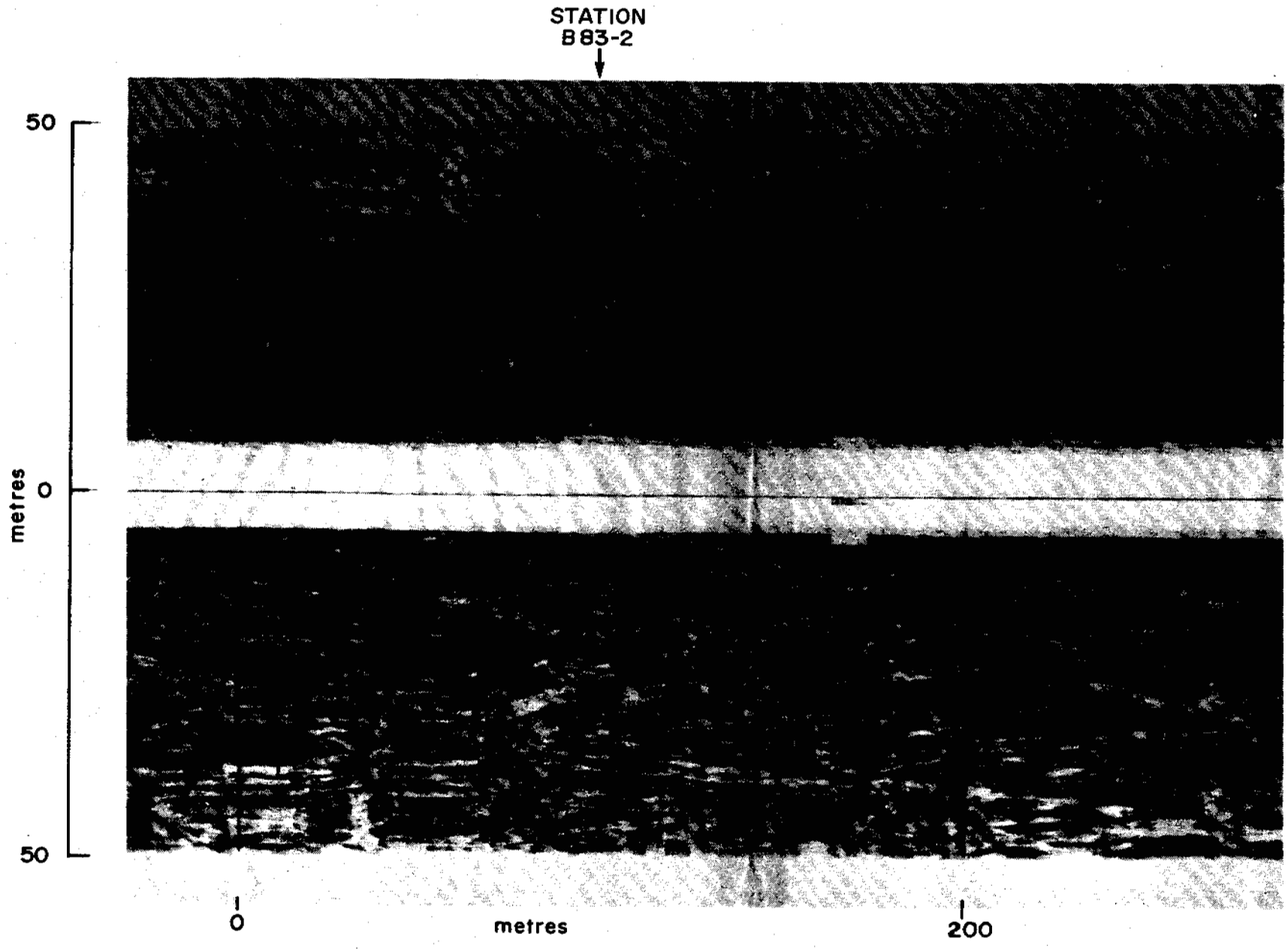


Plate 2. Side-scan sonar record of dredge scours at the Banks Island Borrow Area in the vicinity of dredged station B83-2. The positions of the station and Fixes 1740 and 1750 are shown in Figure 1b. (This sonogram was provided by Geoterrex Ltd., Ottawa, Ont.)

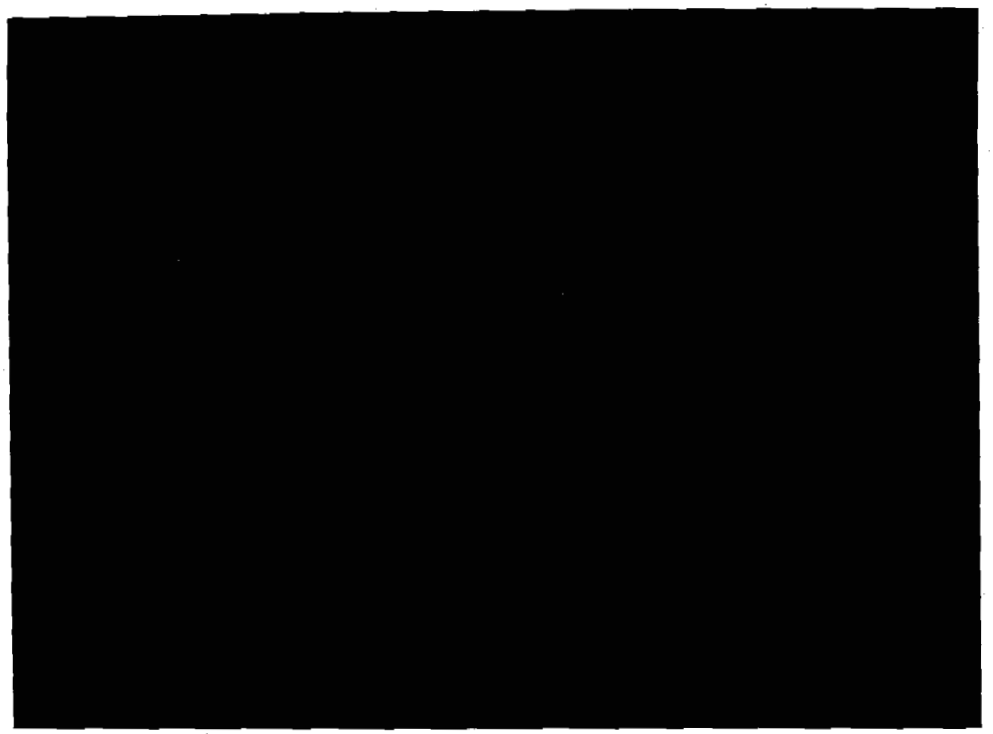


Plate 3. Edge of a dredge trench at Station B83-1, one year after dredging. Note the inward slumping of material and the layer of silt accumulating on the surface.

Exploratory sampling for gravel near the Baillie Islands revealed no substantial deposits of gravel suitable for offshore construction (Thomas 1983).

The rocky substrates provided by exposed cobble and boulders in the vicinity of the borrow area off Banks Island support attached epibenthos such as soft coral, hydroids, sponges and several species of macroalgae (Heath 1981, Heath et al. 1982a). These sessile forms of epibenthos are absent in the soft muddy sediments that cover most of the Beaufort Sea continental shelf (Beaufort EIS 1982). Attached epifauna similar to those observed in this study have been noted at other locations in the Western Arctic Ocean. For example, sessile epibenthos have been found in the Chukchi-Beaufort region; most frequently between Point Hope and Point Barrow, Alaska. The "Boulder Patch" in Stefansson Sound, Alaska, also supports abundant soft corals, hydroids, sponges, macroalgae and other epibenthos (Dunton and Shonberg 1979, Dunton et al. 1982). In the Canadian Beaufort the only other area found to have significant hard substrates and associated sessile epifauna is the ridge in Mackenzie Bay, near Herschel Island (Heath et al. 1982b, Heath and Thomas 1984b).

1.6 Sampling Objectives and Design

The objectives of the study were:

(a) to identify the impacts of dredging on benthos and benthic habitat; and

(b) to examine the process of recolonization by benthos in the dredge trenches.

The sampling design chosen to achieve these objectives was an "optimal impact study design" (Green 1979) satisfying the following four criteria:

1. baseline sampling is performed before the impact occurs (temporal control);

2. the time, place and type of impact is known;

3. measurements of relevant biological and environmental variables are made in association with individual samples; and

4. sampling is done in the area of impact and in an area that did not receive the impact (spatial control or reference area).

The layout of sampling stations for the baseline or pre-impact study was chosen to cover the potential gravel deposit delineated by geophysical survey because the location of the actual dredging area was not established. Two reference stations were positioned outside but near the potential dredging area.

The post-impact benthos sampling program was performed one year after dredging in conjunction with a geophysical survey of the dredging area and other potential gravel deposits. (A survey planned for September 1982 in the period immediately after dredging was cancelled due to poor weather and logistical difficulties). Sampling locations within the dredging area were randomly selected from positions along side-scan sonar survey lines where dredge scour was present (Figure 1b and Plate 2). Reference stations BR83-6 and BR83-8 were positioned as close to the previously sampled reference stations B81-6 and B81-8 as possible.

Figure 1 does not show random sampling

How is this random?

Side-scan sonar detection of dredge trenches was superior to drift searching while viewing the sea bed with a remotely-operated television camera (cf. Heath et al. 1982b; Heath and Thomas 1984b). The side-scan sonar covered a much greater width of sea bed (100 m) than the remote T.V. camera (2 m) and was employed while the vessel was underway rather than drifting. Consequently a much larger area of bottom could be surveyed for dredge scour by side-scan sonar than by T.V. The total area within which dredge scour occurred could also be estimated from the side-scan sonograms (Figure 1b).

The sampling program at dredged stations included sampling inside and outside of dredge trenches by diver-operated airlift sampler. Video and still photographic recordings of epifauna and sedimentary conditions were also performed (see Section 2 for details). Dredged and non-dredged reference stations were sampled for comparison and identification of dredging effects.

1.7 Sampling near Banks Island in 1983

The benthic survey at the Banks Island dredging site in 1983 was conducted in two phases along with a geophysical survey. The first phase involved sampling the reference stations BR83-6 and BR83-8 from the ice breaker ROBERT LEMEUR which was subsequently recalled for ice patrol before the survey of dredge sites was completed. The second phase was conducted from the CANMAR TEAL; two dredging sites were sampled by diving and by grab after the extent of the gravel deposit and dredge scouring had been surveyed by side-scan sonar and seismic profiling. Additional benthic sampling was not possible due to limitations of ship time.

2. METHODS

2.1 Sampling

The dredging stations were randomly selected from positions along side-scan sonar tracks which had indicated dredge scouring. The vessel was anchored so that a dive could be made. Station positions are given in Table 1 and Figure 1b. At each station, the sampling program involved the followed procedures unless otherwise noted:

(a) a dive survey of the epibenthos and benthic habitat recorded with a Hydro Products TC-125 b/w television camera and Sony video tape recorder; diver observations were tape-recorded;

Would be useful to see videotapes if available →

(b) still photography of epibenthos and surficial sediments with a Nikonos II camera equipped with a 35 mm lens, clip-on macro lens and electronic flash;

Would be useful to see more pictures

(c) sampling of infauna within a 0.25 m^2 quadrat by a diver-operated 6.4 cm diameter airlift (Plate 4) which was 2 m long and equipped with removable 1 mm mesh sampling nets. Infauna was also collected by 0.1 m^2 van Veen grab. Two airlift samples and four van Veen grab hauls were taken at each station while at anchor. At one station (BR83-8) four additional grabs were taken with a Ponar grab (0.055 m^2). Attempts with the Ponar grab at the other stations were unsuccessful.

(d) Sediment samples for particle size analysis were taken in a 470 mL plastic jar with each airlift sample by diver. Sediment samples were also taken from each grab haul for particle size and chemical analyses.

The contents of the grab hauls were processed separately. After removal of subsamples, the sediment was wet sieved on the day of collection through a 0.5 mm plastic screen to remove infauna for taxonomic identification. The residues of all benthos samples were preserved in 10% formalin buffered with sodium borate and stained with Rose Bengal. Specimens of macroalgae, starfish, molluscs and crustaceans were hand-collected at certain stations for identification. The algae were wet-mounted on herbarium paper and air-dried in a plant press, and the large epifauna were preserved in 10% formalin in sea water buffered with borax. Infaunal samples were later transferred to 70% isopropyl alcohol and sorted, identified, counted and weighed in the laboratory. The systematics of taxonomic groups in this report follows Barnes (1980). A list of references used in identifying the benthos is given in Appendix E.

How were identifications verified? Can specimens be borrowed to check I.D.'s?

TABLE 1.

POSITION OF SAMPLING STATION LOCATIONS NEAR BANKS ISLAND, N.W.T.

STATION	DATE SAMPLED	UTM* POSITION		GEOGRAPHICAL POSITION	
		NORTHING	EASTING	LAT. (N)	LONG. (W)
A. 1981					
BC81-1	28/07/81	7926027	478329	71° 26' 12"	123° 36' 36"
B81-1	28/07/81	7925726	478617	71° 26' 02"	123° 36' 06"
B81-2	28/07/81	7925294	478785	71° 25' 48"	123° 35' 49"
B81-3	28/07/81	7924835	478967	71° 25' 33"	123° 35' 30"
B81-4	28/07/81	7924517	479136	71° 25' 23"	123° 35' 12"
B81-5	28/07/81	7923959	478997	71° 25' 05"	123° 35' 26"
B81-6	29/07/81	7923586	479148	71° 24' 53"	123° 35' 10"
B81-7	29/07/81	7923341	479375	71° 24' 45"	123° 34' 47"
B81-8	29/07/81	7923020	479700	71° 24' 35"	123° 34' 14"
B81-9	29/07/81	7922717	479922	71° 24' 25"	123° 33' 51"
B81-10	29/07/81	7922384	480156	71° 24' 15"	123° 33' 27"
BC81-2	29/07/81	7922060	480357	71° 24' 04"	123° 33' 06"
B. 1983					
BR83-6	31/07/83	79232130	479315	71° 24' 54"	123° 35' 14"
BR83-8	31/07/83	7931613	479751	71° 24' 36"	123° 34' 36"
B83-1	20/08/83	7924440	478407	71° 25' 20"	123° 36' 26"
B83-2	21/08/83	7924156	478379	71° 25' 11"	123° 36' 28"

* Universal Transverse Mercator coordinates using 123° W as the Central Meridian.

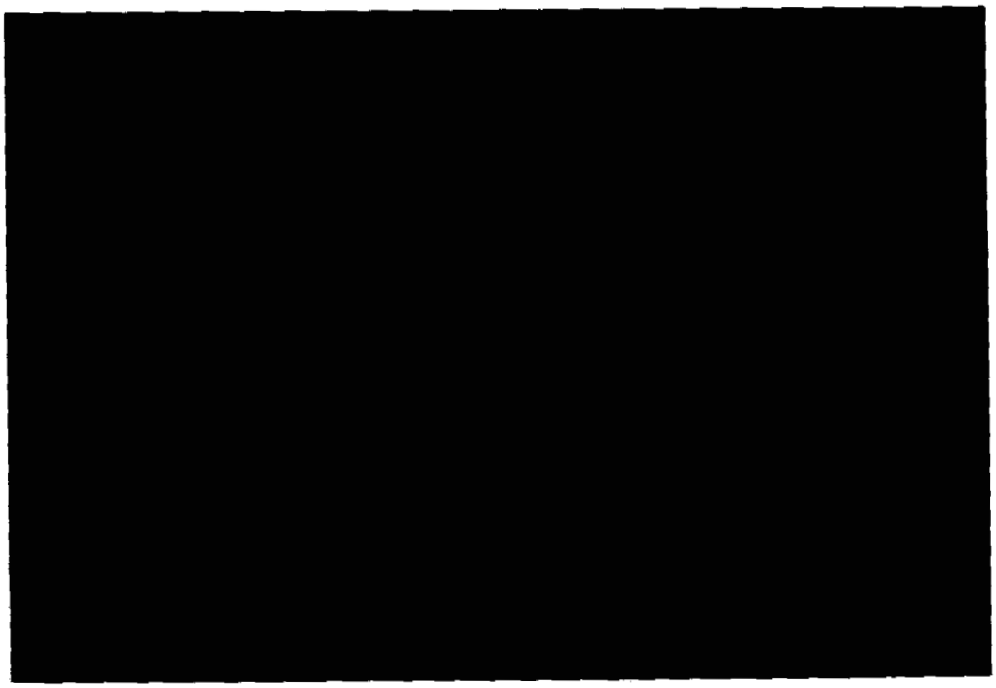


Plate 4. Two airlift samplers with filtration nets attached and sampling quadrat being lowered to the bottom.

2.2 Benthic Biology

2.2.1 Community Analyses

The data on the taxonomic composition of the benthic samples (Appendix A) were analysed for community associations by reciprocal averging ordination (Hill 1973, Gauch 1977) and correspondence analysis (Benzecri 1973, Greenacre and Degos 1977, Greenacre 1978). Rare species, defined as those species occurring in less than five samples, were excluded from the ordination procedure. Species with less than 1.5% of the total population density were treated as "supplementary variables" in the correspondence analysis (see Appendix B.1 for details).

The ordination analysis was performed with the ORDIFLEX program, CEP-25A (Gauch 1977, Cornell Ecology Program Series) on log (X + 1)-transformed data.

The correspondence analysis was computed on a program written by N. Tabet of Laboratoire de Statistique Mathematique de J.-P. Benzecri, Universite de Paris. Descriptions of reciprocal averaging ordination and correspondence analysis are provided in Appendix B1.

2.2.2 Statistical Testing of Hypotheses

Analysis of variance (ANOVA) procedures (e.g., Snedecor 1946; Peng 1967) were used to test hypotheses in comparing means for sample (station) groups. When significant variation between means was detected by one-way classification ANOVA, the contrasting means were tested by an a posteriori method known as Scheffe's S or Gabriel's SS-STP (Scheffe 1959; Sokal and Rohlf 1969). Examples of the above methods are given in Appendix C.1. The sequence of the tests is indicated by a numeric suffix with ANOVA; thus ANOVA1, ANOVA2 ...

3. RESULTS AND DISCUSSION

3.1 Benthic Biology

Diver-operated and remote sampling at dredged sites and at unaffected reference sites near Banks Island have indicated the sedimentary conditions and effects on the benthic community. In this section, initially the sedimentary conditions at dredged stations will be described and compared with those of reference stations. Secondly, the impacts of dredging, evidence of recolonization and the condition of epibenthos in the borrow area will be considered. Thirdly, the results of analyses of faunal indices and benthic community structure will be presented and discussed in relation to possible influence of dredging and sedimentary processes. Detailed results of community analyses and statistical tests of hypotheses are given in Appendices B.2 and C.1. A comparative analysis of benthic sampling techniques and variability is presented in Appendix C.2.

3.1.1 Sedimentary Conditions of the Benthic Habitat

The sedimentary conditions at the dredged and reference stations sampled in 1983 were heterogeneous, with replicate samples ranging from silty to gravelly at each location (Table 2, Figure 3). Particle size spectra plots are given in Appendix D. Generally, there was a layer of silt overlying coarser, poorly sorted sediments (Plate 3). This basic sedimentary condition, therefore, corresponds to dredging case 3 (gravel overlain and/or combined with silt-clay) as described by Heath and Thomas (1984b) for dredging situations near Herschel Island, Y.T. (Dredging cases 1 and 2 are "exposed gravel" and "gravel overlain by sand", respectively.) Reference stations nearest the dredging area which were sampled in 1981 also had a layer of silty sediment overlying the gravel (Table 2, Part A).

3.1.2 Impacts on Benthos and Subsequent Recolonization

The objective of marine dredging is to remove the desired substrate (i.e., gravel, in this case) from the deposit on the sea bed and to transfer it to the construction site. The dredging process affects the benthos in two basic ways:

TABLE 2.

BENTHIC HABITAT CHARACTERISTICS

STATION	SAMPLE NUMBER	DEPTH	% SILT-CLAY	% SAND	% GRAVEL	ICE(I) OR DREDGE(D)
			↗ Fraction should be analysed in more detail.			
A. 1981						
BC81-1	1,2	10.6		Sd		
B81-1	3,4	7.6	Sd			
B81-2	5,6	6.1		Sd		
B81-3	7,8	5.2		Sd		
B81-4	9,10	3.3		Sd/Gr		
B81-5	11,12	10.6	St-C/Gr			I
B81-6	13,14	14.2	St-Sd/Gr			I
B81-7	15,16	12.1	St-C/Gr			
B81-8	17,18	12.1	St-Sd/Gr			I
B81-9	19,20	12.1	St/Gr			I
B81-10	21,22	18.2	St			
BC81-2	23,24	18.2	St			

St = silt
C = clay
Sd = sand
Gr = gravel

St-Sd/Gr = silt-sand overlying gravel

B. 1983					Total / 99.5	
B83 -1a	25	16.5	24.7	55.7	19.1	D
-1b	26		? 41.5	52.7	5.8	
-1c	27		21.4	31.3	47.3	
-1d	28		? 44.4	9.6	46.0	
-1i	29		22.2	47.4	30.4	
-1j	30		56.6	35.8	7.6	
	mean ± S.D.		**35.1 ± 14.5**	**38.8 ± 17.2**	**26.0 ± 18.3**	

TABLE 2. (continued)

BENTHIC HABITAT CHARACTERISTICS

STATION	SAMPLE NUMBER	DEPTH	% SILT-CLAY	% SAND	% GRAVEL	ICE(I) OR DREDGE(D)
B. 1983						
B83 -2a	31	19.5	29.5	44.8	25.7	D
-2b	32		59.3	39.8	0.9 Total	
-2c	33		25.3	38.7	36.0	
-2d	34		16.0	9.6	64.5 /90.1	
-2i	35		21.6	19.5	55.6 /96.7	
-2j	36		14.9	30.6	54.5	
	mean ± S.D.		**27.8 ± 16.4**	**30.5 ± 13.5**	**39.5 ± 23.7**	
BR83-6a	37	12.8	29.5	52.8	17.7	
-6b	38		21.0	68.7	10.3	
-6c	39		25.4	47.9	26.7	
-6d	40		34.8	44.4	20.8	
-6i	41		18.6	61.8	19.8 /100.2	
-6j	42		3.9	11.2	84.9	
	mean ± S.D.		**22.2 ± 10.7**	**47.8 ± 20.0**	**30.0 ± 27.4**	
BR83-8a	43	13.7	48.5	46.2	5.3	
-8b	44		51.6	41.7	6.7	
-8c	45		19.6	51.6	28.8	
-8d	46		37.1	56.0	6.9	
-8e	47		58.3	36.2	5.5	
-8f	48		80.5	18.5	1.0	
-8g	49		30.3	63.0	6.7	
-8h	50		39.8	55.3	4.9	
-8i	51		49.2	41.3	9.5	
-8j	52		8.0	17.0	74.2	
	mean ± S.D.	Highly variable	**42.3 ± 20.4**	**42.7 ± 15.4**	**15.0 ± 22.1**	

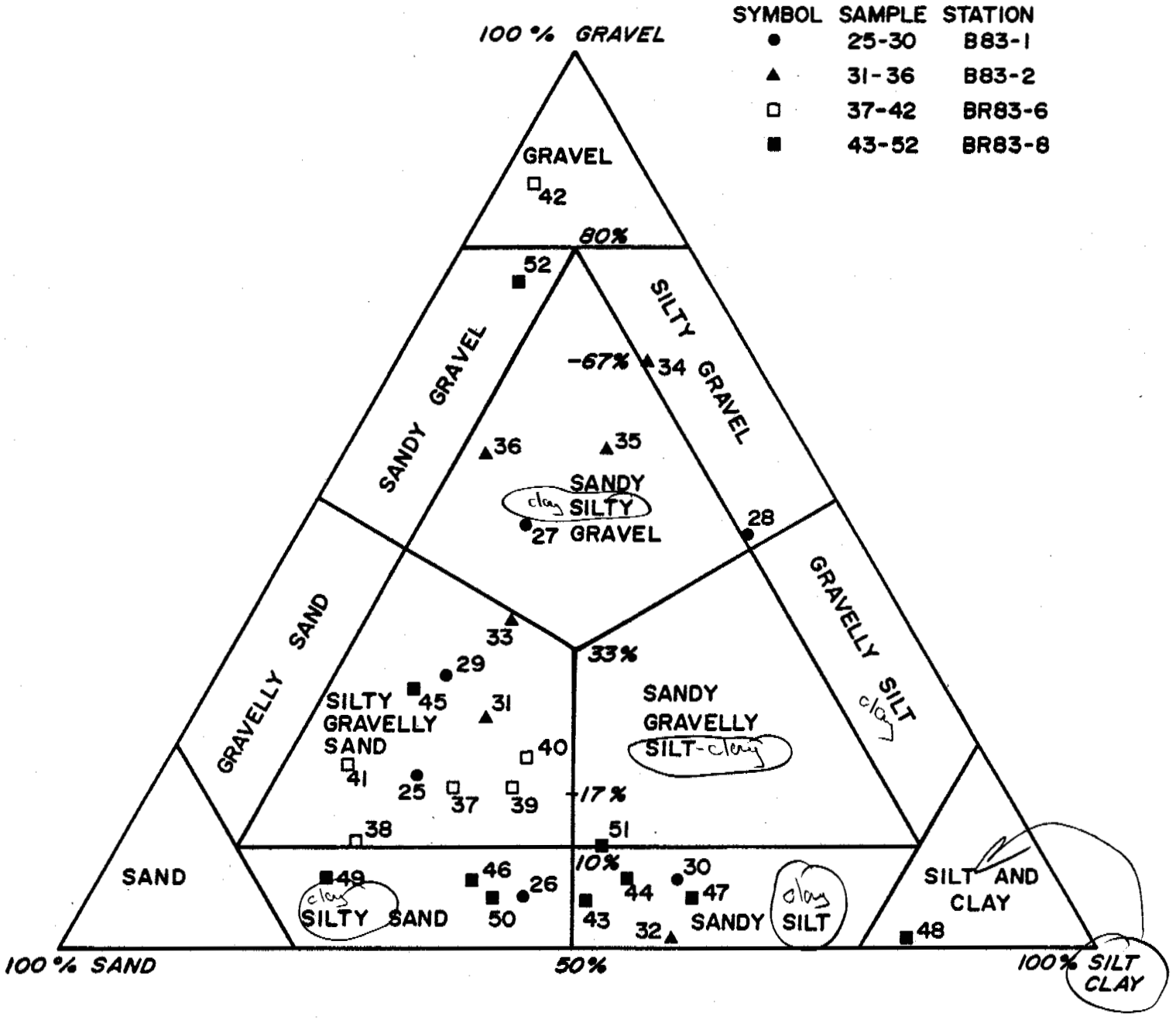


Figure 3. Triangular graph of sediment particle size distributions (Table 2) for post-dredging sediment samples from dredged and reference stations at the Banks Island Gravel Borrow Area.

(a) directly by causing mortality of organisms within or on the target substrate; and
(b) indirectly by modification or destruction of benthic habitat (Section 1.4).

(a) Direct Effects on Benthos

The direct action of dredging is the removal of subtrate and the associated benthos by the suction pipes, resulting in loss of organisms and producing paired trenches on the sea bed to a depth dependent on substrate firmness (Figure 2, Plate 1). Trenches were relatively shallow (0.2 - 0.3 m) in the firm clay-gravel till in the dredging area near Banks Island (e.g., Plate 5).

Direct mortality of benthos in the substrate removed during dredging is generally high, but is not likely to involve the entire population. Some organisms with protective hard parts (e.g., bivalves, crustaceans) may resettle after agitation (Heath et al. 1982b) or possibly may be transplanted in a viable state to the deposition (construction) site (Thomas et al. 1982; Heath and Thomas 1984a).

When dredging activity is concentrated in a small area, the repeated criss-cross scouring of the bottom may also have a cumulative effect (e.g., Plate 2) due to overlapping zones of direct and indirect impacts. Side-scan sonograms of the Rufus River survey area (Figure 1a) indicated that about 90 ha (0.9 km^2) of sea bed contained dredge scours (Figure 1b). Diver observations at Stations B83-1 and B83-2 indicated that the total area of directly disturbed bottom ("high impact" zone), however, is likely only a small portion (less than half) of the general "extended impact" area that contained evidence of dredge trenches. Diver observations near Herschel Island and Banks Island indicate that the loss of benthos (considered to be the primary impact of dredging) was confined principally to the high impact zone in the actual area of the dredge trenches (Heath and Thomas 1984b; this study).

(b) Indirect Effects

The indirect or secondary effects of dredging tend to persist after dredging, and may have a strong influence on the recolonization of affected areas by benthos. These secondary effects and subsequent recolonization are examined below in the context of Dredging Case 3 ("gravel overlain by silt-clay") at dredging stations B83-1 and B83-2.

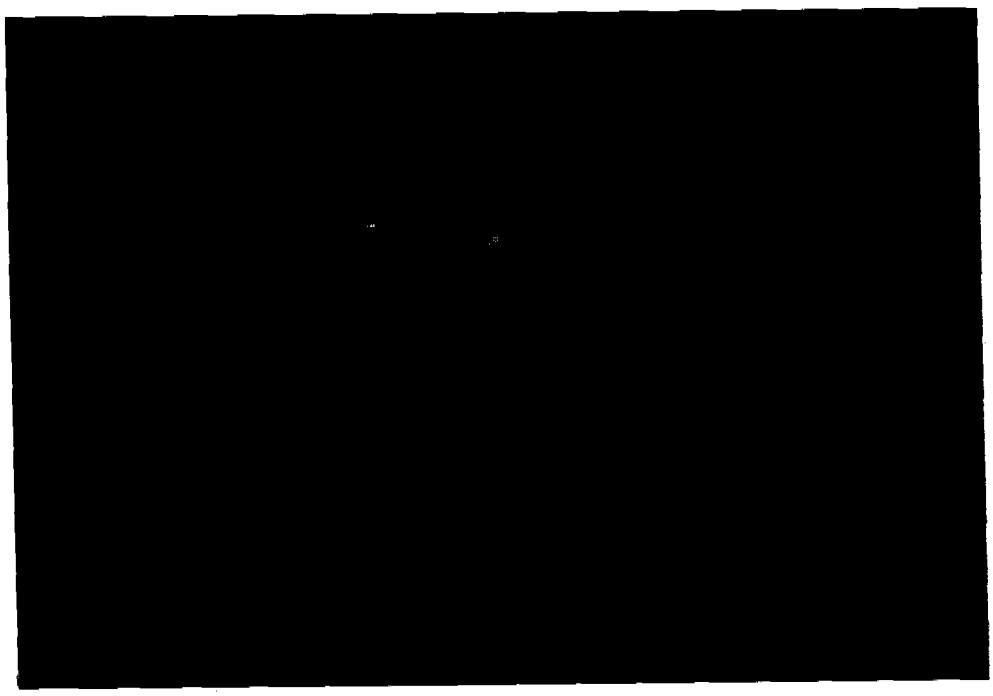


Plate 5. Edge of a dredge trench at Station B83-1 which shows exposed rocks and gravel particles bound in the clay-gravel till. A kelp plant (top) trails into the trench from its point of attachment on a rock outside of the trench.

Sediment redistribution by draghead agitation and subsequent resettling of sediment particles in the trenches and nearby appears to be an important secondary effect of dredging. Suspended sand tends to resettle on the sea bed along the dredge trenches and next to them (Figure 2d), but silt may be carried a considerable distance from the dredged site by ocean currents before it resettles. The dredge trenches may also later accumulate fine sediment which is shifted by waves and currents. Plate 6 shows an area within a dredge trench at B83-1 which was cleared of recently deposited silt to reveal the coarser sand particles left behind after dredging. About 5 cm of silt had drifted into the trench in the year following dredging (see also Plate 7). This layer of fine sediment appears to have provided a favourable substrate for settlement of benthic infauna.

(c) Recolonization of Infauna

Recolonization by zoobenthos in the dredge trenches was well advanced one year after dredging at Stations B83-1 and B83-2, according to results of airlift sampling (Figure 4). Samples taken in the trenches (Nos. 29 and 35) had 43 and 31 species, respectively, compared to 41 and 52 species from sample nos. 30 and 36 collected outside the trenches. The most abundant zoobenthic group colonizing the trench at B83-1 (no. 29) were the polychaetes (14 species) and amphipods (9 species). Other important groups present were the cumaceans (3 species) and molluscs (6 species). The pattern of representation in benthos groups colonizing at B83-2 (no. 35) was quite similar to that of B83-1. Population density of zoobenthos was higher outside of the trench at B83-2, but the difference was largely attributable to only five abundant species which were also present in lower numbers in the sample from inside the trench. Wet biomass levels were very similar inside and outside the trench at B83-2. Population density levels were comparable in samples from inside and outside the dredge trench at B83-1, but biomass was somewhat higher in the sample from the trench. Both values were within the range of biomass for zoobenthos observed in grab samples from the same station (Table 3, Part B).

The levels of the three faunal indices at the dredged stations were similar to those obtained in airlift samples from reference station BR83-6, but lower than those at reference station BR83-8 (Figure 4). The latter reference station appears to have differences from the other three stations in community structure as well (Section 3.1.3 and Appendix B.2).

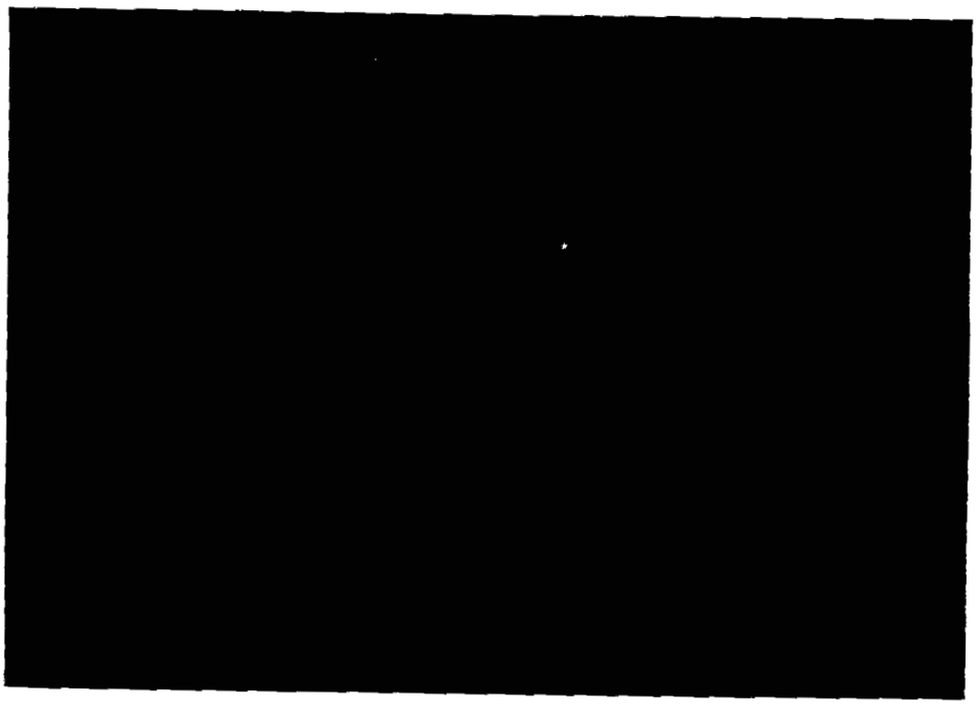


Plate 6. An area on the bottom of a trench at Station B83-1 which was cleared of overlying silt by airlift. Note the coarser sediment particles exposed from below the 5 cm layer of silt.

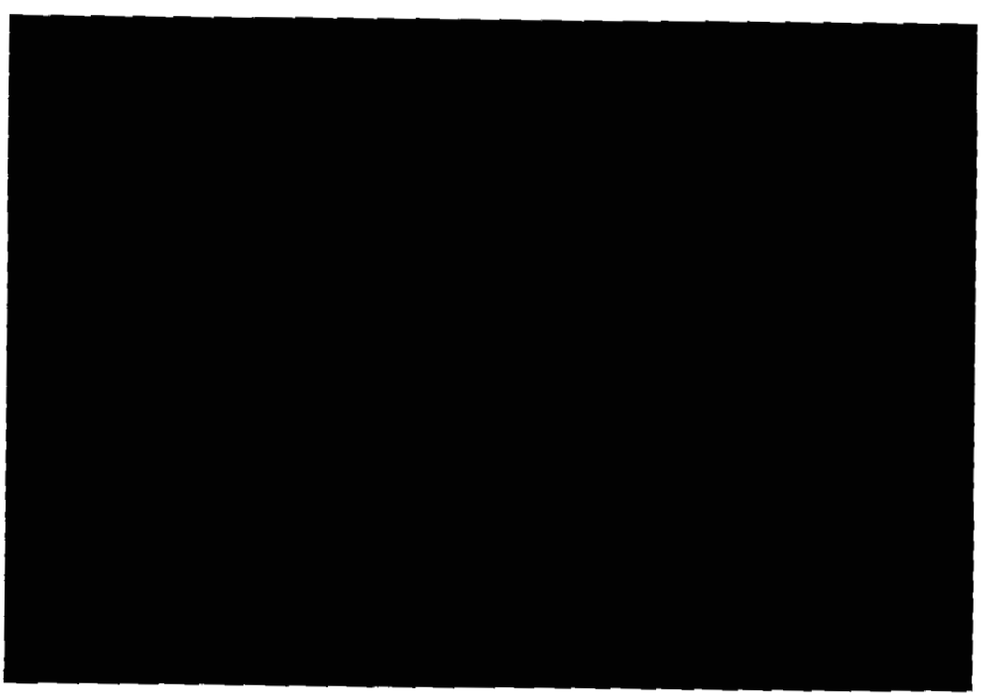


Plate 7. View of a dredge trench at Station B83-1 showing the accumulation of silt in the year since dredging. Only the edge of the trench remains partially exposed.

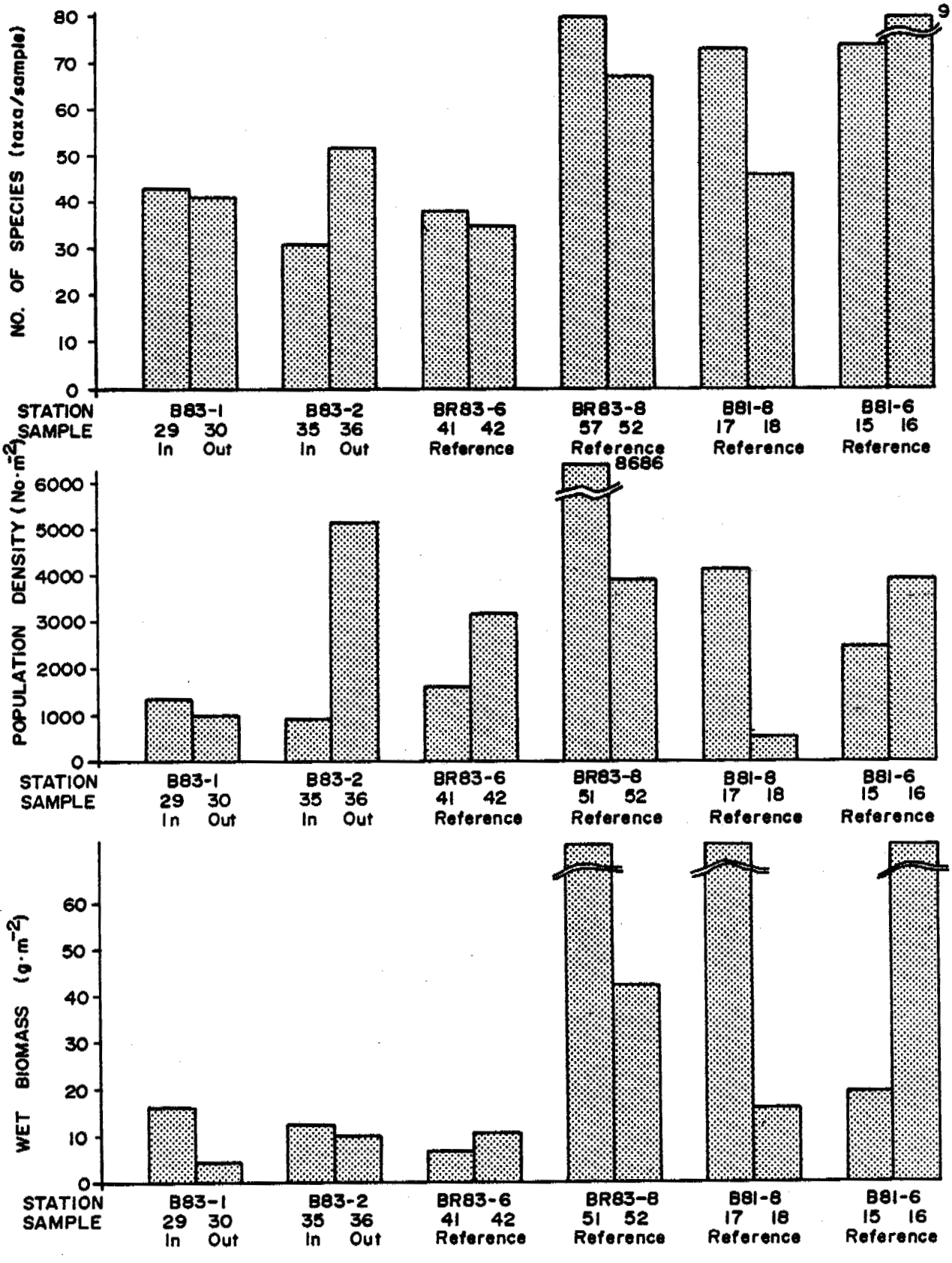


Figure 4. Comparison of faunal indices for benthos samples collected by airlift in 1981 and 1983 at reference and dredged stations at the Banks Island Gravel Borrow Area. "In" and "Out" refer to samples taken inside and outside dredge trenches. "Reference" refers to samples taken at undredged stations.

TABLE 3.

BENTHIC FAUNAL INDICES FOR BANKS
ISLAND GRAVEL BORROW AREA, 1981 and 1983

STATION	SAMPLE NUMBER	DEPTH	NO. OF SPECIES	POPULATION DENSITY ($N\ m^{-2}$)	WET BIOMASS ($g\ m^{-2}$)	DRY BIOMASS ($g\ m^{-2}$)
A. 1981 Sampling						
BC81 -1a	1	10.6	69	4,138	45.0	
-1b	2		61	2,604	51.4	
Mean ± S.D.			6.5 ± 5.7	3,371 ± 1,085	48.2 ± 4.5	
B81 -1a	3	7.6	61	1,330	39.3	
-1b	4		55	1,688	38.3	
Mean ± S.D.			58 ± 4.2	1,509 ± 253	38.8 ± 0.7	
B81 -2a	5	6.1	45	1,654	24.9	
-2b	6		41	1,542	24.9	
Mean ± S.D.			43 ± 2.8	1,598 ± 79	24.9 ± 0	
B81 -3a	7	5.2	32	1,228	19.7	
-3b	8		36	1,470	14.4	
Mean ± S.D.			34 ± 2.8	1,349 ± 171	17.1 ± 3.7	
B81 -4a	9	3.3	24	1,208	28.1	
-4b	10		22	892	24.7	
Mean ± S.D.			23 ± 1.4	1,050 ± 223	26.4 ± 2.4	
B81 -5a	11	10.6	79	2,554	72.7	
-5b	12		64	1,428	19.5	
Mean ± S.D.			71.5 ± 10.6	1,991 ± 796	46.1 ± 37.6	
B81 -6a	13	14.2	74	2,454	19.7	
-6b	14		91	3,922	109.7	
Mean ± S.D.			82.5 ± 12.0	3,188 ± 1,038	64.7 ± 63.6	
B81 -7a	15	12.1	67	1,442	16.2	
-7b	16		68	1,436	17.1	
Mean ± S.D.			67.5 ± 0.7	1,439 ± 4	16.7 ± 0.6	
B81 -8a	17	12.1	73	4,148	94.4	
-8b	18		46	554	16.0	
Mean ± S.D.			59.5 ± 19.1	2,351 ± 2,541	55.2 ± 55.4	
B81 -9a	19	12.1	64	826	14.4	
-9b	20		74	3,666	101.3	
Mean ± S.D.			69 ± 7	2,246 ± 2,008	57.9 ± 61.4	
B81 -10a	21	18.2	78	3,540	52.8	
-10b	22		80	4,418	63.5	
Mean ± S.D.			79 ± 0.7	3,979 ± 621	58.2 ± 7.6	
BC81 -2a	23	18.2	86	18,936	54.6	
-2b	24		73	5,946	50.0	
Mean ± S.D.			79.5 ± 9.2	12,441 ± 9,185	52.3 ± 3.3	

TABLE 3. (continued)

BENTHIC FAUNAL INDICES FOR BANKS
ISLAND GRAVEL BORROW AREA, 1981 and 1983

STATION	SAMPLE NUMBER	DEPTH	NO. OF SPECIES	POPULATION DENSITY (N m^{-2})	WET BIOMASS (g m^{-2})	DRY BIOMASS (g m^{-2})
B. 1983 Sampling						
B83 -1a	25	16.5	42	3,230	13.7	2.47
-1b	26		44	2,630	11.3	2.55
-1c	27		26	910	1.5	0.49
-1d	28		36	1,060	24.4	3.48
-1i	29		43	1,328	16.4	2.84
-1j	30		41	1,028	4.3	0.87
Mean ± S.D.			38.7 ± 6.8	1,698 ± 983	11.9 ± 8.3	2.12 ± 1.17
B83 -2a	31	19.5	50	2,630	10.1	2.84
-2b	32		40	2,720	6.2	1.40
-2c	33		41	2,040	9.9	1.83
-2d	34		40	2,240	2.5	0.42
-2i	35		31	914	12.8	1.95
-2j	36		52	5,170	10.1	2.33
Mean ± S.D.			42.3 ± 7.7	2,619 ± 1,407	8.6 ± 3.7	1.80 ± 0.83
BR83 -6a	37	12.8	45	3,650	9.2	1.04
-6b	38		46	3,150	32.0	4.37
-6c	39		36	2,490	30.6	3.12
-6d	40		40	3,046	60.3	7.41
-6i	41		38	1,688	7.0	0.91
-6j	42		35	3,216	11.1	2.01
Mean ± S.D.			40.0 ± 4.6	2,873 ± 690	25.0 ± 20.5	3.14 ± 2.47
BR83 -8a	43	13.7	81	15,000	212.5	30.95
-8b	44		68	12,670	70.9	10.75
-8c	45		63	9,720	118.1	13.24
-8d	46		81	14,900	111.1	18.01
-8e	47		54	12,865	56.6	7.39
-8f	48		59	10,686	43.3	9.43
-8g	49		62	9,929	75.6	9.24
-8h	50		56	7,033	68.7	8.46
-8i	51		80	8,686	84.9	11.96
-8j	52		67	3,904	42.8	5.33
Mean ± S.D.			67.1 ± 10.3	10,539 ± 3,491	88.5 ± 50.3	12.48 ± 7.37

What species had not recolonized?

These results suggest that recolonization by benthic infauna at the dredged stations is progressing well in terms of species diversity or richness, population density and biomass. One year after dredging, the levels of the above indices in samples from the trenches were near or approaching those of surrounding areas and a nearby reference station.

(d) Condition of Epibenthos in the Vicinity of Dredge Trenches

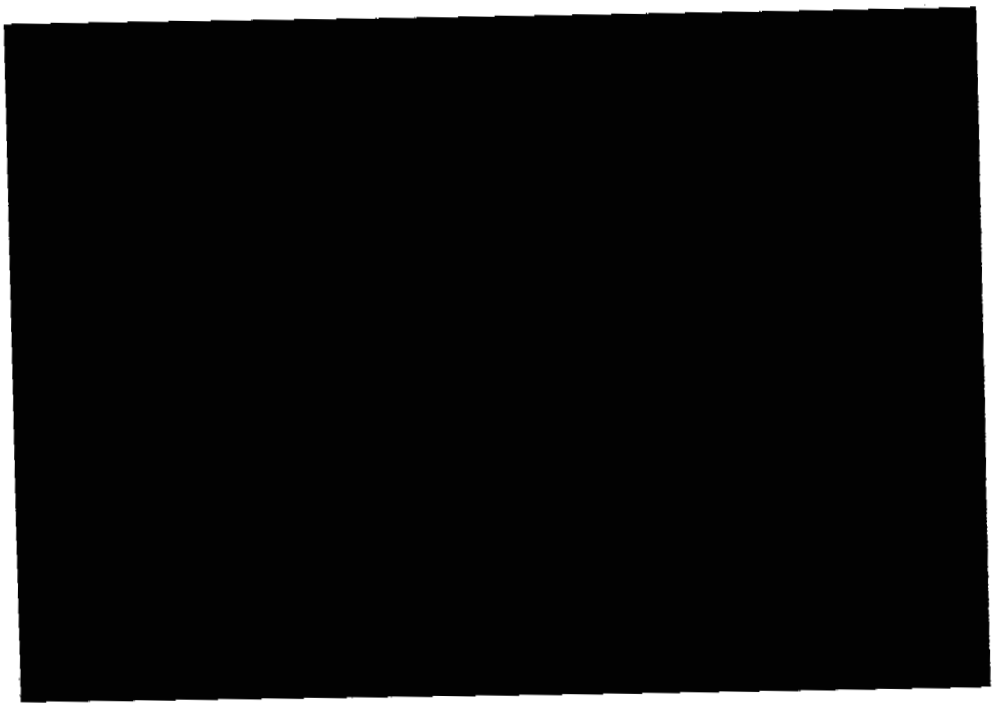
Macroalgae, notably the kelps, Laminaria saccharina (Plate 8a, 8b) and L. yezoensis, were present and thriving in the borrow area, both before and after dredging (Heath et al. 1982a; Plates 8a and 8b). A list of algal specimens identified from hand collections by divers is given in Table 4. The plants were attached to exposed rocks, even ones very close to the dredge trenches (Plate 8b). Small kelp plants and hydroids were growing on exposed rocks along the edges of dredge trenches (Plate 9a). Large sessile epifauna such as the soft coral, Gersemia rubiformis, were also living near the edge of dredge marks (Plate 9b). Several individuals of the sea urchin, Strongylocentrotus droebachiensis and numerous nudibranchs appeared to be feeding on kelp in the borrow area (Plates 10a and 10b). Other forms of epibenthos found at dredged stations and nearby reference stations are shown in Plates 11a to 14b. Results from diver observations, and vided and still photographic recording indicated that epibenthos at the dredged stations was similar in composition, although not as abundant as at the reference stations. The surviving and colonizing epibenthos at Stations B83-1 and B83-2 appeared to be a healthy assemblage with the potential to recover to pre-impact levels within a few years.

would like to see.

3.1.3 Benthic Faunal Indices and Community Structure

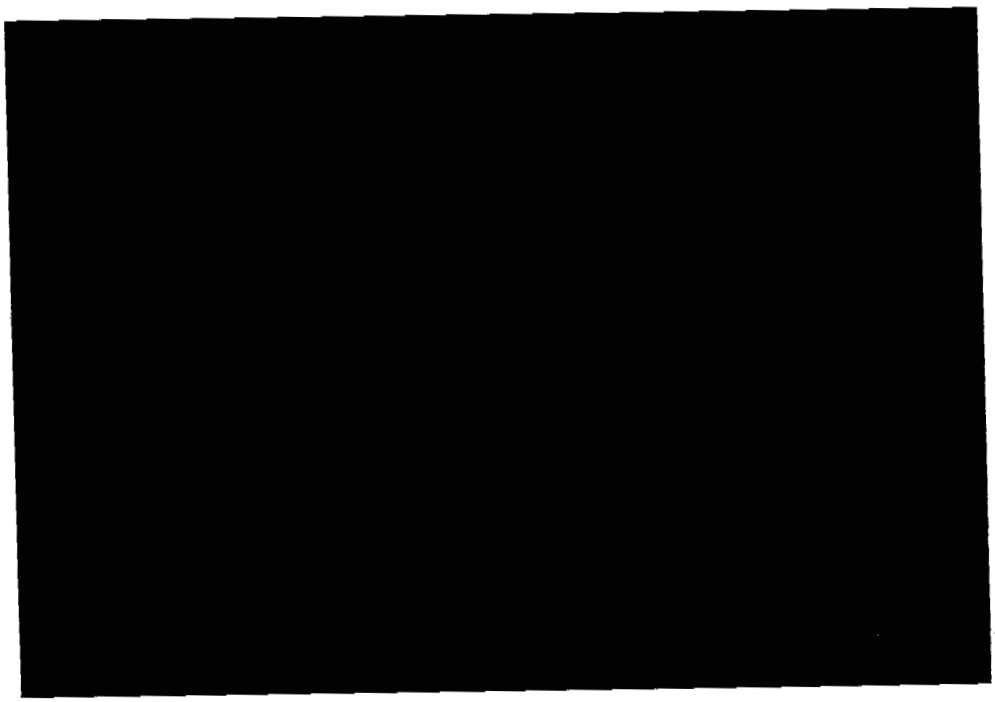
Analyses of faunal indices and community structure revealed no changes in the abundance or composition of the infaunal benthos at dredged sites which could be attributed to dredging.

One year after dredging there was no appreciable depression of mean values of the three faunal indices at the dredged sites B83-1 and B83-2 compared to the mean values for the nearby reference site BR83-6 (Figure 5; $P > 0.05$, ANOVA-1 to -3, Appendix C.1). Mean values of species richness and population density were statistically higher in samples from the more distant reference station BR83-8 than



10 cm

Plate 8a. Kelp, Laminaria saccharina, attached to a rock near a dredge trench at B83-1.



10 cm

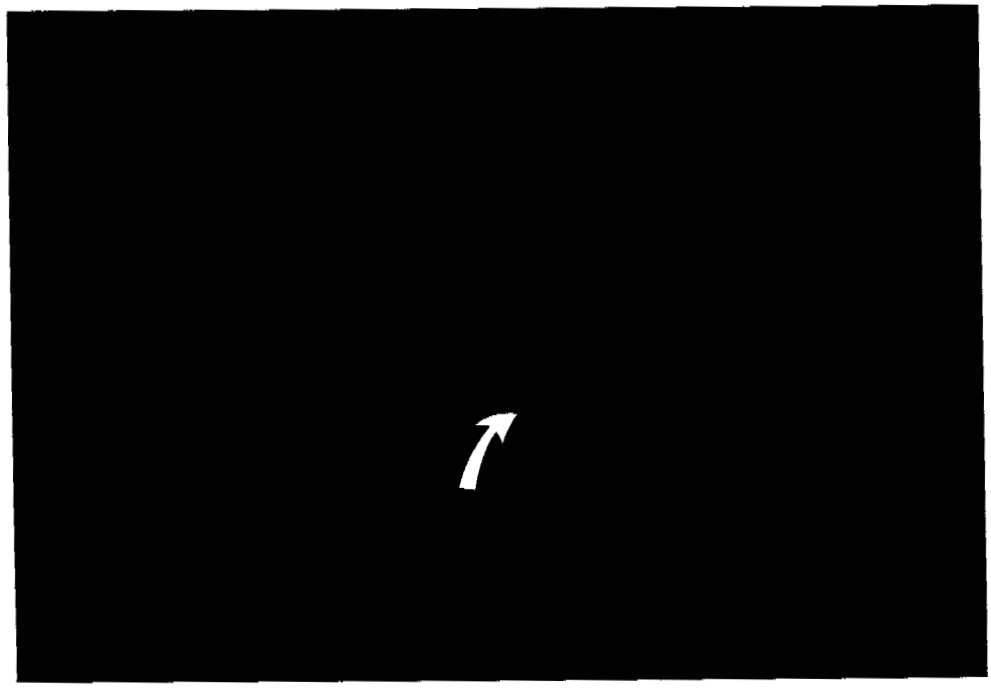
Plate 8b. Large kelp plant extending into a dredge trench at Station B83-1.

TABLE 4.

MACROALGAE* COLLECTED BY DIVERS NEAR BANKS ISLAND, N.W.T.

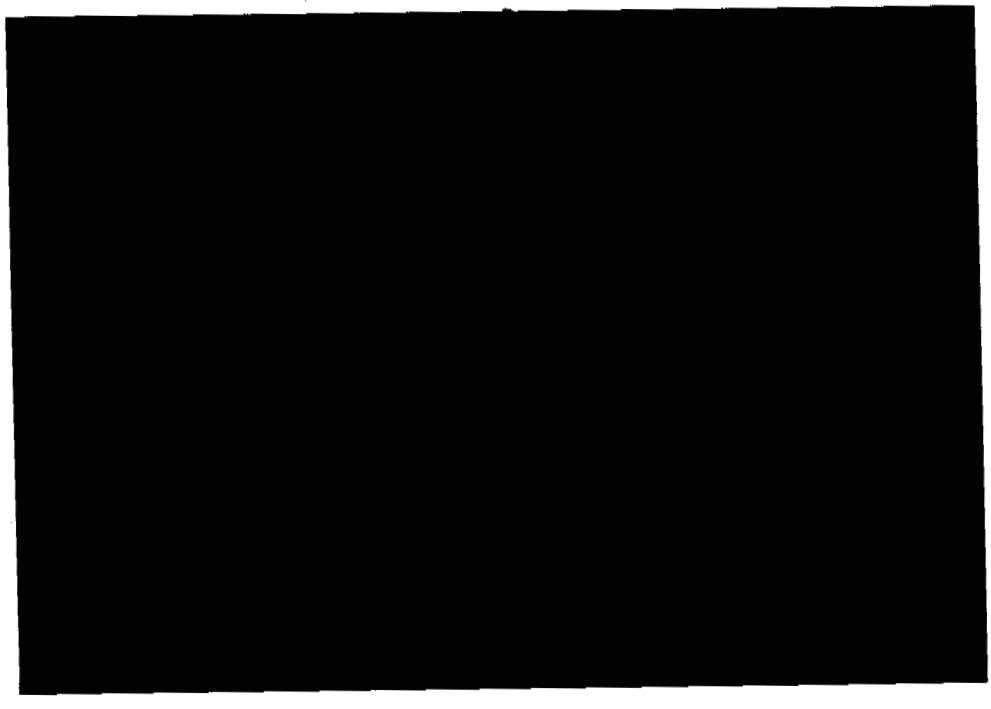
SPECIES	STATION	DATE COLLECTED	COMMENTS
Desmarestia aculeata	B81-6	29/07/81	Brown alga in understory of kelp attached to rocks (e.g., Plate 14a)
	BR83-8	31/07/83	
Laminaria saccharina	BR83-6	31/07/83	Laminarian kelp found on rocks (e.g., Plates 8a, 8b)
Laminaria yezoensis	B81-6	29/07/83	Laminarian kelp attached to rocks (e.g., Plates 11b, 14b)
Petalonia fascia	BR83-8	31/07/83	Brown alga in understory of kelp on rocks
Pterosiphonia bipinnata	BR83-6	31/07/83	Red alga in understory of kelp

* Specimens of the listed species were deposited with the Phycological Herbarium of the Department of Botany, University of British Columbia, Vancouver, B.C., Canada.



2 cm

Plate 9a. A small kelp plant and hydroids (arrow) attached to rocks exposed at the edge of a dredge trench.



10 cm

Plate 9b. Contracted soft coral, Gersemia rubiformis, at the edge of a dredge trench at Station B83-2.

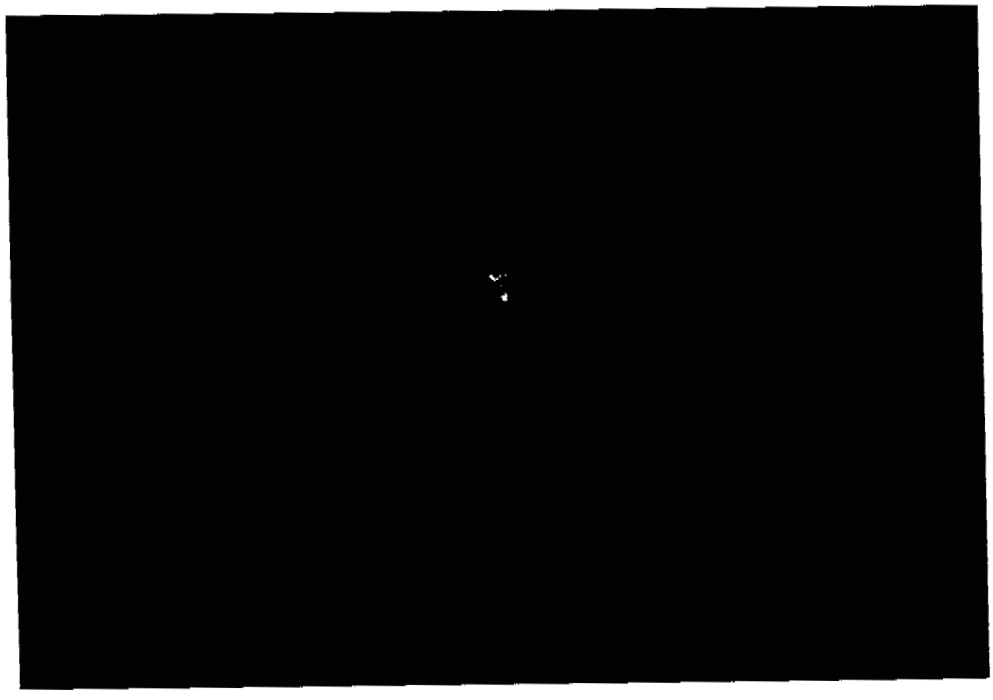


Plate 10a. Sea urchin, Strongylocentrotus droebachiensis, feeding on kelp near a dredge trench at Station B83-2.

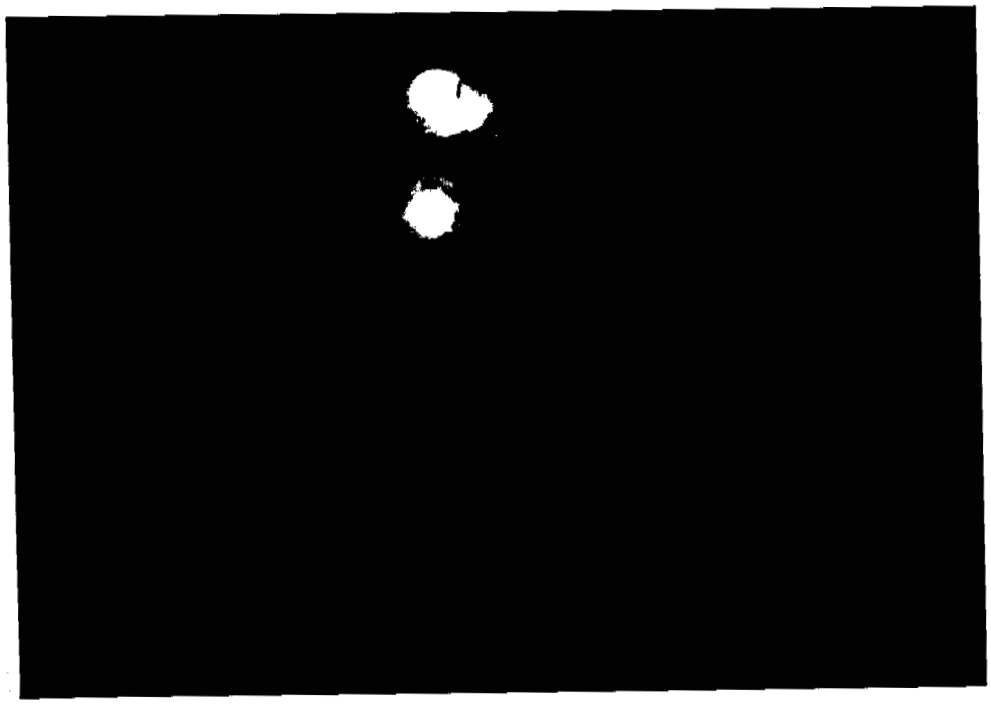


Plate 10b. Nudibranchs feeding on small kelp plants at reference station BR83-6.

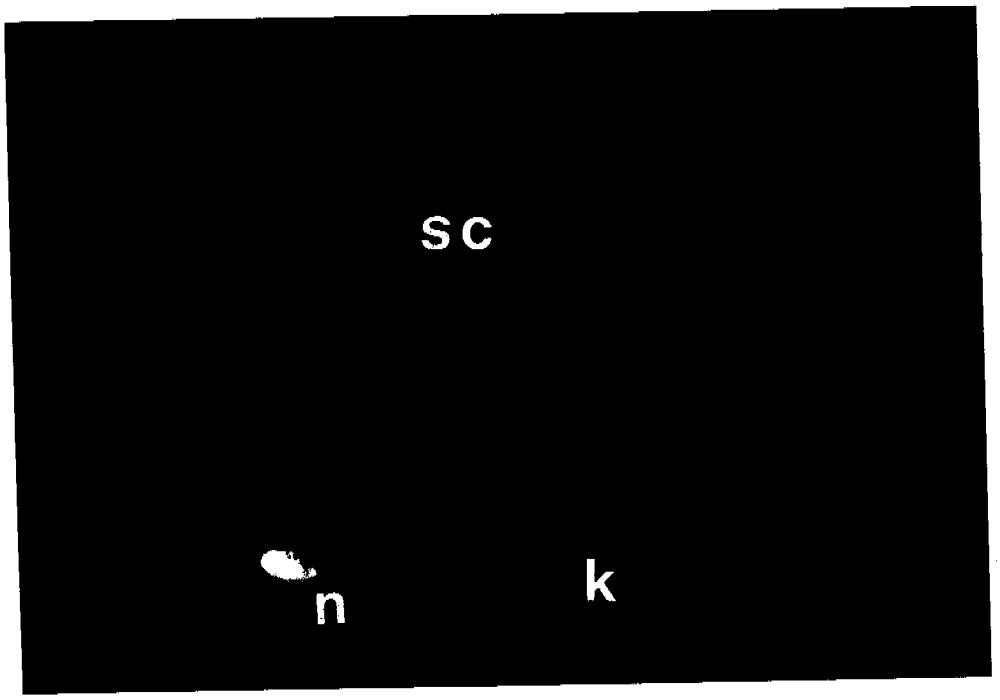
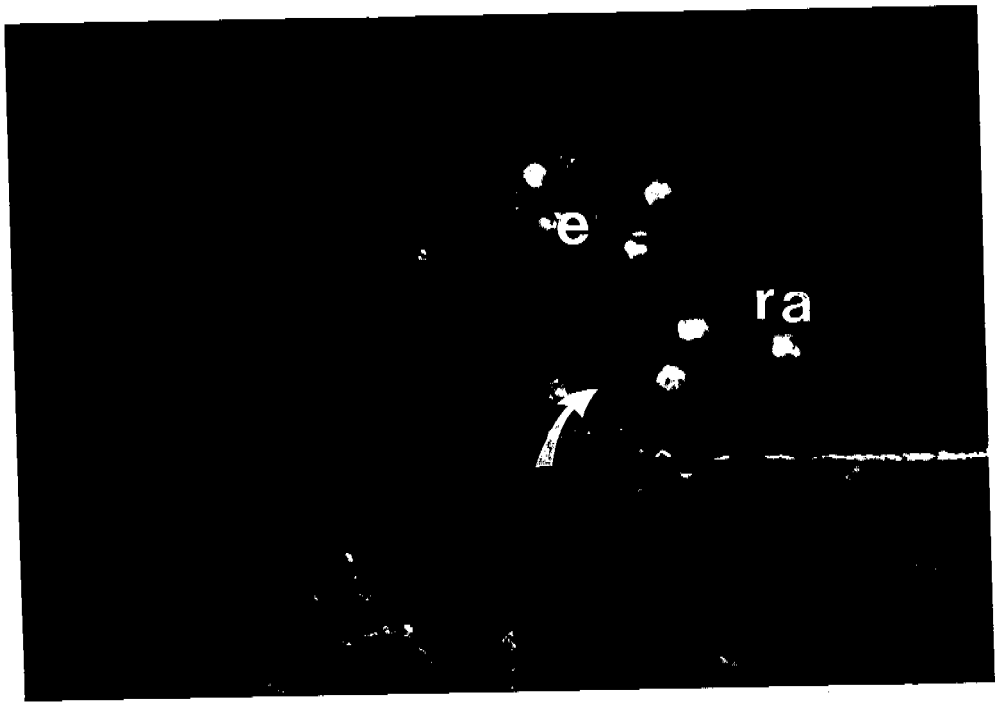


Plate 11a. Soft coral(sc), Gersemia rubiformis, kelp (k) and nudibranch (n) at Reference Station BR83-6. Note the buildup of silt on the plants and the substrate.



Plant 11b. Kelp, Laminaria yezoensis, red algae (ra), shrimp (arrow) and colonial epizoans (e) on a rock at reference station BR83-8.

Plate 12a. Red algae (ra), kelp stipe (ks), and barnacles feeding (arrow) on a rock at Reference Station BR83-8.

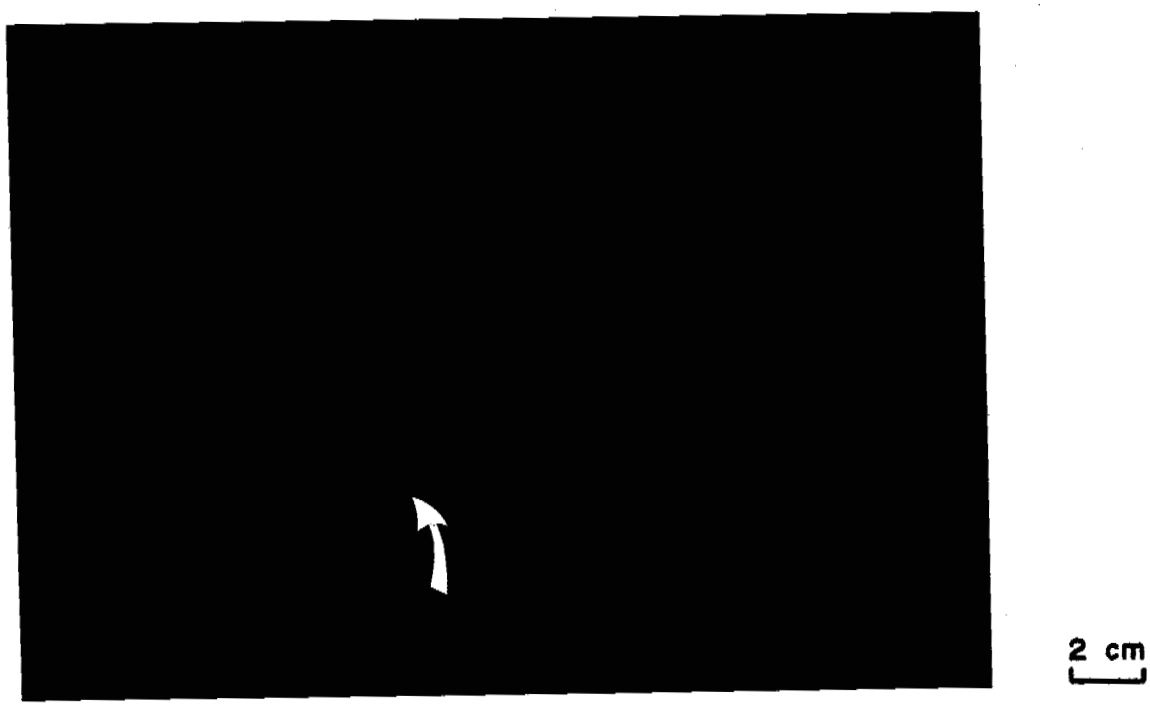
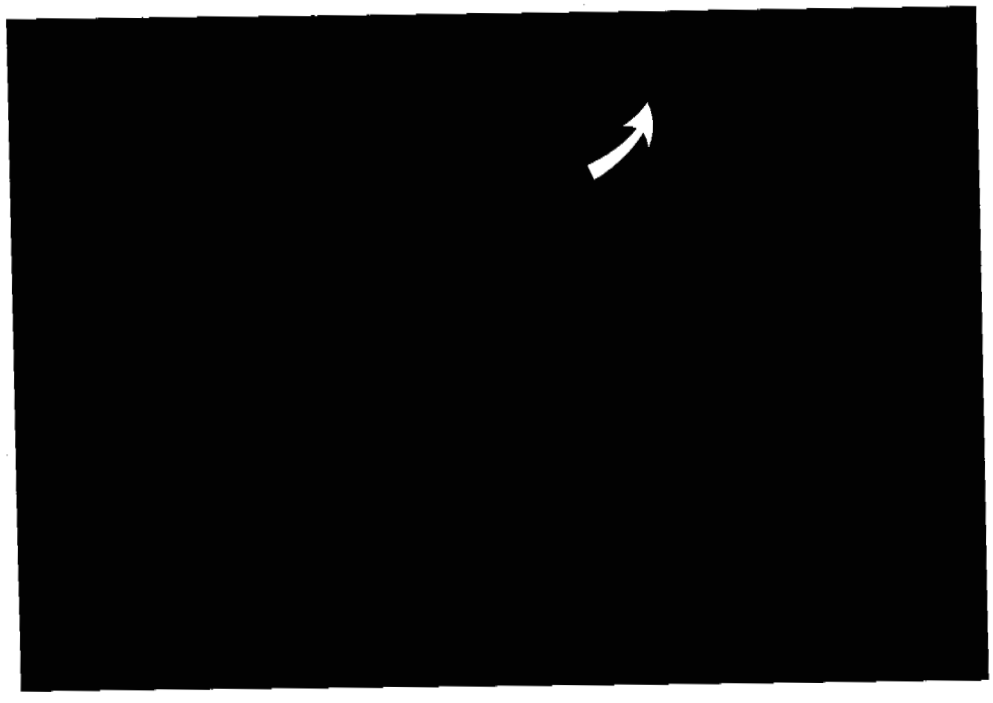
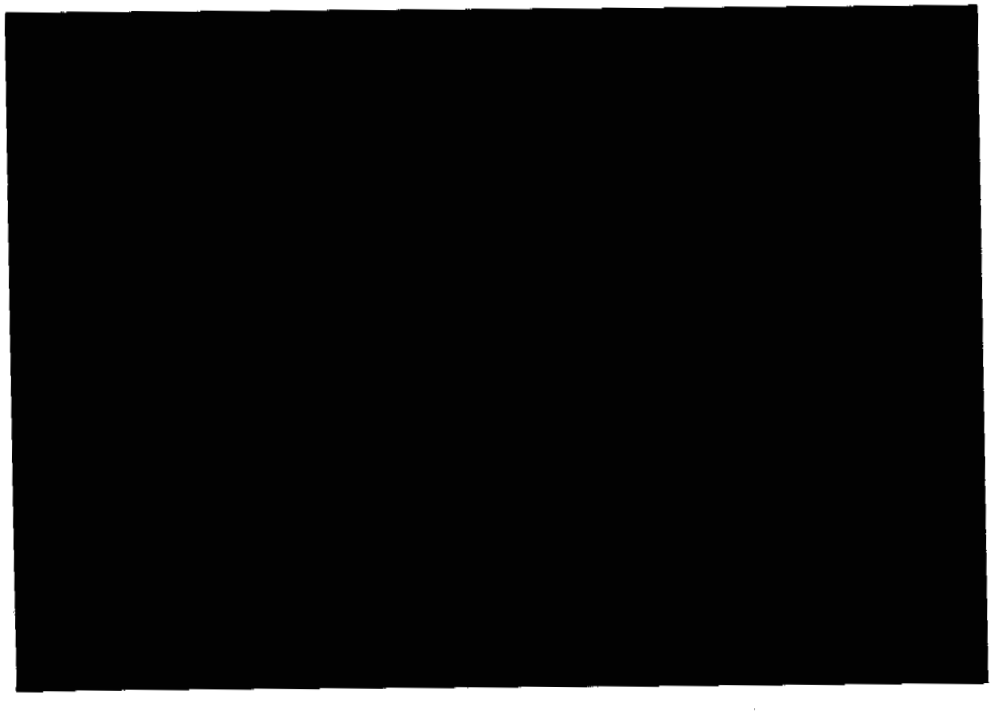


Plate 12b. Snail (Volutopsius sp.) on a nudibranch (arrow) moving over silty bottom at Reference Station BR83-8.



2 cm

Plate 13a. Amphipod (arrow) swimming close to the silty bottom at Reference Station BR83-6. Note the numerous tracks, burrows and other signs of faunal activity.



2 cm

Plate 13b. Camoflaged sculpin on silty gravel bottom at Reference Station BR83-8.

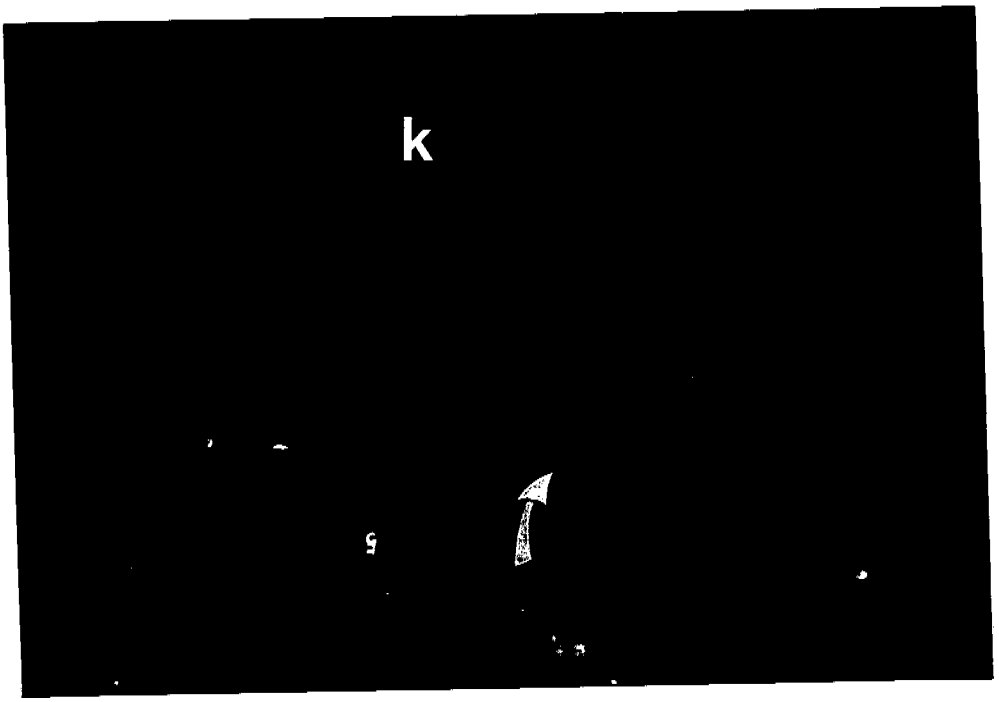


Plate 14a. Brown algae (arrow) growing in the understory of the kelp (k), Laminaria sp. at Reference Station BR83-8.

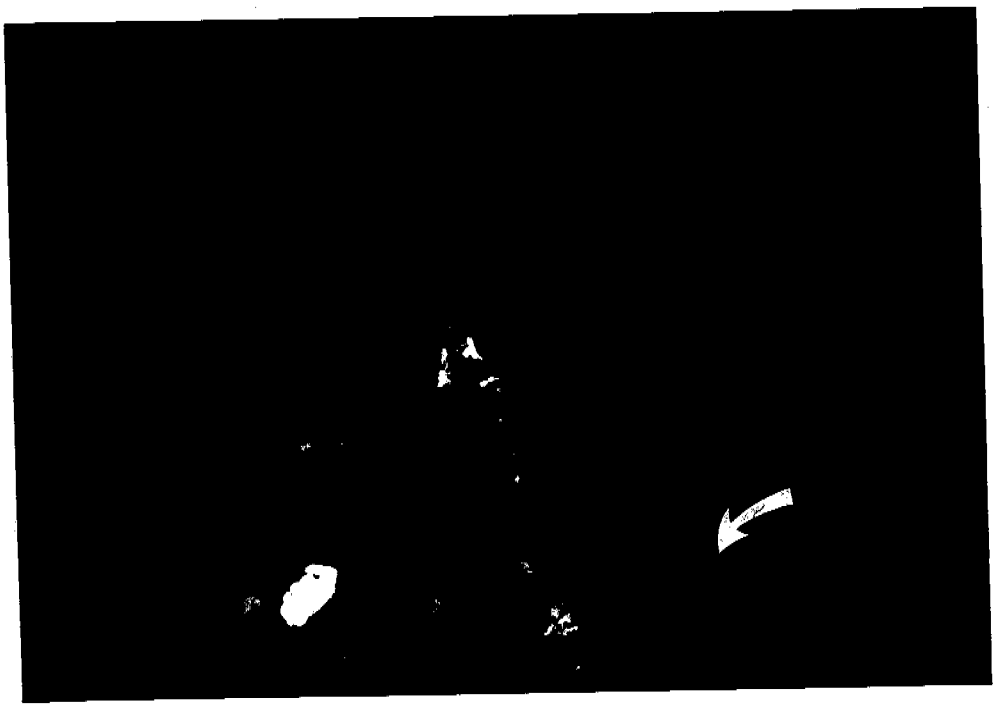
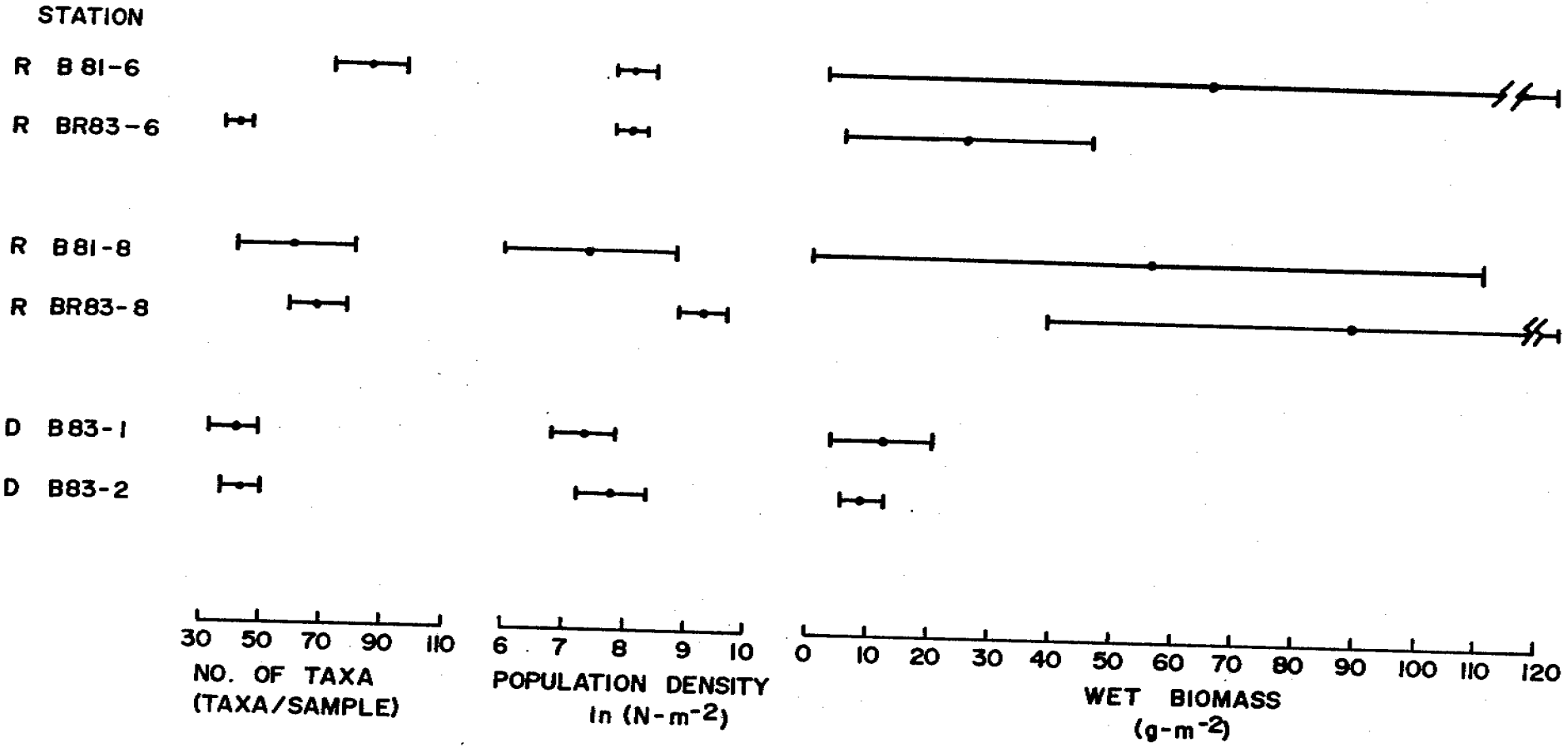


Plate 14b. Kelp, Laminaria yezoensis, and hydroids (arrow) on a rock at Reference Station BR83-8.



R - REFERENCE STATION

D - DREDGED STATION

Figure 5. Comparison of mean values of faunal indices for all benthos samples (airlift and grab) from dredged and reference stations near Banks Island. Bars indicate one standard deviation.

in samples from BR83-6 or the dredged stations ($P < 0.05$, ANOVA-1 and -2). Values of the three indices at the dredged stations and BR83-6 were within the ranges of values of the baseline stations B81-8 and B81-6, with the exception of species diversity at B81-6 (Figure 5). These results indicate that within a year of dredging, the values of gross indices of zoobenthos abundance and diversity at dredging sites were similar to those of unaffected areas, presumably due to recovery of the benthos in the dredged area. The difference in faunal indices between reference BR83-8 and BR83-6, as well as the dredged stations, may have been due to differences in community structure between the stations.

Community analyses by reciprocal averaging ordination (RA) and correspondence analysis (CA) differentiated three groups or assemblages of samples (stations) in the combined benthic results for 1981 and 1983 (Figure B.2-1 to B.2-4, Appendix B.2). Both of these independent techniques clumped the samples from the baseline stations BC81-1 and B81-1 to B81-4 into Group 1 ("sand"). This group of samples with sandy sediments had species such as the bivalve, Thyasira gouldii (Figure 6) in close association with it.

The samples from the dredged stations, B83-1 and B83-2, were grouped along with samples from nearby reference station, BR83-6, into Group 2 ("Dredge Area"). This intermediate group had some similarities to the first and third groups, but was sufficiently different to be distinguished from the other groups. Examples of dominant species with affinities for the "Dredge Area" samples were the amphipod, Monoculodes longirostris, and the cumacean, Lamprops fuscata (Figure 6).

The samples from the remaining baseline stations and reference station BR83-8 were clustered into Group 3. These benthos samples contained heterogeneous sediments, including a silty layer at the surface and sandy to gravelly constituents beneath (Table 2). (The samples from Group 2 were similar in sediment composition.) Examples of species with particular affinities for samples from Group 3 were the polychaetes, Chone duneri and Pygospio elegans (Figure 6).

A comparison of the mean values of faunal indices for the benthic assemblages identified in the community analyses has provided further support for the distinction of the benthic assemblages (Table 5). Mean values for species richness or diversity and population density were statistically higher for Group 3 samples than those for both Groups 1 and 2 ($P < 0.05$, ANOVA-4 and -6). There was no statistical difference between mean values of these indices for Groups 1 and 2. The mean wet biomass, however, was higher for both Groups 1 and 3 than for Group 2 ($P < 0.01$; ANOVA-6).

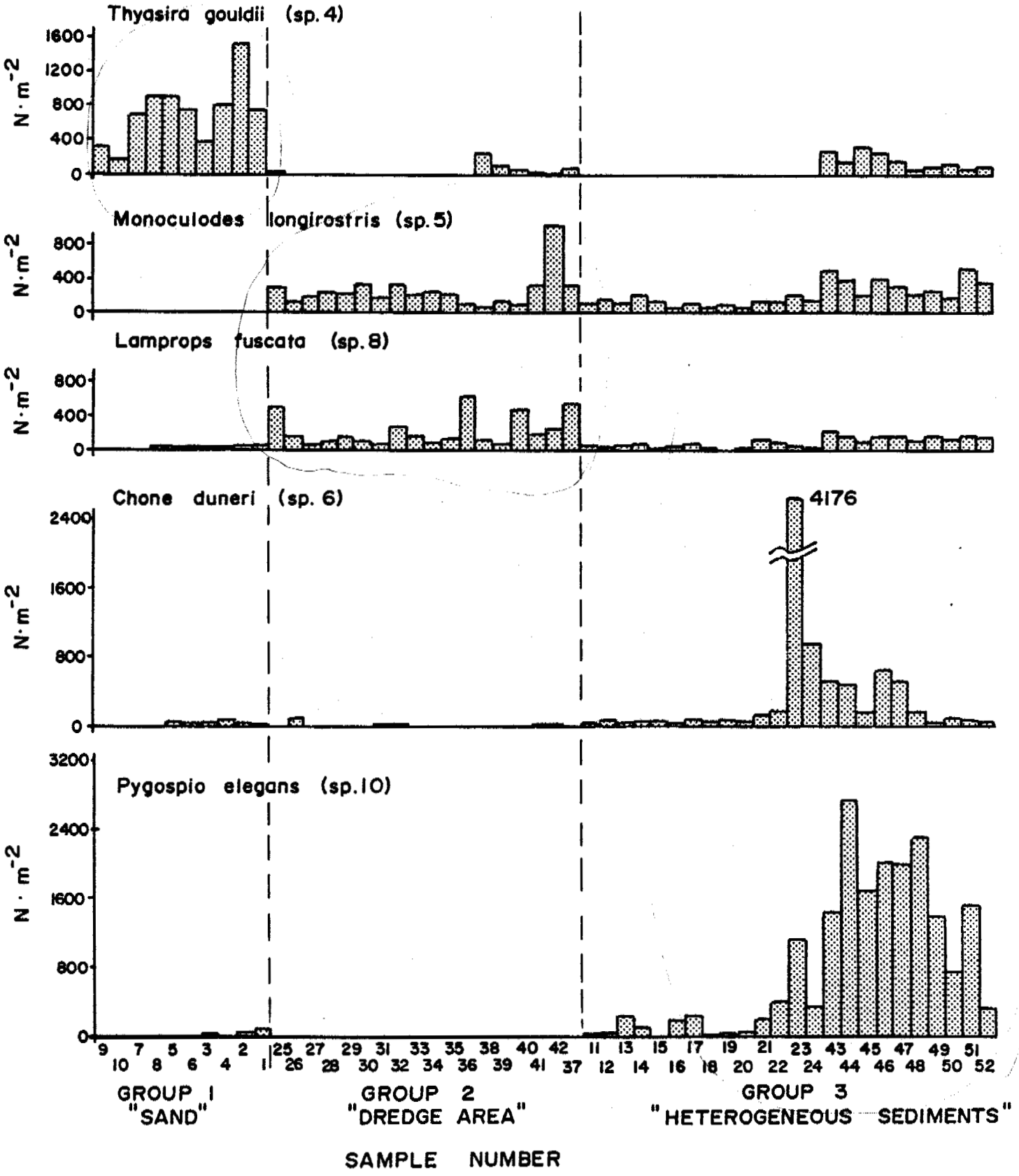


Figure 6. Distribution of representative taxa of benthos in samples from the Banks Island Gravel Borrow Area, 1981 and 1983. Numbers after taxonomic names refer to numbers assigned in Table B.2-1 (Appendix B.2) and employed in the species ordination and correspondence analysis.

TABLE 5.

COMPARISON OF FAUNAL INDICES FOR BENTHIC ASSEMBLAGES.
Mean value per station ± S.D. for number of species, number of individuals and wet biomass in the benthic faunal groups recognized in the 1981 and 1983 Banks Island benthic surveys

MEAN VALUE FOR	GROUP 1 "SAND"	GROUP 2 "DREDGE AREA"	GROUP 3 "HETEROGENEOUS"
No. of species (taxa/sample)	44.6 ± 16.4	40.3 ± 6.3	70.3 ± 10.8
Population density (N m^{-2})	1775.4 ± 945.1	2396.7 ± 1129.9	6694.3 ± 5261.2
Wet biomass (g m^{-2})	31.1 ± 11.8	15.2 ± 14.2	66.1 ± 45.1

The analyses of faunal indices and community associations, therefore, indicate that the dredged stations, B83-1 and B83-2, were part of a benthic faunal assemblage with moderate levels of abundance and species richness, and a species composition which was intermediate or partially overlapping between the "sand" assemblage representatives of Group 1 baseline stations and the "heterogeneous sediments" assemblage of Group 3 stations. There were no discernible negative effects of dredging on benthic community structure one year after dredging near Banks Island. Structure appears to have been altered. Who is to say what is negative?

3.1.4 Possible Implications of Gravel Dredging to Higher Trophic Levels

Before the baseline sampling was performed in 1981, there was concern that the proposed borrow area included rocky bottom habitat that was unique to the Beaufort Sea and which might be important for foraging by higher levels of the food chain, particularly bearded seals, Erignathus barbatus (Heath et al. 1982a). The baseline sampling demonstrated that, except for isolated boulders at Station B81-6, there was no rocky bottom habitat in the potential gravel borrow area off the Rufus River (Heath et al. 1982). The post-impact sampling program in 1983 confirmed that only scattered rocks are present in the actual dredging area according to diver observations and side-scan sonar surveys.

The benthos in the vicinity of the dredging area did not appear to be suitable or adequate for support of many bearded seals. The diet of the benthic feeding bearded seals mainly consists of crabs, shrimp, clams, bottom fish and demersal, (near bottom) schooling fish (Burns 1978). The benthos sampled in the Banks Island area included only small numbers of sculpins and shrimp, and low densities of clams of appreciable size (Appendix A). The main concentrations of bearded seals in the Banks Island region in winter are located in offshore areas with open leads and moving pack ice, towards and north of Cape Kellet (near Sachs Harbour, Figure 1a) and to the east of Cape Lambton (Stirling et al. 1975, and pers. comm.). Consequently, the borrow area near the Rufus River does not appear to be an important feeding or breeding area for bearded seals.

3.1.5 Comparison of Dredging and Ice Scouring near Banks Island

The frequency of ice scour observation during the baseline sampling period in 1981 was relatively high since scours were found at four of the eight stations located in water depths of 10 m or greater (Heath et al. 1982a; Table 2, this report). In 1983, however, ice scours were only detected on side-scan sonar records in relatively low frequency (less than 8 per km). The grounding of pressure ridge keels at the dredging area near Banks Island, therefore, does not appear to be as important in destabilizing sediments and benthos as it was at the dredging sites near Herschel Island (Heath and Thomas 1984b). In this case, however, an area of about 90 ha was marked by dredging near Banks Island. The effects of hopper dredging on the benthos and habitat near Banks Island are thus considered to be more prominent than those of ice scouring. The processes of sediment redistribution by bottom currents and waves and recolonization by opportunistic benthos appeared to be mending the scars of dredging very appreciably, near Banks Island.

3.1.6 Comparison of the Benthos of the Banks Island Borrow Area with that of other Study Areas in The Southern Beaufort Sea

The benthos in the vicinity of the borrow area near Banks Island was relatively rich in taxonomic composition compared to most other sites studied in the Beaufort Sea. A total of 225 taxa were identified in benthos samples collected in 1981 and 1983 (Appendix A). The dominant taxonomic groups in terms of numbers of taxa were polychaetes (92), amphipods (40), bivalves (20), gastropods (19), cumaceans (11) and hydrozoans (8). In comparison, 328 taxa were recognized in samples from around the dredging area near Herschel Island (Heath and Thomas 1984b). This latter figure is considered relatively high for the Beaufort. One principal difference in the benthos at Banks Island compared to other areas was the presence of macroalgae attached to rocks and boulders to depths of 20 m and likely beyond (cf. Chapman and Lindley 1980). The remarkably clear water which permitted exceptional underwater visibility and excellent light penetration at stations near Banks Island is in marked contrast to the often murky, silt-laden waters in Mackenzie Bay near Herschel Island.

Compared to other shallow (< 50 m) areas of the Southern Beaufort Sea, the Banks Island Borrow Area had relatively high average levels of faunal diversity,

population density and biomass (Table 6). The presence of sessile epifauna and macroalgae attached to rocks are features of the benthos near Banks Island which link it with benthic communities of the Canadian Arctic Archipelago east of Banks Island. The general lack of hard substrates and high turbidity of shallow areas in much of the Southern Beaufort Sea are not favourable for growth of sessile epifauna and macrophytes (cf. Lee 1973). These benthic forms, however, do not appear to be any more sensitive to the effects of dredging after one year than do the members of the infauna. Both epibenthos and infauna have survived or recovered from the impacts of dredging to return the affected area to a productive state.

Dredging by trailer suction hopper dredge in other areas of the Beaufort Sea would cause similar physical disturbances to those observed in this study: removal of substrate and modification of benthic habitat. Direct mortality and intense habitat disruption would occur primarily in the excavated ("high impact") zone, while effects within the "extended" impact zone would be mainly related to habitat modification. The size or area of the impact zones would be directly related to the scale and duration of the dredging operation. The nature and rate of the recolonization process would likely be site-related, depending on local substrate types, energy in the benthic environment and the structure of benthic communities present before the dredging impact. Based on the observations presented here and the experience gained in other coastal areas where the effects of dredging activities on benthic invertebrates have been investigated (Herbich 1981; Levings 1982; U.S. Army Corps of Engineers 1975), it is expected that any environmentally significant effects associated with hopper dredging would be mainly confined within the local area of the dredging operations.

TABLE 6.

COMPARISON OF BENTHIC FAUNAL INDICES
FOR SOUTHERN BEAUFORT SEA STUDY AREAS*

AREA	DATE	MEAN DEPTH (m)	DIVERSITY (No. taxa/sample)	DRY BIOMASS ($g\ m^{-2}$)	WET BIOMASS ($g\ m^{-2}$)	REFERENCE+
Kaglulik C-24	1977	32.0 ± 0	33.0 ± 2.6	24.81 ± 16.19	not determined	1
Kaglulik A-75	1977	26.8 ± 0	22.7 ± 2.4	15.01 ± 7.16	not determined	1
Tarsiut A-25	July 1978	18 m	16 ± 0	1.83 ± 1.16	not determined	2
Uviluk	Aug. 1980	28.3 ± 1.1	51.0 ± 12.1	3.02 ± 1.65	16.64 ± 10.20	3
Kaglulik	Aug.-Sept. 1980	26.8 ± 9.3	42.5 ± 15.6	10.18 ± 9.03	53.73 ± 43.78	3
East Tarsiut	Sept. 1981	16.7 ± 4.1	20.8 ± 9.6	not determined	4.26 ± 4.03	4
East Tarsiut	July 1982	17.7 ± 6.2	14.2 ± 7.9	0.71 ± 0.73	5.69 ± 5.32	5
South Tarsiut	Sept. 1981	9.6 ± 1.9	22.4 ± 3.9	not determined	16.39 ± 12.90	4
South Tarsiut	July 1982	9.0 ± 1.8	14.6 ± 8.6	2.16 ± 2.27	15.27 ± 16.2	5
Tuk Harbour	July 1980	9.4 ± 6.9	13.1 ± 6.8	2.75 ± 3.11	12.32 ± 12.63	6
Tuk Harbour	Sept. 1980	8.4 ± 5.5	19.7 ± 4.6	4.01 ± 3.24	20.51 ± 13.55	6
Herschel Island	July 1981	9.5 ± 2.0	36.3 ± 21.7	not determined	4.74 ± 4.91	7
	Sept. 1981	12.5 ± 1.2	41.2 ± 14.9	not determined	15.62 ± 23.18	
	Sept. 1982	11.1 ± 0.6	41.8 ± 27.3	1.19 ± 1.61	11.72 ± 16.48	
This study						
Banks Island	July 1981	10.9 ± 4.7	61.0 ± 19.3	not determined	42.2 ± 28.6	
	July-Aug. 1983	15.6 ± 3.0	49.9 ± 15.2	5.97 ± 6.65	41.4 ± 47.4	

* values expressed are the mean and standard deviation values for all samples at each site.

\+ References for data sources:

1. Thomas 1978a
2. Thomas 1978b
3. Heath and Thomas 1983
4. Thomas et al. 1982
5. Heath and Thomas 1984a
6. Thomas et al. 1981
7. Heath and Thomas 1984b

4. CONCLUSIONS

Two major aspects of the environmental effects of gravel dredging were examined near Banks Island: (1) direct effects on benthic invertebrates and macroalgae; and (2) effects on benthic habitat (destruction, creation, alteration). Loss of benthos in the immediate vicinity of the dredging trenches ("high impact" zone) due to entrainment and smothering is the most immediate direct effect. This immediate, direct loss, although not observed directly in this study, is not expected to be environmentally significant on a regional scale because only about 0.9 km^2 of benthic habitat was within the extended impact zone affected directly or indirectly by dredge scours. The total impacted area is a small portion of the total benthic habitat of this type near Banks Island. Within a year, recolonization of infauna and epibenthos in and near the trenches was well advanced. Levels of species diversity, population density and biomass of benthos were similar in samples from dredged sites and in unaffected reference samples.

Effects on benthic habitat were examined in terms of changes in sediment texture and morphology caused by dredging. The benthic habitat or substrate type present in the borrow area before dredging was gravel overlain (or combined with) silt and clay. Dredging in this situation has a high potential for longer-term habitat modification because the exposure of gravel clearly creates a large shift in sediment texture within the habitat affected. The high rate of sediment (silt) accumulation in the trenches within the year following dredging, however, has quickly restored the surficial sediment texture in the bottom of the trenches to the state present before dredging. The major habitat differences remaining after one year were the presence of gravelly trench edges which were at least partially exposed, and the shallow trench depressions which were receiving the mobile sediments carried by bottom currents.

The possible regional effects due to resettling of silt transported out of the dredging areas by water currents could not be established at the nearby reference stations. The entire area is subject to high levels of sediment accumulation, yet macroalgae and epifauna appear to be coping with this factor.

The main findings of the study were:

1. Dredging by trailer suction hopper dredge in the substrate consisting of gravel overlain by silt/clay was confined to an area of about 0.9 km^2. Hopper dredging excavated shallow (0.2 to 0.3 m deep) paired trenches which were about 4 m wide. Benthos and substrate were stripped from the sea bottom along the parallel trenches.

The secondary effects of dredging included agitation and resettling of fine sediment particles, such as fine sand and silt. Most of the silt/clay particles tended to be carried away from the dredging area by currents, but appreciable amounts of sand may have resettled in and near the dredge trenches. Evidence of sand deposition in trenches was observed in this study. The high rate of accumulation of silt in the trenches (over 5 cm) within the year following dredging, however, overshadowed the sand deposition and offset the shift in sediment texture from silty to gravelly that was initially caused by the dredging.

2. Recolonization of the dredged trenches by benthic infauna was well established with a diverse assemblage of polychaetes, amphipods, cumaceans and molluscs one year after dredging had ceased. Levels of the faunal indices (diversity, population density and biomass) were similar inside and outside the trenches at dredged stations, and were near or approaching levels at non-dredged reference stations. Kelp and large epifauna were observed at the margins of the dredge trenches.

Mainly amphipods + cumaceans Need to go through detailed data tables.

3. The analysis of faunal indices and community associations of benthos indicated that the dredged sites were part of a benthic faunal assemblage with moderate levels of abundance and diversity. The community structure of the "dredge area" assemblage was intermediate between two other assemblages representing stations with "sandy" and "heterogeneous" sediments, respectively. There were no discernible negative effects of dredging on benthic community structure one year after dredging near Banks Island.

There were effects? What is negative? What is positive?

4. Compared to other shallow (< 50 m) areas of the southern Beaufort Sea, the borrow area near Banks Island had relatively high average levels of faunal diversity, population density and biomass. The presence of sessile epifauna and macroalgae attached to scattered rocks are features which link the benthos near Banks Island with that the of the Canadian Arctic Archipelago east of Banks Island. In addition to the members of the infauna, the sessile epifauna and macroalgae adjacent to the trenches appear to have survived or recovered to a large extent from the impact of dredging.

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Banks Island BC81-1

	Genus-Species	Grab	N/M (m-2)	WW (g.m-2)
Phylum:Annelida				
Class:Oligochaeta		a	22	
		b	92	
Class:Polychaeta				
Family: Ampharetidae	Amphorete acutifrons	a	4	0.3
		b	4	0.1
Apistobranchidae	Apistobranchus ornatus	a	10	
		b	8	
Capitellidae	Capitella capitata	a	52	
		b	16	
Cirratulidae	Chaetozone/Tharyx complex	a	130	0.1
		b	94	0.1
Dorvilleidae	Dorvillea (sp.) ?	a	52	
		b	26	
Hesionidae	Castalia aphroditoides	a	4	
		b	4	
	unidentified ?	a	2	
	Family Total	a	6	
		b	4	
Maldanidae	Praxillella praetermissa	a	18	
		b	4	
	Praxillella (sp.) ?	a	46	
		b	12	
	Family Total	a	64	1.1
		b	16	
Nephtyidae	Nephtys longosetosa	a	14	2.1
		b	12	7.1
Ophelliidae	Ophelia limacina	a	102	
		b	136	
	Travisia forbesii	a	82	
		b	86	
	Family Total	a	184	3.4
		b	222	18.4
Orbiniidae	Leitoscoloplos panamensis	a	138	3.2
		b	134	1.5
Paraonidae	Aricidea suecica	b	2	
Phyllodocidae	Eteone longa	a	54	
		b	54	
	Phyllodoce groenlandica	a	2	
		b	4	
	Family Total	a	56	0.5
		b	58	0.4
Polynoidae	Eunoe depressa	a	6	
Sabellidae	Chone duneri	a	10	
		b	18	
	Chone sp.	a	24	
	Euchone analis	a	4	
		b	2	
	Family Total	a	38	
		b	20	
Sisalionidae	Pholoe minuta	a	14	
Sphaerodoridae	Sphaerodoropsis minuta	a	4	
		b	6	

Banks Island BC81-1

	Genus-Species	Grab	N/M (m-2)	WW (g.m-2)
Spionidae	Dispio sp. How many species?	a	88	
		b	40	
	Prionospio cirrifera	a	8	
		b	2	
	Pysospio elegans	a	46	
		b	24	
	Scolecolepides sp.	a	374	
		b	396	
?	?Spio sp.	a	16	
		b	18	
	Family Total	a	532	2.2
		b	480	3.5
Syllidae	Exogone tartica	a	34	
		b	20	
	Exogone verugera	a	192	
		b	86	
	Exogone sp.(epitokus)	a	162	
		b	48	
	Family Total	a	388	0.1
		b	154	
Trichobranchidae	Terebellides stroemi	a	4	0.3
		b	2	0.2
Fragments and Nematodes		a	pr	0.2
		b	pr	0.5
Phylum:Arthropoda				
Class:Copepoda				
Order:Cyclopoida		b	2	
Order:Harpacticoida		b	4	
Class:Malacostraca				
Order:Amphipoda				
Family: Atylidae	Atylus carinatus	a	6	
Corophiidae	Corophium crassicorne	a	10	
		b	2	
Gammaridae	Gammarus sp.	a	2	
Haustoriidae	Priscillina armata	a	6	
Ischyroceridae	Ischyrocerus megacheir	a	20	
		b	4	
Lysianassidae	Anonyx nugax	b	4	
	Boeckosimus sp.	a	14	
		b	6	
	Hippomedon holbolli	a	2	
	Family Total	a	16	0.2
		b	10	1.9
Oedicerotidae	Acanthostepheia behringiensis	a	2	
		b	2	
	Bathymedon saussurei	b	2	
	Monoculodes borealis	a	8	
		b	6	
	Paroediceros lynceus	b	8	
	Family Total	a	10	
		b	18	0.4

Banks Island BC81-1

	Genus-Species	Grab	N/M (m-2)	WW (s.m-2)
Order:Cumacea				
Family Lampropidae	Lamprops fuscata	a	24	
		b	20	
Nannastacidae	Campylaspis costata	a	18	
		b	12	
Order:Tanaidacea	Leptognathia gracilis	a	28	
Class:Ostracoda		a	12	
Arthropod fragments		a	PP	
		b	PP	
Phylum:Bryzoa				
Class:Gymnolaemata				
Family: Scrupariidae	Eucratea loricata	b	PP	
Phylum:Chordata				
Subphylum:Urochordata				
Class:Ascidiacea		a	2	
Phylum:Cnidaria				
Class:Anthozoa				
Order:Actiniaria		a	4	0.1
		b	4	0.2
Phylum:Echinodermata				
Class:Holothuroidea				
Family: Synaptidae		a	fragments	2.6
		b	26	4.2
Phylum : Mollusca				
Class : Gastropoda				
Subclass : Opisthobranchia				
Order : Cephalaspidea		a	18	
		b	20	0.2
Subclass : Prosobranchia				
Family : Buccinidae	Buccinium ciliatum	a	16	6.1
	Buccinium (sp) ?	b	8	1.0
Cylichnidae	Cylichna alba	a	20	
		b	12	
	Scaphander punctostriatus	a	132	
		b	70	
	Family Total	a	152	1.6
		b	82	1.1
Diaphanidae	Diaphana minuta	a	16	
Naticidae	Amauropsis purpurea	a	2	2.7
Retusidae	Retusa obtusa	a	104	0.3
		b	40	0.1
Trochidae	Margarites helicinus	a	2	0.3
Gastropod Fragments		a	PP	
		b	PP	

Banks Island BC81-1

		Genus-Species	Grab	N/M (m-2)	WW (g.m-2)
Class : Pelecypoda					
Family:	Astartidae	Astarte montagui	a	14	0.1
			b	10	
	Cardiidae	Clinocardium ciliatum	a	16	
			b	4	
		Serripes groenlandicus	a	46	
			b	30	
		Family Total	a	62	5.1
			b	34	4.5
	Hiatellidae	Hiatella arctica	a	2	
	Myidae	Mya truncata	b	6	2.5
	Mytilidae	Musculus niger	a	2	
			b	4	
	Pandoridae	Pandora glacialis	b	2	1.4
	Tellinidae	Macoma sp. ?	a	10	
	Thraciidae	Thracia sp. ?	a	78	3.2
			b	30	0.5
	Thyasiridae	Axinopsida orbiculata	a	180	
			b	144	
		Thyasira flexuosa (=gouldii)	a	1494	
			b	704	
		Family Total	a	1674	3.6
			b	848	2.2
	Veneridae	Liocyma fluctuosa	a	70	2.2
			b	34	1.0
Phylum:Nemertinea			a	14	0.2
			b	34	0.6
Phylum : Protozoa					
Class : Sarcodina					
Order : Foraminifera					
Family :	Fischerinidae	Cornuspira foliacea	a	pr	
			b	pr	
Phylum:Sipuncula			a	26	
STATION TOTAL:			a	4138	45.0
			b	2604	51.4

Banks Island B81-1		Genus-Species	Grab	N/M (m-2)	WW (g.m-2)	DW (g.m-2)
Phylum:Annelida						
Class:Oligochaeta			b	22		
Class:Polychaeta						
Family:	Ampharetidae	Amphorete acutifrons	a	2		
			b	2		
	Apistobranchidae	Apistobranchus ornatus	a	26		
			b	4		
	Capitellidae	Capitella capitata	a	6		
			b	10		
	Cirratulidae	Chaetozone/Tharyx complex	a	44		
			b	32		
	Dorvilleidae	Dorvillea sp.	a	14		
			b	10		
	Hesionidae	Castalia aphroditoides	b	4		
	Maldanidae	Praxillella praetermissa	a	6		
			b	8		
		Praxillella sp.	a	2		
		Family Total	a	8		
			b	8		
	Nephtyidae	Nephtys longosetosa	a	6		
			b	8		
		Nephtys sp.	a	4		
			b	2		
		Family Total	a	10	1.7	
			b	10	2.5	
	Opheliidae	Ophelia limacina	a	14		
			b	30		
		Travisia forbesii	a	36		
			b	32		
		Family Total	a	50	2.3	
			b	62	1.8	
	Orbiniidae	Leitoscoloplos panamensis	a	72	0.5	
			b	44	0.5	
	Paraonidae	Arcidea suecica	a	2		
			b	2		
	Phyllodocidae	Eteone ?longa	a	42		
			b	44		
		Phyllodoce groenlandica	a	fragment		
			b	2		
		Family Total	a	42		
			b	46	0.2	
	Polynoidae	Hesperonoe adventor	a	2		
		Hesperonoe sp.	b	2		
		Melaenis loveni	a	4		
		Family Total	a	4	0.1	
			b	2		
	Sabellidae	Chone duneri	a	8		
			b	28		
		Euchone analis	a	10		
			b	8		
		Family Total	a	18		
			b	36		
	Sigalionidae	Pholoe minuta	a	4		
			b	4		

Banks Island B81-1

	Genus-Species	Grab	N/M (m-2)	WW (g.m-2)	DW (g.m-2)
Spionidae	Dispio sp.	a	48		
		b	34		
	Prionospio cirrifera	a	4		
	Pygospio elegans	a	2		
	Scolecolepides sp.	a	86		
		b	130		
	Unidentifiable	a	16		
		b	12		
	Family Total	a	156	0.6	
		b	176	0.9	
Syllidae	Exogone verugera	a	18		
	Exogone sp.(epitokus)	a	16		
		b	14		
	Family Total	a	34		
		b	14		
Trichobranchidae	Terebellides stroemi	b	4	0.5	
Fragments and Nematodes		a	pr	0.1	
		b	pr	0.2	
Phylum:Arthropoda					
Class:Copepoda					
Order:Cyclopoida		a	2		
		b	16		
Order:Harpacticoida		a	6		
Class:Malacostraca					
Order:Amphipoda					
Family :Corophiidae	Corophium sp.	a	4		
		b	16		
Gammaridae	Gammarus duebeni	b	2		
Haustoriidae	Priscillina armata	a	12		
		b	42	0.1	
Ischyroceridae	Ischyrocerus sp.	a	6		
		b	2		
Lysianassidae	Boeckosimus botkini	a	8	0.3	
		b	6	0.6	
Oedicerotidae	Acanthostepheia behringiensis	a	10		
		b	8		
	Monoculodes sp.	b	4		
	Monoculopsis longicornis	a	24		
		b	16		
	Family Total	a	34	0.1	
		b	28	0.1	
Order:Cumacea					
Family :Lampropidae	Lamprops fuscata	a	10		
		b	14		
Nannastacidae	Campylaspis costata	a	14		
		b	10		
Order:Tanaidacea	Leptognathia gracilis	a	2		
		b	18		
Phylum:Chordata					
Subphylum:Urochordata					
Class:Ascidiacea		a	6	0.1	
		b	2		

Banks Island B81-1

	Genus-Species	Grab	N/M (m-2)	WW (g.m-2)	DW (g.m-2)
Phylum:Cnidaria					
Class:Anthozoa					
Order:Actiniaria		a	8	21.0	
		b	2		
Phylum:Echinodermata					
Class:Holothuroidea					
Family:Synaptidae	Myriotrochus rinkii	a	4	1.8	
Phylum : Mollusca					
Class : Gastropoda					
Subclass : Opisthobranchia					
Order : Cephalaspidea		a	4	0.1	
		b	6		
Subclass : Prosobranchia					
Family : Buccinidae	Buccinium sp.	a	2		
		b	4	0.2	
Cylichnidae	Cylichna alba	a	10		
		b	2		
	Scaphander punctostriatus	a	80		
		b	66		
	Family Total	a	90	1.4	
		b	68	0.4	
Diaphanidae	Diaphana minuta	a	4		
Naticidae	Amauropsis purpurea	a	2		
	Natica clausa	a	2		
	Family Total	a	4	1.2	
Retusidae	Retusa obtusa	a	8		
		b	16		
Gastropod Fragments and Eggs		b	pr	3.0	
Class : Pelecypoda					
Family : Astartidae	Astarte montagui	a	2	0.5	
		b	2		
Cardiidae	Clinocardium ciliatum	a	2		
	Serripes groenlandicus	a	8		
		b	6		
	Family Total	a	10	3.8	
		b	6	21.7	
Myidae	Mya truncata	a	4	0.2	
Thraciidae	Thracia sp.	a	12	0.1	
		b	20	0.2	
Thyasiridae	Axinopsida orbiculata	a	88		
		b	64		
	Thyasira flexuosa (=gouldii)	a	378		
		b	792		
	Family Total	a	466	1.3	
		b	856	2.0	
Veneridae	Liocyma fluctuosa	a	46	1.6	
		b	30	2.7	
Phylum:Nemertinea		a	36	0.1	
		b	14	0.1	

Banks Island B81-1

	Genus-Species	Grab	N/M (m-2)	WW (g.m-2)	DW (g.m-2)
Phylum : Protozoa					
Class : Sarcodina					
Order : Foraminifera					
Family : Fischerinidae	Cornuspira foliacea	a	pr		
		b	pr		
Phylum:Sipuncula		a	32		
		b	16	0.3	
STATION TOTAL:		a	1330	39.3	
		b	1688	38.3	

Banks Island B81-2

		Genus-Species	Grab	N/M (m-2)	WW (g.m-2)
Phylum:Annelida					
Class:Oligochaeta			b	4	
Class:Polychaeta					
Family:	Ampharetidae	Amphorete acutifrons	a	4	0.4
			b	2	
	Aristobranchidae	Aristobranchus ornatus	a	2	
	Capitellidae	Capitella capitata	b	2	
	Cirratulidae	Chaetozone/Tharyx complex	a	10	
			b	2	
	Dorvilleidae	Dorvillea sp.	a	2	
	Maldanidae	Praxillella praetermissa	a	4	
		Praxillella sp.	b	2	
	Nephtyidae	Nephtys longosetosa	b	8	
		Nephtys sp.	a	4	
			b	2	
		Family Total	a	4	0.1
			b	10	1.9
	Opheliidae	Ophelia limacina	a	26	
			b	22	
		Travisia forbesii	a	84	
			b	70	
		Family Total	a	110	7.7
			b	92	10.3
	Orbiniidae	Leitoscoloplos panamensis	a	52	1.5
			b	50	2.2
	Phyllodocidae	Eteone ?longa	a	34	
			b	40	
		Phyllodoce groenlandica	a	2	
		Family Total	a	36	0.1
			b	40	0.1
	Polynoidae	Melaenis loveni	a	4	3.2
	Sabellidae	Chone duneri	a	4	
			b	14	
		Euchone analis	a	8	
			b	14	
		Family Total	a	12	
			b	28	
	Spionidae	Dispio sp.	a	2	
			b	10	
		Scolecolepides sp.	a	122	
			b	150	
		Family Total	a	124	0.9
			b	160	0.9
	Syllidae	Exogone sp.(epitokus)	a	2	
			b	4	
	Fragments and Nematodes		a	pr	0.2
			b	pr	0.1
Phylum:Arthropoda					
Class:Copepoda					
Order:Cyclopoida			b	2	

Banks Island B81-2

	Genus-Species	Grab	N/M (m-2)	WW (g.m-2)
Class:Malacostraca				
Order:Amphipoda				
Family :Corophiidae	Corophium crassicorne	a	4	
		b	2	
Haustoriidae	Priscillina armata	a	4	
		b	16	
Ischyroceridae	Ischyrocerus megacheir	a	6	
Lysianassidae	Boeckosimus sp.	a	4	
		b	2	0.3
Oedicerotidae	Acanthostepheia behringiensis	a	6	
		b	16	
	Monoculopsis longicornis	a	30	
		b	64	
	Family Total	a	36	0.1
		b	80	0.2
Order:Cumacea				
Family :Lampropidae	Lamprops fuscata	a	8	
		b	2	
Nannastacidae	Campylaspis costata	b	6	
Order:Tanaidacea	Leptognathia gracilis	a	4	
		b	2	
Pyhlum:Chordata				
Subpyhlum:Urochordata				
Class:Ascidiacea		a	6	
		b	2	
Phylum:Cnidaria				
Class:Anthozoa				
Order:Actiniaria		a	4	
Phylum: Mollusca				
Class: Gastropoda				
Subclass: Opisthobranchia				
Orde: Cephalaspidea		a	2	
Subclass : Prosobranchia				
Family : Buccinidae	Buccinium sp.	a	12	0.8
		b	12	0.7
Cylichnidae	Cylichna alba	a	2	
		b	2	
	Scaphander punctostriatus	a	110	
		b	102	
	Family Total	a	112	0.4
		b	104	1.3
Diaphanidae	Diaphana minuta	a	4	
		b	4	
Naticidae	Lunatia pallida	a	2	2.5
Retusidae	Retusa obtusa	a	14	
		b	14	
Gastropod Fragments and Eggs		a	pr	

Banks Island B81-2

	Genus-Species	Grab	N/M (m-2)	WW (g.m-2)
Class : Pelecypoda				
Family : Astartidae	Astarte montagui	a	4	0.7
Cardiidae	Serripes groenlandicus	a	4	0.1
		b	6	3.6
Myidae	Mya truncata	b	2	0.1
Tellinidae	Macoma sp.	a	2	
Thraciidae	Thracia sp.	a	18	0.2
		b	20	0.2
Thyasiridae	Axinopsida orbiculata	a	90	
		b	78	
	Thyasira flexuosa (=gouldii)	a	886	
		b	752	
	Family Total	a	976	2.7
		b	830	2.5
Veneridae	Liocyma fluctuosa	a	18	2.5
		b	16	0.4
Phylum:Nemertinea		a	36	0.3
		b	20	
Phylum : Protozoa				
Class : Sarcodina				
Order : Foraminifera				
Family : Fischerinidae	Cornuspira foliacea	a	pr	
		b	pr	
Phylum:Sipuncula		a	8	
		b	4	
STATION TOTAL:		a	1654	24.9
		b	1542	24.9

Banks Island B81-3

	Genus-Species	Grab	N/M (m-2)	WW (g.m-2)
Phylum:Annelida				
Class:Polychaeta				
Family: Ampharetidae	Ampharete acutifrons	b	4	
Apistobranchidae	Apistobranchus ornatus	a	2	
Cirratulidae	Chaetozone/Tharyx complex	a	2	
		b	2	
Maldanidae		b	fragments	
Nephtyidae	Nephtys longosetosa	a	4	1.5
		b	2	1.1
Opheliidae	Ophelia limacina	a	22	
		b	4	
	Travisia forbesii	a	40	
		b	62	
	Family Total	a	62	7.7
		b	66	2.1
Orbiniidae	Leitoscoloplos panamensis	a	10	
		b	16	0.1
Phyllodocidae	Eteone longa	a	32	0.1
		b	32	0.1
Sabellidae	Euchone analis	a	4	
		b	4	
Spionidae	Dispio sp.	a	10	
		b	2	
	Scolecolepides sp.	a	82	
		b	48	
	Family Total	a	92	0.6
		b	50	0.3
Syllidae	Exogone sp.	a	2	
Fragments and Nematodes		a	pr	
		b	pr	
Phylum:Arthropoda				
Class:Malacostraca				
Order:Amphipoda				
Family :Corophiidae	Corophium crassicorne	a	10	
		b	12	
Haustoriidae	Priscillina armata	a	4	
		b	10	
Ischyroceridae	Ischyrocerus sp.	b	2	
Lysianassidae	Boeckosimus sp.	a	4	0.5
Oedicerotidae	Acanthostepheia behringiensis	a	22	
		b	20	
	Monoculodes borealis	a	6	
		b	6	
	Monoculopsis longicornis	a	92	
		b	52	
	Family Total	a	120	0.3
		b	78	0.4
Order:Cumacea				
Family :Lampropidae	Lamprops fuscata	b	4	
Order:Tanaidacea	Leptognathia gracilis	a	2	
		b	2	
Phylum:Chordata				
Subphylum:Urochordata				
Class:Ascidiacea		a	18	2.1
		b	30	2.7

Banks Island B81-3	Genus-Species	Grab	N/M (m-2)	WW (g.m-2)
Subphylum:Vertebrata				
Class:Osteichtyes				
Family:Cottidae		b	2	1.9*
Phylum : Mollusca				
Class : Gastropoda				
Subclass : Prosobranchia				
Family : Buccinidae	Buccinium sp.	a	6	0.3
		b	20	1.1
Cylichnidae	Cylichna alba	a	4	
		b	2	
	Scaphander punctostriatus	a	62	
		b	82	
	Family Total	a	66	1.1
		b	84	1.6
Retusidae	Retusa obtusa	a	22	0.1
		b	38	0.2
Gastropod Juveniles		a	2	
		b	2	
Class : Pelecypoda				
Family : Cardiidae	Serripes groenlandicus	b	2	
Myidae	Mya truncata	a	2	
		b	2	0.1
Thraciidae	Thracia sp.	a	10	1.6
		b	8	
Thyasiridae	Axinopsida orbiculata	a	24	
		b	66	
	Thyasira flexuosa (=gouldii)	a	684	
		b	892	
	Family Total	a	708	1.8
		b	958	2.5
Veneridae	Liocyma fluctuosa	a	18	1.7
		b	26	0.1
Phylum:Nemertinea		a	26	0.3
		b	10	0.1
Phylum : Protozoa				
Class : Sarcodina				
Order : Foraminifera				
Family : Fischerinidae	Cornuspira foliacea	a	pr	
		b	pr	
Phylum:Sipuncula		b	4	
STATION TOTAL:		a	1228	19.7
		b	1470	14.4

Banks Island B81-4

	Genus-Species	Grab	N/M (m-2)		WW (g.m-2)
Phylum:Annelida					
Class:Polychaeta					
Family: Cirratulidae	Chaetozone/Tharyx complex	a	4		
Dorvilleidae	unidentifiable		b	2	
Nephtyidae	Nephtys longosetosa	b	2		0.3
Opheliidae	Ophelia limacina	a	6		
	Travisia forbesii	a	12		
		b	16		
	Family Total	a	18		0.1
		b	16		0.2
Orbiniidae	Leitoscoloplos panamensis	a	14		
		b	2		0.1
Phyllodocidae	Eteone ?longa	a	88		0.5
		b	76		0.5
Sabellidae	Euchone analis	a	64		
		b	114		
Sphaerodoridae	Sphaerodoropsis minuta	b	4		
Spionidae	Dispio sp.	a	330		
		b	98		
	Scolecolepides sp.	a	112		
		b	174		
	Family Total	a	442		1.2
		b	272		1.9
Fragments and Nematodes		a	pr		
		b	pr		
Phylum:Arthropoda					
Class:Malacostraca					
Order:Amphipoda					
Family: Atylidae	Atylus carinatus	a	2		
Corophiidae	Corophium sp.	b	4		
Haustoriidae	Priscillina armata	a	2		
Lysianassidae	Boeckosimus sp.	b	2		0.2
Oedicerotidae	Acanthostepheia behringiensis	a	6		
		b	8		
	Monoculodes borealis	a	2		
	Monoculopsis longicornis	a	36		
		b	22		
	Family Total	a	44		0.1
		b	30		0.2
Phylum:Chordata					
Subphylum:Urochordata					
Class:Ascidiacea		a	142		23.2
		b	146		20.0
Phylum : Mollusca					
Class : Gastropoda					
Subclass : Prosobranchia					
Family: Cylichnidae	Scaphander punctostriatus	a	46		0.6
		b	28		0.2
Turridae	Juveniles	a	2		
Gastropod Fragments		b			

Banks Island B81-4

	Genus-Species	Grab	N/M (m-2)	WW (g.m-2)
Class : Pelecypoda				
Family : Thraciidae	Thracia sp.	a	4	
		b	4	
Thyasiridae	Axinopsida orbiculata	a	2	
		b	2	
	Thyasira flexuosa (=gouldii)	a	302	
		b	160	
	Family Total	a	304	0.6
		b	162	0.2
Veneridae	Liocyma fluctuosa	a	2	
Pelecypod Fragments		b	pr	
Phylum:Nemertinea		a	28	1.7
		b	28	0.6
Phylum : Protozoa				
Class : Sarcodina				
Order : Foraminifera				
Family : Fischerinidae	Cornuspira foliacea	a	pr	
		b	pr	
Phylum:Sipuncula		a	2	
STATION TOTAL:		a	1208	28.1
		b	892	24.7

Banks Island B81-5

	Genus-Species	Grab	N/M (m-2)	WW (g.m-2)
Phylum:Annelida				
Class:Oligochaeta		b	26	
Class:Polychaeta				
Family: Ampharetidae	Ampharete acutifrons	a	28	
		b	48	0.1
Amphictenidae	Pectinaria granulata	a	2	0.3
		b	2	0.2
Capitellidae	Capitella capitata	a	10	0.1
		b	22	
Cirratulidae	Chaetozone/Tharyx complex	a	4	
		b	4	
Dorvilleidae	Dorvillea sp.	a	12	
		b	4	
Hesionidae	Castalia aphroditoides	a	16	
		b	28	
	unidentified	b	10	
	Family Total	a	16	0.1
		b	38	0.2
Lumbrineridae	Lumbrineris fragilis	a	2	
Maldanidae	Praxillella sp.	b	8	0.1
Nephtyidae	Nephtys cornuta	a	2	
		b	10	
	Nephtys sp.	b	6	
	Family Total	a	2	
		b	16	0.2
Orbiniidae	Leitoscoloplos panamensis	a	2	
		b	2	
	Leitoscoloplos pugettensis	a	8	
		b	20	
	Family Total	a	10	0.2
		b	22	0.4
Paraonidae	Arcidea suecica	b	2	
Phyllodocidae	Eteone ?longa	a	10	
		b	14	
Polynoidae	Eunoe depressa	a	6	
	Eunoe nodosa	b	6	
	Gattyana cirrosa	a	6	
		b	8	
	Harmothoe imbricata	b	8	
	Harmothoe multisetosa	b	2	
	Family Total	a	12	0.1
		b	24	2.0
Sabellidae	Chone duneri	a	32	
		b	128	
	Chone sp.	a	2	
	Euchone analis	b	14	
	Euchone incolor	a	16	
		b	10	
	Family Total	a	50	
		b	152	0.6
Sigalionidae	Pholoe minuta	a	70	0.1
		b	78	0.1

Banks Island B81-5

	Genus-Species	Grab	N/M (m-2)	WW (g.m-2)
Spionidae	Prionospio cirrifera	a	2	
		b	2	
	Prionospio steenstrupi	a	2	
		b	2	
	Pygospio elegans	a	22	
		b	40	
	Scolecolepides sp.	a	4	
		b	6	
	?Spio sp.	a	180	
		b	200	
	Family Total	a	210	0.1
		b	250	0.1
Syllidae	Exogone verugera	a	2	
	Exogone sp.(epitokus)	a	2	
	Family Total	a	4	
Terebellidae	Proclea graffi	a	2	
Fragments and Nematodes		a	Pr	0.1
		b	Pr	0.6
Phylum:Arthropoda				
Class:Malacostraca				
Order:Amphipoda				
Family: Ampeliscidae	Byblis gaimardi	a	2	
Atylidae	Atylus carinatus	a	26	0.8
Gammaridae	Gammarus duebeni	a	2	0.2
	Melita dentata	b	2	0.1
Ischyroceridae	Ischyrocerus megacheir	a	298	0.1
		b	212	0.1
Lysianassidae	Anonyx nugax	a	4	
		b	4	
	Boeckosimus plautus	a	6	
		b	2	
	Orchomene amblyops	b	2	
	Family Total	a	10	0.3
		b	8	0.4
Oedicerotidae	Acanthostepheia behringiensis	a	2	
	Aceroides latipes	a	8	
		b	2	
	Monoculodes borealis	a	8	
		b	14	
	Monoculodes longirostris	a	84	
		b	130	
	Paroediceros lynceus	a	2	
	Family Total	a	104	0.6
		b	146	0.2
Pleustidae	Pleustes panoplus	a	2	
Podoceridae	Paradulichia typica	a	18	
		b	8	
Stenothoidae	Metopella sp.	a	6	
		b	16	
Unidentified Amphipoda		a	6	
		b	6	
Order:Cumacea				
Family: Diastylidae	Diastylis edwardsi	a	14	0.1
		b	6	

Banks Island B81-5

	Genus-Species	Grab	N/M (m-2)	WW (g.m-2)
Lampropidae	Lamprops fuscata	a	14	
		b	22	
Nannastacidae	Campylaspis costata	a	2	
Order:Isopoda				
Family: Munnidae	Munna kroyeri	a	2	
		b	2	
Order:Mysidacea		a	2	
Class:Ostracoda		a	16	
Class:Pycnogonida				
Family: Nymphonidae	Nymphon sp.	a	4	
Arthropod fragments		b	rr	
Phylum:Bryzoa				
Class:Gymnolaemata				
Family: Scrupariidae	Eucratea loricata	a	rr	
		b	rr	
Pyhlum:Vertebrata				
Class:Osteichtyes				
Family: Zoarcidae		a	2	0.2
Phylum:Cnidaria				
Class:Anthozoa				
Order:Actiniaria		a	6	0.5
		b	2	0.1
Class:Hydrozoa				
Family: Campanulariidae	Obelia sp.	b	rr	
Campanulinidae	Lafoeina maxima	a	rr	
		b	rr	
Lafoeidae		a	rr	
Phylum:Echinodermata				
Class:Holothuroidea				
Family: Synaptidae	Fragments	a	6	1.7
		b	2	
Class:Stelleroida				
Subclass:Ophiuroidea				
Family: Ophiolepididae	Ophiocten sericeum	a	4	
	unidentified juveniles	a	2	
	Family Total	a	6	0.5
Phylum : Mollusca				
Class : Gastropoda				
Subclass : Opisthobranchia				
Order : Cephalaspidea		a	2	
		b	4	0.1
Subclass : Prosobranchia				
Family : Buccinidae	Buccinium sp.	a	2	0.1

Banks Island B81-5

		Genus-Species	Grab	N/M (m-2)	WW (g.m-2)
	Cylichnidae	Cylichna alba	a	2	
			b	2	
		Scaphander punctostriatus	a	218	
			b	124	
		Family Total	a	220	4.0
			b	126	2.1
	Naticidae	Amauropsis purpurea	a	116	2.3
	Turridae	Oenopota sp.	b	4	0.2
		Propebela sp.	a	4	
	Gastropod Fragments		a	Pr	
			b	Pr	
Class : Pelecypoda					
Family :	Astartidae	Astarte montagui	a	4	0.5
	Cardiidae	Clinocardium ciliatum	a	78	
			b	14	
		Serripes groenlandicus	a	44	
			b	4	
		Family Total	a	122	33.5
			b	18	5.0
	Hiatellidae	Hiatella arctica	a	6	0.1
	Myidae	Mya truncata	a	8	0.3
			b	4	
	Mytilidae	Musculus niger	a	18	0.1
			b	2	
	Nuculanidae	Portlandia arctica	a	4	
		Yoldiella fraterna	a	4	
		Family Total	a	8	0.3
	Pandoridae	Pandora glacialis	b	2	0.6
	Tellinidae	Macoma calcarea	a	36	0.5
		Macoma sp.	b	10	
	Thraciidae	Thracia sp.	a	8	0.1
	Thyasiridae	Axinopsida orbiculata	a	368	
			b	24	
		Thyasira flexuosa (=gouldii)	a	42	
			b	8	
		Family Total	a	410	2.3
			b	32	0.1
	Veneridae	Liocyma fluctuosa	a	562	22.3
			b	60	5.6
Pelecypod fragments			a	Pr	
			b	Pr	
Phylum:Nemertinea			a	24	
			b	14	
Phylum:Porifera			a	2	
Phylum : Protozoa					
Class : Sarcodina					
Order : Foraminifera					
Family :	Fischerinidae	Cornuspira foliacea	a	Pr	
			b	Pr	
Phylum:Sipuncula			a	10	
			b	10	

Banks Island B81-5

Genus-Species	Grab	N/M (m-2)	WW (g.m-2)
STATION TOTAL:	a	2554	72.7
	b	1428	19.5

Banks Island B81-6

		Genus-Species	Grab	N/M (m-2)	WW (g.m-2)
Phylum:Annelida					
Class:Oligochaeta			b	14	
Class:Polychaeta					
	Family: Ampharetidae	Amphorete acutifrons	a	198	
			b	178	
		Anobothrus gracilis	a	2	
		Glyphanostomum pallescens	a	2	
		Family Total	a	202	0.3
			b	178	0.1
	Amphictenidae	Pectinaria granulata	b	2	
		Pectinaria hyperborea	a	6	
			b	16	
		Family Total	a	6	0.3
			b	18	0.9
	Capitellidae	Capitella capitata	a	8	
			b	28	
	Cirratulidae	Chaetozone/Tharyx complex	a	4	
			b	6	
	Dorvilleidae	Dorvillea sp.	a	4	
			b	4	
	Hesionidae	Castalia aphroditoides	b	2	
	Lumbrineridae	Lumbrineris fragilis	a	2	
		Lumbrineris minuta	b	2	
	Maldanidae	Praxillella praetermissa	a	4	
		Fragments	a	56	
			b	24	
		Family Total	a	60	0.2
			b	24	
	Nephtyidae	Nephtys cornuta	a	20	
			b	6	
		Nephtys longosetosa	a	2	
			b	4	
		Nephtys sp.	a	18	
			b	10	
		Family Total	a	40	1.5
			b	20	1.3
	Orbiniidae	Leitoscoloplos panamensis	a	4	
			b	8	
		Leitoscoloplos pugettensis	a	436	
			b	228	
		Family Total	a	440	5.1
			b	236	2.2
	Paraonidae	Arcidea suecica	a	4	
	Phyllodocidae	Eteone ?longa	a	22	0.1
			b	14	
	Polynoidae	Eunoe sp.	b	8	
		Gattyana cirrosa	a	14	
			b	6	
		Harmothoe imbricata	a	6	
			b	12	
		Hesperonoe sp.1	a	6	
		Hesperonoe sp.2	b	2	
		Family Total	a	26	0.1
			b	28	0.9

Banks Island B81-6

	Genus-Species	Grab	N/M (m-2)		WW (g.m-2)
Sabellidae	Chone duneri	a	22		
		b	26		
	Euchone incolor	a	2		
	Family Total	a	24		
		b	26		
Sigalionidae	Pholoe minuta	a	146		0.3
		b	290		0.3
Spionidae	Polydora sp.	a	2		
		b	10		
	Prionospio cirrifera	a	12		
		b	4		
	Prionospio steenstrupi	a	2		
		b	2		
	Pygospio elegans	a	198		
		b	74		
	?Spio sp.	a	486		
		b	162		
	unidentifiable	b	6		
	Family Total	a	700		0.2
		b	258		0.1
Syllidae	Autolytus sp.	b	8		
	Exogone verugera	a	2		
	Exogone tatarica		b	4	
	Exogone sp.(epitokus)	a	2		
		b	2		
	Family Total	a	4		
		b	14		
Terebellidae	Nicolea zostericola	a	2		
	Proclea graffi	a	6		
	Family Total	a	8		
Trichobranchidae	Terebellides stroemi	b	2		
Fragments and Nematodes		a	pr		0.5
		b	pr		0.9
Phylum:Arthropoda					
Class:Cirripedia					
Order:Thoracica					
Family: Balanidae	Balanus sp.	b	pr		
Class:Copepoda					
Order:Cyclopoida		b	2		
Class:Malacostraca					
Order:Amphipoda					
Family: Ampeliscidae	Byblis gaimardi	a	10		
		b	4		
	Haploops tubicola	a	10		
	Family Total	a	20		
		b	4		
Atylidae	Atylus carinatus	a	2		
		b	4		0.4
Calliopiidae		b	4		
Corophiidae	Erichthonius hunteri	a	2		
		b	12		
Gammaridae	Melita dentata	a	70		0.2
		b	2		

Banks Island B81-6

	Genus-Species	Grab	N/M (m-2)	WW (g.m-2)
Ischyroceridae	Ischyrocerus megacheir	a	66	
		b	74	
Lysianassidae	Anonyx nugax	b	4	
	Boeckosimus plautus	a	4	
		b	8	
	Family Total	a	4	
		b	12	0.7
Oedicerotidae	Acanthostepheia behringiensis	a	6	
	Aceroides latipes	a	2	
	Halicreion longicaudatus	a	4	
	Monoculodes borealis	a	20	
		b	16	
	Monoculodes longirostris	a	82	
		b	182	
	Paroediceros lynceus	b	4	
	Family Total	a	114	0.3
		b	202	0.3
Pleustidae	Pleustes panoplus	a	14	
		b	6	
Podoceridae	Paradulichia typica	a	30	
		b	24	
Stenothoidae	Metopa longicornis	b	14	
Order:Cumacea				
Family: Diastylidae	Brachydiastylis resima	b	4	
	Diastylis edwardsi	a	44	
		b	42	
	Diastylis rathkei	a	4	
		b	2	
	Family Total	a	48	0.1
		b	48	0.3
Lampropidae	Lamprops fuscata	a	26	
		b	26	
Nannastacidae	Campylaspis costata	a	2	
Order:Decapoda				
Infraorder:Brachyura		b	2	2.0
Order:Isopoda				
Family: Munnidae	Munna kroyeri	a	2	
Order:Tanaidacea	Leptognathia gracilis	a	16	
		b	10	
Class:Ostracoda		b	2	
Class:Pycnogonida				
Family: Nymphonidae	Nymphon sp.	a	14	
		b	6	
Arthropod fragments		a	Pr	
		b	Pr	
Phylum:Bryzoa				
Class:Gymnolaemata				
Family: Crisiidae	Crisia sp.	b	Pr	
Scrupariidae	Eucratea loricata	a	Pr	
		b	Pr	

Banks Island B81-6

	Genus-Species	Grab	N/M (m-2)	WW (g.m-2)
Scrupocellariidae	Scrupocellaria sp.	b	PP	
Unidentified sp.		b	PP	
Phylum:Cnidaria				
Class:Anthozoa				
Order:Actiniaria		a	10	0.1
		b	8	0.4
Order:Alcyonacea				
Family: Nephthyidae	Gersemia rubiformis	b	PP	
Class:Hydrozoa				
Family: Bougainvillidae	Dicoryne conferta	b	PP	
Campanulariidae	Obelia sp.	a	PP	
	Unidentified sp.	b	PP	
Campanulinidae	Cuspidella sp.	b	PP	
Campanulinidae	Lafoeina maxima	a	PP	
		b	PP	
Phylum:Echinodermata				
Class:Echinoidea				
Family: Strongylocentrotidae	Strongylocentrotus sp.	b	2	0.2
Class:Holothuroidea				
Family: Synaptidae		b	6	1.0
Class:Stelleroida				
Subclass:Ophiuroidea				
Family: Ophiolepididae	Ophiocten sericeum	a	2	
		b	20	
	Unidentified juveniles	a	2	
		b	8	
	Family Total	a	4	0.8
		b	28	6.1
Phylum : Mollusca				
Class : Gastropoda				
Subclass : Opisthobranchia				
Order : Cephalaspidea		b	2	
Order : Nudibranchia		b	2	
Subclass : Prosobranchia				
Family : Buccinidae	Buccinium ciliatum	b	8	6.3
	Buccinium sp.	a	2	0.1
Cylichnidae	Scaphander punctostriatus	a	106	1.2
		b	320	6.5
Naticidae	Amauropsis purpurea	b	26	0.1
Retusidae	Retusa obtusa	b	2	
Turridae	Oenopota sp.	a	2	
		b	2	
	Propebela sp.	b	4	
	Family Total	a	2	0.1
		b	6	0.4
Gastropod Fragments		a	PP	
		b	PP	

Banks Island B81-6

	Genus-Species	Grab	N/M (m-2)	WW (g.m-2)
Class : Pelecypoda				
Family : Cardiidae	Clinocardium ciliatum	a	12	
		b	154	
	Serripes groenlandicus	a	2	
		b	64	
	Family Total	a	14	4.7
		b	218	63.2
Hiatellidae	Hiatella arctica	a	2	1.0
		b	28	0.7
Myidae	Mya truncata	b	14	0.8
Mytilidae	Musculus niger	a	2	
		b	10	0.2
Nuculanidae	Portlandia arctica	b	10	
	Yoldiella fraterna	a	2	
		b	2	
	Family Total	a	2	
		b	12	0.7
Tellinidae	Macoma sp.	a	12	
		b	104	0.3
Thyasiridae	Axinopsida orbiculata	a	32	
		b	416	
	Thyasira flexuosa (=gouldii)	a	16	
		b	66	
	Family Total	a	48	0.2
		b	482	1.8
Veneridae	Liocyma fluctuosa	a	62	1.8
		b	942	10.2
Pelecypod fragments		a	Pr	
		b	Pr	0.1
Phylum:Nemertinea		a	16	
		b	28	0.1
Phylum : Protozoa				
Class : Sarcodina				
Order : Foraminifera				
Family : Fischerinidae	Cornuspira foliacea	a	Pr	
		b	Pr	
Phylum:Sipuncula		a	42	
		b	56	
STATION TOTAL:		a	2454	19.7
		b	3922	109.7

Banks Island B81-7

	Genus-Species	Grab	N/M (m-2)	WW (g.m-2)
Phylum:Annelida				
Class:Oligochaeta		b	2	
Class:Polychaeta				
Family: Ampharetidae	Ampharete acutifrons	a	16	
		b	66	
	Anobothrus gracilis	b	10	
	Family Total	a	16	
		b	76	0.1
Amphictenidae	Pectinaria hyperborea	b	2	0.1
Aristhobranchidae	Aristhobranchus ornatus	b	2	
Capitellidae	Capitella capitata	a	4	
		b	16	
Cirratulidae	Chaetozone/Tharyx complex	b	2	
Dorvilleidae	Dorvillea sp.	a	2	
		b	2	
Hesionidae	Castalia aphroditoides	a	2	
	unidentified	a	4	
	Family Total	a	6	
Maldanidae	Praxillella praetermissa	b	6	
	Fragments	a	2	
Nephtyidae	Nephtys cornuta	a	2	
		b	4	
	Nephtys longosetosa	b	4	
	Nephtys sp.	a	2	
		b	8	
	Family Total	a	4	0.1
		b	16	0.3
Orbiniidae	Leitoscoloplos panamensis	b	8	
	Leitoscoloplos pugettensis	b	10	
	Family Total	b	18	0.5
Phyllodocidae	Eteone pacifica	a	2	0.2
	Eteone ?longa	b	12	
Polynoidae	Antinoella sarsi	a	2	
	Gattyana cirrosa	a	6	
	Harmothoe imbricata	a	6	
	Harmothoe parispina	a	8	
	Hesperonoe sp.	b	2	
	Family Total	a	22	0.1
		b	2	
Sabellidae	Chone duneri	a	36	
		b	6	
	Euchone analis	b	2	
	Euchone incolor	a	2	
		b	202	
	Family Total	a	38	
		b	210	0.1
Sigalionidae	Pholoe minuta	a	2	
		b	6	
Spionidae	Prionospio cirrifera	a	6	
		b	46	
	Pygospio elegans	a	22	
		b	150	
	?Spio sp.	a	768	
		b	118	
	Family Total	a	796	0.2
		b	314	0.1

Banks Island B81-7

	Genus-Species	Grab	N/M (m-2)	WW (g.m-2)
Syllidae	Autolytus sp.	a	12	
	Exogone tatarica	b	2	
Terebellidae	Proclea graffi	b	14	
Fragments and Nematodes		a	pr	
		b	pr	0.1
Phylum:Arthropoda				
Class:Cirripedia				
Order:Thoracica				
Family: Balanidae	Balanus sp.	a	pr	
		b	pr	
Class:Copepoda				
Order:Cyclopoida		b	2	
Order:Harpacticoida		a	26	
		b	2	
Class:Malacostraca				
Order:Amphipoda				
Family: Acanthonotozomatidae	Acanthonotozoma sp.	a	36	0.2
Ampeliscidae	Byblis gaimardi	b	2	
	Haploops tubicola	b	2	
	Family Total	b	4	
Atylidae	Atylus carinatus	a	14	2.0
		b	4	
Calliopiidae		a	16	
Corophiidae	Erichthonius hunteri	a	2	
Gammaridae	Melita dentata	b	18	
	Weyprechtia sp.	a	8	
		b	2	
	Family Total	a	8	
		b	20	0.8
Ischyroceridae	Ischyrocerus megacheir	a	130	0.1
		b	68	0.1
Lysianassidae	Anonyx nugax	a	8	
	Boeckosimus plautus	a	2	
		b	2	
	Tryphosella nanoides	a	2	
	Family Total	a	12	1.3
		b	2	
Oedicerotidae	Acanthostepheia behringiensis	a	4	
		b	2	
	Aceroides latipes	a	2	
		b	20	
	Halicreion longicaudatus	a	6	
	Monoculodes borealis	a	4	
		b	10	
	Monoculodes longirostris	a	92	
		b	18	
	Family Total	a	108	0.2
		b	50	0.1
Pleustidae	Pleustes panoplus	a	2	
Podoceridae	Paradulichia typica	a	6	
Stenothoidae	Metopa sp.	a	24	
		b	2	

Banks Island B81-7

	Genus-Species	Grab	N/M (m-2)	WW (g.m-2)
Order:Cumacea				
Family: Diastylidae	Diastylis edwardsi	b	6	0.1
Lampropidae	Lamprops fuscata	a	2	
		b	10	
Nannastacidae	Campylaspis costata	b	2	
Order:Mysidacea		a	6	
Class:Ostracoda		b	14	
Arthropod fragments		a	Pr	
		b	Pr	
Phylum:Bryzoa				
Class:Gymnolaemata				
Family: Crisiidae	Crisia sp.	a	Pr	
Scrupariidae	Eucratea loricata	a	Pr	
		b	Pr	
Unidentified sp.		a	Pr	
		b	Pr	
Phylum:Chordata				
Subphylum:Urochordata				
Class:Ascidiacea		b	2	
Subphylum:Vertebrata				
Class:Osteichtyes				
Family: Cottidae		a	2	2.0***
Phylum:Cnidaria				
Class:Anthozoa				
Order:Alcyonacea				
Family: Nepthyidae	Gersemia rubiformis	a	Pr	
Class:Hydrozoa				
Family: Campanulariidae	Obelia sp.	a	Pr	
		b	Pr	
Campanulinidae	Lafoeina maxima	a	Pr	
		b	Pr	
	Lafoeina tenuis	b	Pr	
Phylum:Echinodermata				
Class:Holothuroidea				
Family: Synaptidae	Fragments	b	Pr	0.1
Class:Stelleroida				
Subclass:Ophiuroidea				
Family: Ophiolepididae	Ophiocten sericeum	a	18	
	Unidentified juveniles	a	4	
		b	2	
	Family Total	a	22	5.0
		b	2	
Phylum : Mollusca				
Class : Gastropoda				
Subclass : Opisthobranchia				
Order : Nudibranchia		b	2	

Banks Island B81-7

	Genus-Species	Grab	N/M (m-2)	WW (g.m-2)
Subclass : Prosobranchia				
Family : Buccinidae	Buccinium ciliatum	a	2	0.6
	Buccinium sp.	b	4	0.1
Cylichnidae	Scaphander punctostriatus	a	20	0.2
		b	112	1.7
Naticidae	Lunatia pallida	a	4	
Gastropod Fragments		a	Pr	
		b	Pr	
Class : Pelecypoda				
Family : Cardiidae	Clinocardium ciliatum	a	2	
		b	12	
	Serripes groenlandicus	a	4	
		b	20	
	Family Total	a	6	0.7
		b	32	7.0
Hiatellidae	Hiatella arctica	a	46	0.4
		b	2	
Myidae	Mya truncata	a	4	
		b	2	0.2
Mytilidae	Musculus niger	a	2	
Nuculanidae	Portlandia arctica	b	4	0.7
Tellinidae	Macoma sp.	a	2	
		b	24	0.1
Thyasiridae	Axinopsida orbiculata	a	2	
		b	66	
	Thyasira flexuosa (=gouldii)	a	2	
		b	76	
	Family Total	a	4	
		b	142	0.4
Veneridae	Liocyma fluctuosa	a	14	2.1
		b	196	3.7
Pelecypod fragments		a	Pr	
		b	Pr	
Phylum:Nemertinea		a	10	0.3
		b	6	
Phylum : Protozoa				
Class : Sarcodina				
Order : Foraminifera				
Family : Elphidiidae	Elphidium arcticum	b	Pr	
Fischerinidae	Cornuspira foliacea	a	Pr	
Phylum:Sipuncula		a	6	
		b	18	0.5
STATION TOTAL:		a	1442	16.2
		b	1436	17.1

Banks Island B81-8

	Genus-Species	Grab	N/M (m-2)	WW (g.m-2)
Phylum:Annelida				
Class:Oligochaeta		b	8	
Class:Polychaeta				
Family: Ampharetidae	Ampharete acutifrons	a	426	
		b	26	
	Anobothrus gracilis	b	2	
	Family Total	a	426	1.0
		b	28	
Amphictenidae	Pectinaria hyperborea	a	10	0.8
Capitellidae	Capitella capitata	a	74	
		b	16	
Cirratulidae	Chaetozone/Tharyx complex	a	16	
		b	2	
Dorvilleidae	Dorvillea sp.	a	4	
		b	10	
Hesionidae	Castalia aphroditoides	b	2	
Lumbrineridae	Lumbrineris fragilis	a	6	
		b	2	
Maldanidae	Praxillella sp.	a	44	0.2
Nephtyidae	Nephtys cornuta	a	20	
		b	2	
	Nephtys sp.	a	52	
		b	2	
	Family Total	a	72	0.7
		b	4	0.7
Orbiniidae	Leitoscoloplos pugettensis	a	118	1.4
		b	22	0.2
Paraonidae	Arcidea suecica	a	36	
		b	2	
Phyllodocidae	Eteone sp.	a	48	
		b	18	
	Phyllodoce groenlandica	a	2	
		b	2	
	Family Total	a	50	0.1
		b	20	0.1
Polynoidae	Antinoella sarsi	a	4	
		b	2	
	Gattyana cirrosa	a	6	
	Harmothoe imbricata	a	2	
	Harmothoe sp.	a	2	
	Hesperonoe sp.	a	2	
		b	2	
	Family Total	a	16	2.2
		b	4	
Sabellidae	Chone duneri	a	60	
		b	10	
Sigalionidae	Pholoe minuta	a	92	0.1
		b	8	
Spionidae	Prionospio cirrifera	a	22	
		b	4	
	Prionospio steenstrupi	a	8	
	Pygospio elegans	a	226	
		b	16	
	Scolecolepides sp.	b	2	
	?Spio sp.	a	6	
		b	24	
	Family Total	a	262	0.1
		b	46	

Banks Island B81-8

		Genus-Species	Grab	N/M (m-2)	WW (g.m-2)
	Syllidae	Autolytus sp.	b	2	
		unidentified	a	2	
	Terebellidae	Proclea graffi	a	8	
	Trichobranchidae	Terebellides stroemi	a	10	0.1
	Fragments and Nematodes		a	pr	0.4
			b	pr	0.1
Phylum:Arthropoda					
Class:Malacostraca					
Order:Amphipoda					
Family:	Acanthonotozomatidae	Acanthonotozoma sp.	a	10	
	Ampeliscidae	Byblis gaimardi	a	2	
			b	2	
		Haploops tubicola	a	188	
		Family Total	a	190	1.7
			b	2	0.1
	Atylidae	Atylus carinatus	a	6	1.0
	Calliopiidae		b	2	
	Corophiidae	Erichthonius hunteri	a	2	
	Gammaridae	Melita dentata	a	80	0.7
	Ischyroceridae	Ischyrocerus megacheir	a	56	
			b	14	
	Lysianassidae	Anonyx nugax	b	6	1.6
		Boeckosimus plautus	a	6	
	Oedicerotidae	Acanthostepheia behringiensis	a	4	
			b	6	
		Aceroides latipes	a	8	
		Monoculodes borealis	a	10	
			b	6	
		Monoculodes longirostris	a	74	
			b	36	
		Family Total	a	96	0.7
			b	48	0.1
	Pleustidae	Pleustes panoplus	a	2	
			b	2	
	Podoceridae	Paradulichia typica	a	8	
	Stenothoidae	Metopa sp.	a	4	
Order:Cumacea					
Family:	Diastylidae	Brachydiastylis resima	a	4	
		Diastylis edwardsi	a	16	
			b	6	
		Family Total	a	20	
			b	6	
	Lampropidae	Lamprops fuscata	a	34	
			b	12	
	Leuconidae	Eudorella sp.	b	2	
Order:Isopoda					
Family:	Idoteidae	Mesidotea sabini	a	4	
Order:Mysidacea			a	2	
Order:Tanaidaca		Leptognathia gracilis	a	22	
Class:Ostracoda			a	44	
			b	16	

Banks Island B81-8

	Genus-Species	Grab	N/M (m-2)	WW (g.m-2)
Class:Pycnogonida				
Family: Nymphonidae	Nymphon sp.	a	6	
Arthropod fragments		a	PP	0.2
		b	PP	
Phylum:Bryzoa				
Class:Gymnolaemata				
Family: Scrupariidae	Eucratea loricata	a	PP	
Phylum:Cnidaria				
Class:Hydrozoa				
Family: Campanulinidae	Lafoeina maxima	a	PP	
Phylum:Echinodermata				
Class:Holothuroidea				
Family: Synaptidae		a	2	0.2
Class:Stelleroida				
Subclass:Ophiuroidea				
Family: Ophiolepididae	Ophiocten sericeum	a	30	3.7
		b	4	0.5
Phylum : Mollusca				
Class : Gastropoda				
Subclass : Opisthobranchia				
Order : Cephalaspidea		a	4	
Subclass : Prosobranchia				
Family: Cylichnidae	Scaphander punctostriatus	a	176	3.9
		b	94	1.5
Naticidae	Amauropsis purpurea	a	4	0.2
Turridae	Oenopota sp.	a	4	
	Propebela sp.	a	2	
	Family Total	a	6	0.3
Gastropod Fragments		a	PP	
		b	PP	
Class : Pelecypoda				
Family : Cardiidae	Clinocardium ciliatum	a	26	
		b	8	
	Serripes groenlandicus	a	54	
		b	12	
	Family Total	a	80	24.6
		b	20	2.9
Hiatellidae	Hiatella arctica	a	6	
Myidae	Mya truncata	a	10	0.9
Mytilidae	Musculus niger	a	2	
Nuculanidae	Portlandia arctica	a	6	
		b	6	
	Yoldiella fraterna	a	2	
	Family Total	a	8	0.9
		b	6	0.4

Banks Island B81-8

	Genus-Species	Grab	N/M (m-2)	WW (g.m-2)
Tellinidae	Macoma sp.	a	214	0.8
		b	18	
Thraciidae	Thracia sp.	a	34	0.5
Thyasiridae	Axinopsida orbiculata	a	744	
		b	30	
	Thyasira flexuosa (=gouldii)	a	238	
		b	16	
	Family Total	a	982	4.8
		b	46	0.3
Veneridae	Liocyma fluctuosa	a	670	41.8
		b	50	4.1
Pelecypod fragments		a	rr	
		b	rr	
Phylum:Nemertinea		a	6	
		b	6	0.1
Phylum:Sipuncula		a	16	0.1
		b	14	0.3
STATION TOTAL:		a	4148	94.4
		b	554	16.0

Banks Island B81-9

	Genus-Species	Grab	N/M (m-2)	WW (g.m-2)
Phylum:Annelida				
Class:Oligochaeta		a	2	
Class:Polychaeta				
Family: Ampharetidae	Ampharete acutifrons	a	4	
		b	112	
	Anobothrus gracilis	a	52	
		b	2	
	Lysippe labiata	b	2	
	Family Total	a	56	
		b	116	0.1
Amphictenidae	Pectinaria hyperborea	b	2	
	Pectinaria sp.	b	2	
	Family Total	b	4	0.5
Capitellidae	Capitella capitata	a	18	
		b	16	
Cirratulidae	Chaetozone/Tharyx complex	a	6	
		b	2	
Lumbrineridae	Lumbrineris fragilis	b	2	
	Lumbrineris minuta	b	2	
	Family Total	b	4	
Maldanidae	Praxillella praetermissa	a	4	
	Praxillella sp.	b	12	0.1
Nephtyidae	Nephtys cornuta	a	8	
		b	38	
	Nephtys sp.	a	6	
		b	24	
	Family Total	a	14	0.1
		b	62	0.4
Orbiniidae	Leitoscoloplos panamensis	a	6	
	Leitoscoloplos pugettensis	a	8	
		b	4	
	Family Total	a	14	0.1
		b	4	0.1
Paraonidae	Arcidea suecica	a	2	
		b	6	
Phyllodocidae	Eteone ?longa	a	12	
		b	8	
	Eteone pacifica	a	2	
	unidentified	a	2	
	Family Total	a	16	0.1
		b	8	
Polynoidae	Antinoella sarsi	b	2	
	Arcteobea anticostiensis	a	10	
	Gattyana cirrosa	b	2	
	Family Total	a	10	
		b	4	
Sabellidae	Chone duneri	a	32	
		b	24	
	Chone sp.	b	2	
	Family Total	a	32	
		b	28	
Sigalionidae	Pholoe minuta	a	2	
		b	22	

Banks Island B81-9

	Genus-Species	Grab	N/M (m-2)	WW (s.m-2)
Spionidae	Dispio sp.	a	12	
	Prionospio cirrifera	a	46	
		b	14	
	Pygospio elegans	a	42	
		b	68	
	Scolecolepides sp.	a	26	
	?Spio sp.	a	26	
	Family Total	a	152	0.3
		b	82	
Syllidae	Exogone tatarica	a	2	
	Exogone sp.(epitokus)	a	2	
		b	2	
	Family Total	a	4	
		b	2	
Terebellidae	Nicolea zostericola	b	2	
Trichobranchidae	Terebellides stroemi	b	2	
Fragments and Nematodes		a	pr	0.1
		b	pr	0.2
Phylum:Arthropoda				
Class:Malacostraca				
Order:Amphipoda				
Family: Ampeliscidae	Byblis gaimardi	a	16	
		b	4	
	Haploops tubicola	b	2	
	Family Total	a	16	
		b	6	0.3
Gammaridae	Melita dentata	a	8	0.6
		b	100	1.7
Ischyroceridae	Ischyrocerus megacheir	a	36	
		b	4	
Lysianassidae	Anonyx nugax	a	2	
		b	2	
	Boeckosimus plautus	a	12	
	Family Total	a	14	0.5
		b	2	0.7
Oedicerotidae	Acanthostepheia behringiensis	a	8	
		b	2	
	Aceroides latipes	a	24	
		b	6	
	Monoculodes borealis	a	18	
		b	2	
	Monoculodes longirostris	a	46	
		b	18	
	Family Total	a	96	0.3
		b	28	0.1
Order:Cumacea				
Family: Diastylidae	Brachydiastylis resima	a	2	
		b	4	
	Diastylis eduardsi	a	8	
		b	8	
	Family Total	a	10	
		b	12	0.1
Lampropidae	Lamprops fuscata	a	6	
		b	12	

Banks Island B81-9

	Genus-Species	Grab	N/M (m-2)	WW (g.m-2)
Leuconidae	Leucon nasica	a	2	
Nannastacidae	Campylaspis costata	a	2	
Order:Mysidacea		a	2	0.1
Order:Tanaidacea	Leptognathia gracilis	b	42	
Class:Ostracoda		b	14	
Class:Pycnogonida				
Family: Nymphonidae	Nymphon sp.	b	2	
Arthropod fragments		a	PT	
		b	PT	0.2
Phylum:Bryzoa				
Class:Gymnolaemata				
Family: Scrupariidae	Eucratea loricata	a	PT	
		b	PT	
Scrupocellariidae	Scrupocellaria sp.	a	PT	
Unidentified spp.		a	PT	
		b	PT	
Phylum:Chordata				
Subphylum:Urochordata				
Class:Ascidiacea		a	4	
		b	10	1.3
Phylum:Cnidaria				
Class:Hydrozoa				
Family: Campanulariidae		a	PT	
Campanulinidae	Lafoeina maxima	a	PT	
		b	PT	
	Lafoeina tenuis	b	PT	
Eudendridae	Eudendrium sp.	b	PT	
Sertulariidae	Two app. spp.	a	PT	
		b	PT	
Phylum:Echinodermata				
Class:Holothuroidea				
Family: Synaptidae		b	2	0.1
Class:Stelleroida				
Subclass:Ophiuroidea				
Family: Ophiolepididae	Ophiocten sericeum	a	2	
		b	4	
	Unidentified juveniles	a	2	
		b	6	
	Family Total	a	4	0.4
		b	10	0.5
Phylum:Echiura		a	2	

Banks Island B81-9

	Genus-Species	Grab	N/M (m-2)	WW (g.m-2)
Phylum : Mollusca				
Class : Gastropoda				
Subclass : Opisthobranchia				
Order : Cephalaspidea		b	4	
Subclass : Prosobranchia				
Family: Cylichnidae	Scaphander punctostriatus	a	78	1.1
		b	166	2.8
Diaphanidae	Diaphana minuta	b	6	
Retusidae	Retusa obtusa	b	6	
Turridae	Oenopota sp.	a	2	
		b	6	
Gastropod Fragments		a	Pr	
		b	Pr	
Class : Pelecypoda				
Family: Astartidae	Astarte montagui	b	2	
Cardiidae	Clinocardium ciliatum	a	8	
		b	28	
	Serripes groenlandicus	a	28	
		b	74	
	Family Total	a	36	7.5
		b	102	42.9
Hiatellidae	Hiatella arctica	b	4	
Myidae	Mya truncata	b	10	0.9
Mytilidae	Musculus niger	b	6	
Nuculanidae	Portlandia arctica	b	14	
	Yoldiella fraterna	a	2	
		b	2	
	Family Total	a	2	
		b	16	1.8
Pandoridae	Pandora glacialis	b	2	0.1
Tellinidae	Macoma sp.	a	16	
		b	98	0.1
Thraciidae	Thracia sp.	a	4	
		b	2	
Thyasiridae	Axinopsida orbiculata	a	22	
		b	218	
	Thyasira flexuosa (=gouldii)	a	52	
		b	1624	
	Family Total	a	74	0.2
		b	1842	4.8
Veneridae	Liocyma fluctuosa	a	46	2.6
		b	740	40.6
Pelecypod fragments		a	Pr	
		b	Pr	0.3
Phylum:Nemertinea		a	2	
		b	8	
Phylum : Protozoa				
Class : Sarcodina				
Order : Foraminifera				
Family : Elphidiidae	Elphidium arcticum	a	Pr	
Fischerinidae	Cornuspira foliacea	b	Pr	

Banks Island B81-9

Genus-Species	Grab	N/M (m-2)	WW (g.m-2)
Phylum:Sipuncula	a	32	0.1
	b	28	0.2
STATION TOTAL:	a	826	14.4
	b	3666	101.3

Banks Island B81-10

	Genus-Species	Grab	N/M (m-2)	WW (g.m-2)
Phylum:Annelida				
Class:Polychaeta				
Family: Ampharetidae	Ampharete acutifrons	a	84	
		b	158	
	Anobothrus gracilis	a	6	
		b	6	
	Glyphanostomum pallescens	b	2	
	Family Total	a	90	0.2
		b	160	0.3
Amphictenidae	Pectinaria granulata	a	6	
	Pectinaria hyperborea	a	8	
	Family Total	a	14	1.9
Apisthobranchidae	Apisthobranchus ornatus	b	2	
Capitellidae	Capitella capitata	a	4	
		b	10	
Cirratulidae	Chaetozone/Tharyx complex	a	12	
		b	2	
Cossuridae	Cossura soyeri	a	4	
Dorvilleidae	Dorvillea sp.	a	4	
Lumbrineridae	Lumbrineris fragilis	a	6	
Maldanidae	Praxillella sp.	a	38	0.2
		b	6	
Nephtyidae	Nephtys cornuta	a	20	
		b	58	
	Nephtys longosetosa	a	8	
		b	2	
	Nephtys sp.	a	22	
		b	36	
	Family Total	a	50	2.4
		b	96	9.6
Opheliidae	Ophelia limacina	a	2	0.1
Orbiniidae	Leitoscoloplos panamensis	a	40	
		b	4	
	Leitoscoloplos pugettensis	a	84	
		b	144	
	Family Total	a	124	1.4
		b	148	1.9
Paraonidae	Arcidea suecica	a	6	
		b	36	
Phyllodocidae	Eteone ?longa	a	16	
		b	4	
	Eteone pacifica	a	2	
		b	2	
	Phyllodoce groenlandica	b	2	
	Family Total	a	18	0.2
		b	8	0.5
Polynoidae	Arcteobea anticostiensis	a	4	
	Gattyana cirrosa	b	2	
	Hesperonoe sp.	a	12	
		b	12	
	Melaenis loveni	a	2	
		b	2	
	Family Total	a	18	0.1
		b	16	0.1

Banks Island B81-10

	Genus-Species	Grab	N/M (m-2)	WW (g.m-2)
Sabellidae	Chone duneri	a	98	
		b	154	
	Euchone incolor	a	18	
		b	10	
	Family Total	a	116	
		b	164	0.1
Sigalionidae	Pholoe minuta	a	18	0.1
		b	46	0.1
Sphaerodoridae	Sphaerodoropsis minuta	b	2	
Spionidae	Dispio sp.	a	14	
	Polydora sp.	a	4	
		b	2	
	Prionospio cirrifera	a	38	
		b	34	
	Prionospio steenstrupi	a	4	
		b	6	
	Pygospio elegans	a	174	
		b	400	
	Scolecolepides sp.	a	8	
	?Spio sp.	a	4	
	Family total	a	246	0.1
		b	442	0.1
Syllidae	Exogone verugera	b	2	
	Exogone sp.(epitokus)	b	6	
	Family Total	b	8	
Terebellidae	Proclea graffi	b	2	
Trichobranchidae	Terebellides stroemi	a	4	
		b	4	
Fragments and Nematodes		a	pr	0.1
		b	pr	0.3
Phylum:Arthropoda				
Class:Malacostraca				
Order:Amphipoda				
Family: Ampeliscidae	Byblis gaimardi	a	22	0.3
		b	44	0.4
Corophiidae	Corophium crassicorne	a	8	
	Erichthonius sp.	b	4	
Gammaridae	Melita dentata	a	150	1.2
		b	178	4.1
Ischyroceridae	Ischyrocerus megacheir	a	30	
		b	28	
Lysianassidae	Anonyx nugax	a	8	
		b	4	
	Boeckosimus plautus	a	10	
		b	26	
	Orchomene sp.	a	6	
	Family Total	a	24	0.6
		b	30	0.1
Oedicerotidae	Acanthostepheia behringiensis	a	10	
		b	4	
	Aceroides latipes	a	26	
		b	66	
	Monoculodes borealis	a	80	
		b	48	

Banks Island B81-10

	Genus-Species	Grab	N/M (m-2)	WW (g.m-2)
	Monoculodes longirostris	a	82	
		b	90	
	Paroediceros lynceus	b	2	
	Family Total	a	208	0.6
		b	210	0.5
Pleustidae	Pleustes panoplus	b	2	
Podoceridae	Paradulichia typica	a	2	
Order:Cumacea				
Family: Diastylidae	Diastylis edwardsi	a	14	
		b	30	
	Diastylis rathkei	a	4	
		b	4	
	Family Total	a	18	0.2
		b	34	0.3
Lampropidae	Lamprops fuscata	a	82	
		b	62	
Leuconidae	Eudorella sp.	b	2	
Nannastacidae	Campylaspis costata	b	4	
Order:Isopoda				
Family: Idoteidae	Mesidotea sabini	a	2	11.8
		b	2	
Order:Mysidacea		a	2	
Order:Tanaidaca	Leptognathia gracilis	a	16	
		b	24	
Class:Ostracoda		a	2	
		b	140	
Class:Pycnogonida				
Family: Nymphonidae	Nymphon sp.	a	2	0.1
Arthropod fragments		a	pr	
		b	pr	0.1
Phylum Chordata				
Subphylum:Urochordata				
Class:Ascidiacea		a	8	1.0
		b	6	
Subphylum:Vertebrata				
Class:Osteichtyes				
Family: Cottidae		a	2	0.1
Phylum:Cnidaria				
Class:Hydrozoa				
Family Campanulariidae	Obelia sp.	a	pr	
Phylum:Echinodermata				
Class:Holothuroidea				
Family: Synaptidae		a	6	1.2
		b	4	0.1

Banks Island B81-10

	Genus-Species	Grab	N/M (m-2)	WM (g.m-2)
Class:Stelleroida				
Subclass:Ophiuroidea				
Family: Ophiolepididae	Ophiocten sericeum	a	10	
		b	2	
	Juveniles	a	10	
		b	50	
	Family Total	a	20	1.1
		b	52	
Phylum : Mollusca				
Class : Gastropoda				
Subclass : Opisthobranchia				
Order : Cephalaspidea		a	8	0.1
		b	8	0.1
Order : Nudibranchia		a	2	
Subclass : Prosobranchia				
Family : Buccinidae	Buccinium sp.	a	8	0.2
Cylichnidae	Scaphander punctostriatus	a	138	3.2
		b	168	3.5
Naticidae	Natica clausa	b	2	3.4
Retusidae	Retusa obtusa	b	2	
Turridae	Oenopota sp.	a	8	0.1
	Propebela sp.	b	10	0.5
Gastropod Fragments		a	pr	
		b	pr	
Class : Pelecypoda				
Family: Astartidae	Astarte montagui	a	4	0.1
Cardiidae	Clinocardium ciliatum	a	8	
		b	50	
	Serripes groenlandicus	a	464	
		b	512	
	Family Total	a	472	7.3
		b	562	15.9
Myidae	Mya truncata	a	10	0.3
		b	12	0.9
Mytilidae	Musculus niger	b	6	1.0
Nuculanidae	Yoldiella fraterna	b	2	
Tellinidae	Macoma sp.	a	94	0.5
		b	246	1.2
Thraciidae	Thracia sp.	a	30	0.7
		b	2	0.1
Thyasiridae	Axinopsida orbiculata	a	756	
		b	252	
	Thyasira flexuosa (=gouldii)	a	190	
		b	148	
	Family Total	a	946	5.4
		b	400	1.3
Veneridae	Liocyma fluctuosa	a	382	9.7
		b	866	16.5
Pelecypod fragments		a	pr	
		b	pr	0.1
Phylum:Nemertinea		b	12	

Banks Island B81-10		Genus-Species	Grab	N/M (m-2)	WM (g.m-2)
Phylum : Protozoa					
Class : Sarcodina					
Order : Foraminifera					
Family :	Elphidiidae	Elphidium arcticum	a	Pr	
			b	Pr	
	Fischerinidae	Cornuspira foliacea	a	Pr	
			b	Pr	
	Lituolidae	Alveolophragmium orbiculatum	a	Pr	
			b	Pr	
	Miliolidae	Miliolina seminulum	b	Pr	
Phylum:Sipuncula			a	70	0.1
			b	136	0.1
STATION TOTAL:			a	3540	52.8
			b	4418	63.5

Banks Island BC81-2

	Genus-Species	Grab	N/M (m-2)	WW (g.m-2)
Phylum:Annelida				
Class:Polychaeta				
Family: Ampharetidae	Ampharete acutifrons	a	610	
		b	120	
	Amphicteis sundevalli	b	2	
	Lysippe labiata	b	4	
	Sabellides borealis	b	2	
	Family Total	a	610	1.5
		b	128	0.9
Amphictenidae	Pectinaria hyperborea	a	4	0.2
Apistobranchidae	Apistobranchus ornatus	a	4	
Capitellidae	Capitella capitata	a	12	
		b	2	
Cirratulidae	Chaetozone/Tharyx complex	a	4	
Dorvilleidae	Dorvillea sp.	a	2	
Hesionidae	Castalia aphroditoides	a	2	
	unidentified	a	2	
	Family Total	a	4	
Lumbrineridae	Lumbrineris fragilis	a	4	
Maldanidae	Praxillella praetermissa	a	16	
	Praxillella sp.	a	284	
		b	16	
	Fragments	a	54	
	Family Total	a	354	1.3
		b	16	0.1
Nephtyidae	Nephtys cornuta	a	54	
		b	70	
	Nephtys longosetosa	a	2	
	Nephtys sp.	a	46	
		b	58	
	Family Total	a	102	3.6
		b	128	1.4
Opheliidae	Ophelia limacina	a	2	0.1
Orbiniidae	Leitoscoloplos panamensis	a	2	
	Leitoscoloplos pugettensis	a	210	
		b	64	
	Family Total	a	212	2.1
		b	64	0.5
Paraonidae	Arcidea suecica	a	192	0.1
		b	32	
Phyllodocidae	Eteone longa	a	46	
		b	12	
	Phyllodoce sp.	a	2	
	Juveniles?	a	12	
Polynoidae	Eunoe nodosa	a	2	
	Gattyana cirrosa	a	4	
	Hesperonoe sp.	a	18	
		b	12	
	Family Total	a	24	0.1
		b	12	

Banks Island BC81-2

		Genus-Species	Grab	N/M (m-2)	WW (g.m-2)
	Sabellidae	Chone duneri	a	4176	
			b	928	
		Chone sp.	b	16	
		Euchone analis	a	1122	
			b	96	
		Euchone incolor	a	80	
			b	40	
		Family Total	a	5378	1.9
			b	1080	0.4
	Sigalionidae	Pholoe minuta	a	202	0.3
			b	46	0.1
	Sphaerodoridae	Sphaerodoropsis minuta	a	4	
			b	2	
	Spionidae	Prionospio cirrifera	a	14	
			b	2	
		Prionospio steenstrupi	a	2	
			b	6	
		Pygospio elegans	a	1100	
			b	368	
		?Spio sp.	a	18	
		Family Total	a	1134	0.5
			b	376	0.1
	Syllidae	Exogone verugera	a	4	
			b	2	
		Exogone sp.(epitokus)	a	28	
			b	8	
		Family Total	a	32	
			b	10	
	Trichobranchidae	Terebellides stroemi	a	8	0.1
			b	10	0.1
	Fragments and Nematodes		a	pr	0.9
			b	pr	0.5
Phylum:Arthropoda					
Class:Malacostraca					
Order:Amphipoda					
Family:	Ampeliscidae	Byblis gaimardi	a	64	
			b	104	0.3
	Corophiidae	Corophium crassicorne	a	26	
			b	10	
		Erichthonius difformis	a	20	
			b	4	
		Family Total	a	46	
			b	14	
	Gammaridae	Melita dentata	a	98	1.1
			b	102	0.9
	Ischyroceridae	Ischyrocerus megacheir	a	92	
			b	40	
	Lysianassidae	Anonyx nugax	a	6	
			b	26	
		Boeckosimus plautus	a	22	
			b	16	
		Family Total	a	28	0.4
			b	42	4.2

Banks Island BC81-2

	Genus-Species	Grab	N/M (m-2)	WW (g.m-2)
Oedicerotidae	Acanthostepheia behringiensis	a	8	
		b	2	
	Aceroides latipes	a	148	
		b	96	
	Monoculodes borealis	a	64	
		b	28	
	Monoculodes longirostris	a	164	
		b	102	
	Paroediceros lynceus	b	2	
	Family Total	a	384	0.8
		b	230	0.4
Pleustidae	Pleustes panoplus	a	2	
Podoceridae	Paradulichia typica	a	2	
		b	2	
Stenothoidae	Metopa sp.	a	4	
		b	4	
Order:Cumacea				
Family: Diastylidae	Brachydiastylis resima	b	2	
	Diastylis edwardsi	a	188	
		b	494	
	Diastylis oxyrhyncha	a	74	
		b	104	
	Family Total	a	262	1.6
		b	600	1.9
Lampropidae	Lamprops fuscata	a	28	
		b	24	
Leuconidae	Leucon nasica	a	4	
		b	10	
Nannastacidae	Campylaspis costata	b	2	
Order:Tanaidacea	Leptognathia gracilis	a	4652	0.4
		b	44	
Class:Ostracoda		a	140	
		b	82	
Class:Pycnogonida				
Family: Nymphonidae	Nymphon sp.	a	2	
		b	4	
Arthropod fragments		a	pr	0.1
		b	pr	0.1
Phylum:Bryzoa				
Class:Gymnolaemata				
Family: Scrupariidae	Eucratea loricata	a	pr	
Phylum:Chordata				
Subphylum:Urochordata				
Class:Ascidiacea		a	2	
		b	2	0.4
Phylum:Cnidaria				
Class:Hydrozoa				
Family: Campanulinidae	Lafoeina maxima	b	pr	
Corynidae	Coryne sp.	a	pr	

Banks Island BC81-2

	Genus-Species	Grab	N/M (m-2)	WW (g.m-2)
Phylum:Echinodermata				
Class:Holothuroidea				
Family: Synaptidae		b	2	0.1
Class:Stelleroida				
Subclass:Ophiuroidea				
Family: Ophiolepididae	Ophiocten sericeum	a	10	
		b	10	
	unidentified juveniles	a	50	
		b	42	
	Family Total	a	60	4.0
		b	52	3.9
Phylum : Mollusca				
Class : Gastropoda				
Subclass : Opisthobranchia				
Order : Cephalaspidea		a	12	0.2
		b	2	0.1
Subclass : Prosobranchia				
Family: Cylichnidae	Scaphander punctostriatus	a	82	0.7
		b	16	
Turridae	Oenopota sp.	a	2	
Gastropod Fragments		a	pr	
		b	pr	
Class : Pelecypoda				
Family: Astartidae	Astarte montagui	a	12	0.1
Cardiidae	Clinocardium ciliatum	a	30	
		b	30	
	Serripes groenlandicus	a	190	
		b	64	
	Family Total	a	220	12.9
		b	94	23.1
Hiatellidae	Hiatella arctica	a	4	0.2
Myidae	Mya truncata	a	20	2.2
		b	16	
Mytilidae	Musculus niger	a	86	0.8
		b	68	0.3
Nuculanidae	Yoldiella fraterna	b	2	
Pandoridae	Pandora glacialis	a	4	1.0
Tellinidae	Macoma calcarea	a	216	1.2
	Macoma sp.	b	190	0.4
Thraciidae	Thracia sp.	a	10	
		b	4	
Thyasiridae	Axinopsida orbiculata	a	1922	
		b	902	
	Thyasira flexuosa (=gouldii)	a	14	
		b	26	
	Family Total	a	1936	3.8
		b	928	1.5
Veneridae	Liocyma fluctuosa	a	1402	9.9
		b	1068	7.7
Pelecypod fragments		a	pr	0.1
		b	pr	

Banks Island BC81-2

		Genus-Species	Grab	N/M (m-2)	WW (g.m-2)
Phylum:Nemertinea			a	244	0.1
			b	38	
Phylum : Protozoa					
Class : Sarcodina					
Order : Foraminifera					
Family:	Elphidiidae	Elphidium arcticum	a	Pr	
			b	Pr	
	Fischerinidae	Cornuspira foliacea	a	Pr	
			b	Pr	
	Lituolidae	Alveolophragmium orbiculatum	a	Pr	
			b	Pr	
	Miliolidae	Miliolina seminulum	a	Pr	
			b	Pr	
	Two app. spp.		a	Pr	
			b	Pr	
Phylum:Sipuncula			a	84	
			b	12	
FAMILY TOTAL:			a	18936	54.6
			b	5946	50.0

Banks Island B-83-1

	Genus-Species	Grab	N/M (m-2)	WW (g.m-2)	DW (g.m-2)
Phylum:Annelida					
Class:Oligochaeta		a	30		
		b	180		
		c	150		
		i	24		
Class:Polychaeta					
Family: Capitellidae	Capitella sp.	a	40		
		b	170	0.1	0.03
		c	80		
		d	100		
		i	40		
		j	4		
Cirratulidae	Chaetozone/Tharyx complex	a	60	0.2	0.04
		b	130	0.2	0.03
		c	40	0.1	0.03
		i	44	0.1	0.03
		j	20	0.1	0.02
Dorvilleidae	Dorvillea sp.	a	90		
		b	170	0.1	0.02
		c	20		
		d	10		
		i	36		
		j	4		
Hesionidae	Castalia aphroditoides	c	10		
		d	40		
Opheliidae	Ophelia limacina	a	70	0.1	0.01
		b	50	0.8	0.15
		c	20		
		i	8		
Orbiniidae	Leitoscoloplos panamensis	b	20	0.3	0.11
		c	10		
	Leitoscoloplos pugettensis	a	10		
		i	8	0.1	0.03
	Leitoscoloplos sp.	d	10		
Phyllodocidae	Eteone ?longa	a	10		
		b	70	0.1	0.04
		c	20		
		d	10		
		i	8		
		j	4		
	Phyllodoce groenlandica	a	180	0.1	0.03
		b	150	0.1	0.03
		c	40		
		d	70		
		i	40	<0.1	0.02
		j	4		
Sabellidae	Chone duneri	b	10		Museum
		b	60	0.8	0.26
	Euchone analis	i	16	<0.1	0.02
		j	4		
Scalibregmidae	Scalibregma inflatum	a	10	0.5	0.14
Serpulidae		i	4		Museum
Sigalionidae	Pholoe minuta	a	30		
		j	8		

Banks Island B-83-1

	Genus-Species	Grab	N/M (m-2)	WW (g.m-2)	DW (g.m-2)
Spionidae	Dispio sp.	a	90	0.1	0.03
		b	50		
		d	10		
		i	28	0.1	0.02
		j	12	<0.1	0.01
	Pygospio elegans	j	16		
	Scolecolepides sp.	a	40	0.4	0.09
		b	50	0.8	0.21
		c	20	0.1	0.03
		d	20		
		i	12	0.1	M (0.03)*
		i	48	0.8	0.21
		j	4	<0.1	0.01
Syllidae	Exogone tatarica	a	200		
		b	230		
		d	10		
		i	20		
		j	4		
	Exogone verrusera	a	40		
		b	50		
		d	20		
		i	28		
		j	8		
	Exogone sp.(buddins)	a	20		Museum
		b	30		
		i	12		
	Exogone sp.(epitokus)	a	30		
		b	70		
		d	10		
		i	8		
Trichobranchidae	Terebellides stroemi	b	10	0.5	0.20
Fragments and Nematodes		a	Pr	0.2	0.10
		b	Pr	0.2	0.05
		c	Pr		
		d	Pr		
		i	Pr	<0.1	0.01
		j	Pr	<0.1	0.01
Phylum:Arthropoda					
Class:Cirripedia					
Order:Thoracica					
Family : Balanidae		j	36		
Class:Copepoda					
Order:Cyclopoida	Oncaea sp.	d	30		
Order:Harpacticoida		c	20		
Class:Malacostraca					
Order:Amphipoda					
Family : Calliopiidae		i	16		Museum
		j	4		
Corophiidae	Corophium crassicorne	c	10		

Banks Island B-83-1

	Genus-Species	Grab	N/M (m-2)	WW (g.m-2)	DW (g.m-2)
Isaeidae	Protomedeia fasciata	b	10		
		j	8		
Ischyroceridae	Ischyrocerus megacheir	a	270		
		b	140		
		c	110		
		d	40		
		i	40		
		j	20		
Lysianassidae	Anonyx nugax	i	4	0.2	0.05
	Boeckosimus sp.	a	40		
		b	10		
	Boeckosimus plautus	i	4		
		j	4	<0.1	0.01
Oedicerotidae	Acanthostepheia behringiensis	j	4	0.1	0.02
	Monoculodes borealis	a	160	0.5	0.15
		b	50	0.1	0.03
		c	30		
		d	90	0.4	0.12
		i	244	1.0	0.20
		j	188	0.9	0.17
	Monoculodes longirostris	a	290	0.6	0.19
		b	110	0.2	0.06
		c	150	0.3	0.08
		d	240	0.5	0.12
		i	240	0.7	0.14
		j	372	1.2	0.22
	Monoculodes sp.	a	40		
		b	100		
		d	50		
		i	20		
		j	12		
	Monoculopsis longicornis	a	20		
		i	20		
		j	8		
	Paroediceros lynceus	a	20		
		b	20		
		d	10		
		i	56	0.2	0.04
		j	44	0.1	0.01
Podoceridae	Paradulichia typica	j	8		
Order:Cumacea					
Family : Diastylidae	Diastylis edwardsi	a	10		
		i	4	<0.1	0.01
	Diastylis oxyrhyncha	a	70		
		b	60		
		c	50	0.9	0.32
		d	40	0.6	0.17
		i	40	0.2	0.06
		j	52	0.2	0.07
	Diastylis sulcata	j	4		
Lampropidae	Lamprops fuscata	a	460	0.2	0.06
		b	130		
		c	20		
		d	50		
		i	140	0.1	0.01
		j	104	<0.1	0.02

Banks Island B-83-1

	Genus-Species	Grab	N/M (m-2)	WW (g.m-2)	DW (g.m-2)
Order:Tanaidacea	Leptognathia gracilis	b	20		
		i	4		
Class:Ostracoda		b	30		
		c	30		
Arthropoda Fragments		a	Pr		
		c	Pr	0.1	0.03
		d	Pr	0.1	0.02
		i	Pr	0.2	0.05
		j	Pr		
Phylum:Bryzoa					
Class:Gymnolaemata					
Family:Scrupariidae	Eucratea loricata	c	Pr		
		d	Pr		
		i	Pr		
		j	Pr		
Phylum:Chordata					
Subphylum:Urochordata					
Class:Ascidiacea		a	10		Museum
		b	70		Museum
		c	50		Museum
		d	10		Museum
		j	4		Museum
Phylum:Cnidaria					
Class:Anthozoa					
Order:Actiniaria		a	10		Museum
		b	30	0.3	M (0.03)*
		i	8		Museum
		j	4		Museum
Class:Hydrozoa					
Family:Campanulariidae	Obelia sp.	i	Pr		
	unidentified	c	Pr		
		d	Pr		
Campanulinidae	Lafoeina maxima	j	Pr		
Phylum : Echinodermata					
Class : Stelleroidea					
Subclass : Asteroidea					
Juveniles		d	10		
Subclass : Ophiuroidea					
Family : Ophiolepididae	Juveniles	a	10	0.2	
Juveniles		a	40		
		b	10		
		d	40		
		i	20		
		j	8		

Banks Island B-83-1

	Genus-Species	Grab	N/M (m-2)	WW (g.m-2)	DW (g.m-2)
Phylum : Mollusca					
Class : Gastropoda					
Subclass : Prosobranchia					
Family : Cylichnidae	Scaphander punctostriatus	a	30		
		b	30	0.3	0.03
		d	20		
		i	4		
Naticidae	Lunatia pallida	a	10		
Rissoidae	Cingula castanea	b	20	0.1	0.01
		d	10		
		i	4		
Turridae	Oenopota sp.	j	4		
Class : Pelecypoda					
Family : Cardiidae	Clinocardium ciliatum	a	20	6.2	1.10
	Serripes groenlandicus	a	30	4.2	0.57
		b	10		
		d	10	22.7	2.95
		i	16	12.6	1.95
		j	20	1.3	0.18
Myidae	Mya truncata	b	10	0.3	0.03
	Mya sp.	a	30		
		d	10		
Mytilidae	Crenella faba	b	20		
		i	4		
		j	4		
	Musculus sp.	a	20		
		b	20		
		d	20		
		i	8		
Tellinidae	Macoma sp.	a	30		
Thyasiridae	Axinopsida orbiculata	b	20		
		d	10		
		i	40		
		j	4		
	Thyasira gouldii	a	10		
Veneridae	Liocyma fluctuosa	b	30		
		d	10		
Juveniles		b	20		
		i	4		
		j	4		
Phylum:Nemertinea		a	650	0.2	0.04
		b	160	6.0	1.30
		c	30		
		d	40		
		i	52		
		j	16	0.4	0.12
Phylum : Protozoa					
Class : Sarcodina					
Order : Foraminifera					
Family : Elphidiidae	Elphidium arcticum	a	pr		
		b	pr		
		c	pr		
	Elphidium sp.1	b	pr		

Banks Island B-83-1

	Genus-Species	Grab	N/M (m-2)	WW (g.m-2)	DW (g.m-2)
Fischerinidae	Cornuspira foliacea	a	Pr		
		b	Pr		
		c	Pr		
		d	Pr		
		i	Pr		
		j	Pr		
Phylum:Sipuncula		d	10	0.4	0.10
Egg Masses		b	Pr		
		d	Pr		
STATION TOTAL		a	3230	13.7	2.55
		b	2630	11.3	2.62
		c	910	1.5	0.49
		d	1060	24.7	3.48
		i	1376	16.4	2.88
		j	1028	4.3	0.87

Banks Island B83-1

FAMILY TOTALS	Grab	N/M (m-2)	WM (g.m-2)	DM (g.m-2)
Phylum:Annelida				
Class:Oligochaeta	a	30		
	b	180		
	c	150		
	i	24		
Class:Polychaeta				
Family: Capitellidae	a	40		
	b	170	0.1	0.03
	c	80		
	d	100		
	i	40		
	j	4		
Cirratulidae	a	60	0.2	0.04
	b	130	0.2	0.03
	c	40	0.1	0.03
	i	44	0.1	0.03
	j	20	0.1	0.02
Dorvilleidae	a	90		
	b	170	0.1	0.02
	c	20		
	d	10		
	i	36		
	j	4		
Hesionidae	c	10		
	d	40		
Opheliidae	a	70	0.1	0.01
	b	50	0.8	0.15
	c	20		
	i	8		
Orbiniidae	a	10		
	b	20	0.3	0.11
	c	10		
	d	10		
	i	8	0.1	0.03
Phyllodocidae	a	190	0.1	0.03
	b	220	0.2	0.07
	c	60		
	d	80		
	i	48	<0.1	0.02
	j	8		
Sabellidae	b	70	0.8	M (0.26)*
	i	16	<0.1	0.02
	j	4		
Scalibregmidae	a	10	0.5	0.14
Serpulidae	i	4		M
Sigalionidae	a	30		
	j	8		
Spionidae	a	130	0.5	0.12
	b	100	0.8	0.21
	c	20	0.1	0.03
	d	30		
	i	88	1.0	M (0.26)*
	j	32	<0.1	0.02
Syllidae	a	290		
	b	380		
	d	40		
	i	68		
	j	12		

Banks Island B83-1

FAMILY TOTALS	Grab	N/M (m-2)	WW (g.m-2)	DW (g.m-2)	
Trichobranchidae	b	10	0.5	0.20	
Fragments and Nematodes	a	Pr	0.2	0.10	
	b	Pr	0.2	0.05	
	c	Pr			
	d	Pr			
	i	Pr	<0.1	0.01	
	j	Pr	<0.1	0.01	
Phylum:Arthropoda					
Class:Cirripedia					
Order:Thoracica					
Family : Balanidae	j	36			
Class:Copepoda					
Order:Cyclopoida	d	30			
Order:Harpacticoida	c	20			
Class:Malacostraca					
Order:Amphipoda					
Family : Calliopiidae	i	16			Museum
	j	4			
Corophiidae	c	10			
Isaeidae	b	10			
	j	8			
Ischyroceridae	a	270			
	b	140			
	c	110			
	d	40			
	i	40			
	j	20			
Lysianassidae	a	40			
	b	10			
	i	8	0.2	0.05	
	j	4	<0.1	0.01	
Oedicerotidae	a	530	1.1	0.34	
	b	280	0.3	0.09	
	c	180	0.3	0.08	
	d	390	0.9	0.24	
	i	580	1.9	0.38	
	j	628	2.3	0.42	
Podoceridae	j	8			
Order:Cumacea					
Family : Diastylidae	a	80			
	b	60			
	c	50	0.9	0.32	
	d	40	0.6	0.17	
	i	44	0.2	0.07	
	j	56	0.2	0.07	
Lampropidae	a	460	0.2	0.06	
	b	130			
	c	20			
	d	50			
	i	140	0.1	0.01	
	j	104	<0.1	0.02	

Banks Island B83-1

FAMILY TOTALS	Grab	N/M (m-2)	WW (g.m-2)	DW (g.m-2)
Order:Tanaidacea	b	20		
	i	4		
Class:Ostracoda	b	30		
	c	30		
Arthropoda Fragments	a	Pr		
	c	Pr	0.1	0.03
	d	Pr	0.1	0.02
	i	Pr	0.2	0.05
	j	Pr		
Phylum:Chordata				
Subphlum:Urochordata				
Class:Ascidiacea	a	10		Museum
	b	70		Museum
	c	50		Museum
	d	10		Museum
	j	4		Museum
Phylum:Cnidaria				
Class:Anthozoa				
Order:Actiniaria	a	10		Museum
	b	30	0.3	M (0.03)*
	i	8		Museum
	j	4		Museum
Class:Hydrozoa				
Family:Campanulariidae	i	Pr		
	c	Pr		
	d	Pr		
Campanulinidae	j	Pr		
Phylum : Echinodermata				
Class : Stelleroidea				
Subclass : Asteroidea				
Juveniles	d	10		
Subclass : Ophiuroidea				
Family : Ophiolepididae	a	10	0.2	
Juveniles	a	40		
	b	10		
	d	40		
	i	20		
	j	8		
Phylum : Mollusca				
Class : Gastropoda				
Subclass : Prosobranchia				
Family : Cylichnidae	a	30		
	b	30	0.3	0.03
	d	20		
	i	4		
Naticidae	a	10		
Rissoidae	b	20	0.1	0.01
	d	10		
	i	4		
Turridae	j	4		

Banks Island B83-1

FAMILY TOTALS	Grab	N/M (m-2)	WW (g.m-2)	DW (g.m-2)
Class : Pelecypoda				
Family : Cardiidae	a	50	10.4	1.67
	b	10		
	d	10	22.7	2.95
	i	16	12.6	1.95
	j	20	1.3	0.18
Myidae	a	30		
	b	10	0.3	0.03
	d	10		
Mytilidae	a	20		
	b	40		
	d	20		
	i	12		
	j	4		
Tellinidae	a	30		
Thyasiridae	a	10		
	b	20		
	d	10		
	i	40		
	j	4		
Veneridae	b	30		
	d	10		
Juveniles	b	20		
	i	4		
	j	4		
Phylum : Protozoa				
Class : Sarcodina				
Order : Foraminifera				
Family : Elphidiidae	a	Present		
	b	Present		
	c	Present		
Fischerinidae	a	Present		
	b	Present		
	c	Present		
	d	Present		
	i	Present		
	j	Present		
Phylum:Nemertinea	a	650	0.2	0.04
	b	160	6.0	1.30
	c	30		
	d	40		
	i	52		
	j	16	0.4	0.12
Phylum:Sipuncula	d	10	0.4	0.10
Egg Masses	b	Pr		
	d	Pr		
STATION TOTAL	a	3230	13.7	2.55
	b	2630	11.3	2.62
	c	910	1.5	0.49
	d	1060	24.7	3.48
	i	1376	16.4	2.88
	j	1028	4.3	0.87

Banks Island B-83-2

	Genus-Species	Grab	N/M (m-2)	WW (g.m-2)	DW (g.m-2)
Phylum:Annelida					
Class:Oligochaeta		a	30		
		b	30		
		c	10		
		d	20		
		i	30		
		j	750	0.1	0.03
Class:Polychaeta					
Family:					
Capitellidae	Capitella sp.	a	40	0.3	0.12
		b	60		
		c	20		
		d	40		
		i	68	0.2	M (0.05)*
		j	68	<0.1	0.02
Cirratulidae	Chaetozone/Tharyx complex	a	170	0.2	0.05
		b	90	0.1	0.04
		c	40		
		d	30		
		i	44	0.1	0.02
		j	384	0.7	M (0.05)*
Dorvilleidae	Dorvillea sp.	a	40		
		b	30		
		c	60		
		d	20		
		i	52	<0.1	0.01
		j	156	0.1	0.02
Glyceridae	Glycera sp.	j	4	0.2	0.02
Hesionidae	Castalia aphroditoides	d	10		
		j	4		
Opheliidae	Ophelia limacina	a	50		
		b	10		
		c	50		
		d	10		
		i	4	<0.1	0.02
		j	32	0.1	0.04
	Travisia forbesii	a	10		
Orbiniidae	Leitoscoloplos panamensis	a	30	1.5	0.69
		b	10		
	Leitoscoloplos pugettensis	c	10		
		j	8	0.1	0.03
Paraonidae	Aricidea suecica	a	10		
	Paraonella platybranchia	j	8		Museum
Phyllodocidae	Eteone ?longa	a	50		
		b	40		
		c	10		
		d	20		
		j	16		
	Phyllodoce groenlandica	a	260	0.1	0.04
		b	310	0.2	0.04
		c	170	0.1	0.03
		d	200	0.2	0.06
		i	40		
		j	36		

Banks Island B-83-2

	Genus-Species	Grab	N/M (m-2)	WW (g.m-2)	DW (g.m-2)
Sabellidae	Chone duneri	a	10	0.3	0.10
		b	10		
Sigalionidae	Pholoe minuta	a	50		
		b	20		
		c	20		
		d	10		
		i	4		
		j	16	0.1	0.04
Spionidae	Dispio sp.	a	30		
		b	30		
		c	10		
		d	40		
		i	16		
		j	48	0.1	0.05
	Pygospio elegans	a	10		
		d	30		
		j	44		
	Scolecolepides sp.	a	20	0.4	0.11
		b	10	0.3	0.09
		c	40	0.6	0.17
		d	10	0.1	0.04
		i	4	0.1	0.04
	juveniles	a	10		
Syllidae	Exogone tatarica	a	190		
		b	130		
		c	130		
		d	130		
		i	28		
		j	64		
	Exogone verrugera	a	110		
		b	30		
		c	40		
		d	50		
		i	8		
		j	28		
	Exogone sp.(buddins)	a	20		
		b	10		
		d	10		
		j	28		
	Exogone sp.(epitokus)	a	110		
		b	50		
		c	40		
		d	20		
		i	4		
		j	56		
Fragments and Nematodes		a	Pr	0.2	0.08
		b	Pr	0.1	0.03
		c	Pr	0.1	0.04
		d	Pr	0.2	0.07
		i	Pr		
		j	Pr	0.1	0.04

Banks Island B-83-2

	Genus-Species	Grab	N/M (m-2)	WW (g.m-2)	DW (g.m-2)
Phylum:Arthropoda					
Class:Cirripedia					
Order:Thoracica					
Family : Balanidae		d	20		
		j	8		
Class:Malacostraca					
Order:Amphipoda					
Suborder:Gammaridea					
Family : Ampeliscidae	Ampelisca macrocephala	a	10	1.5	M (0.4)*
		c	10	1.2	0.32
		j	4	0.1	0.01
	Byblis gaimardi	a	10		
		b	10	0.1	0.03
		c	10		
		j	8	0.1	0.02
	Haploops tubicola	a	10		
		i	4		
Calliopiidae		c	20		
		j	4		
Corophiidae	Corophium sp.	c	20		
Isaeidae	Protomedeia fasciata	a	80		
		j	4		
Ischyroceridae	Ischyrocerus megacheir	a	200		
		b	170		
		c	50		
		d	540	0.2	0.04
		i	4		
		j	816	0.4	0.09
Lysianassidae	Anonyx nugax	d	10		
		j	4	<0.1	0.01
	Boeckosimus plautus	j	4	<0.1	0.01
	Orchomene sp.	j	4		
Oedicerotidae	Monoculodes borealis	a	20		
		b	90	0.3	0.14
		c	60	0.2	0.07
		d	20	0.1	0.01
		i	80	0.3	0.08
		j	136	0.4	0.12
	Monoculodes longirostris	a	180	0.3	0.08
		b	370	0.8	0.12
		c	230	0.4	0.12
		d	270	0.4	0.09
		i	244	0.6	0.12
		j	1008	2.1	0.40
	Monoculodes sp.	a	10		
		b	50		
		c	40		
		d	30		
		i	8		
		j	20		
	Monoculopsis longicornis	a	10		
	Paroediceros lynceus	a	20		
		c	10	0.1	0.03
		d	30		
		i	16		
		j	96	0.7	0.16

Banks Island B-83-2

	Genus-Species	Grab	N/M (m-2)	WW (g.m-2)	DW (g.m-2)
Pleustidae	Pleustes sp.	j	16		
Podoceridae	Paradulichia typica	j	164	0.3	0.06
Stenothoidae	Metopa pusilla	j	4		
	Metopella sp.	j	12		
Suborder:Hyperiidea (pelagic)		d	10	0.2	Museum
Order:Cumacea					
Family : Diastylidae	Diastylis edwardsi	b	10		
		c	10		
		j	20	0.2	0.08
	Diastylis oxyrhyncha	a	50		
		b	230	0.8	0.31
		c	110	0.5	0.20
		d	70		
		i	52	0.2	0.08
		j	92	1.2	0.41
	Diastylis sulcata	a	30	0.5	0.18
		b	40	0.5	0.21
		c	50		
		d	50	0.1	0.01
		i	24		
		j	200	1.2	0.39
Lampropidae	Lamprops fuscata	a	50		
		b	300	0.2	0.02
		c	150		
		d	40		
		i	64	<0.1	0.01
		j	596	0.2	0.06
Order:Tanaidacea	Leptognathia gracilis	a	10		
		b	10		
		c	10		
		d	10		
Class:Mysidacea		i	4	<0.1	0.01
Class:Ostracoda		a	40		
		c	40		
		d	30		
Class:Pycnogonida					
Family : Nymphonidae	Nymphon sp.	j	4		Museum
Arthropoda Fragments		a	pr		
		b	pr		
		c	pr		
		d	pr		
		i	pr		
		j	pr	0.1	0.03
Phylum:Bryzoa					
Class:Gymnolaemata					
Family:Scrupariidae	Eucratea loricata	d	pr		

Banks Island B-83-2

	Genus-Species	Grab	N/M (m-2)	WW (g.m-2)	DW (g.m-2)
Phylum:Chordata					
Subphylum:Urochordata					
Class:Ascidiacea		b	30		Museum
		c	60		Museum
		i	48		Museum
		j	20		Museum
Phylum:Cnidaria					
Class:Anthozoa					
Order:Actiniaria		a	10		Museum
		b	10		Museum
		c	30	0.3	M (0.03)*
		d	20		Museum
		i	4		Museum
		j	16	0.1	Museum
Order:Alcyonacea					
Family:Nephthyidae	Gersemia sp.	j	PP		
Class:Hydrozoa					
Family:Campanulariidae	Obelia sp.	d	PP		
	unidentified	b	PP		
Phylum : Echinodermata					
Class : Stelleroidea					
Subclass : Ophiuroidea					
Family : Ophiolepididae	Ophiocten sericeum	j	4	1.3	M (0.13)*
	Juveniles	j	8	0.1	
Juveniles		a	10		
		b	80		
		c	20		
		d	30		
		i	4		
		j	76		
Phylum : Mollusca					
Class : Gastropoda					
Subclass : Prosobranchia					
Family : Cylichnidae	Scaphander punctostriatus	a	10	0.3	0.04
		b	10		
		c	20		
		d	10	0.1	0.01
Naticidae	Lunatia pallida	j	4		
Rissoidae	Cingula castanea	b	20	0.1	0.01
Trochidae	Margarites sp.	d	10		
Class : Pelecypoda					
Family : Cardiidae	Clinocardium ciliatum	a	10	1.3	0.12
		c	10	6.3	0.79
		d	10		
	Serripes groenlandicus	a	10		
		b	30	2.7	0.33
		i	20	8.9	1.15
		j	4		

Banks Island B-83-2

	Genus-Species	Grab	N/M (m-2)	WW (g.m-2)	DW (g.m-2)
Hiatellidae	Hiatella arctica	b	10		
		c	10		
		d	40		
		j	12		
Myidae	Mya truncata	d	10	0.8	0.08
	Mya sp.	a	10		
		b	20		
		c	10		
Mytilidae	Crenella faba	a	40		
		b	30		
	Musculus niger	b	30		
	Musculus sp.	c	20		
		d	10		
Pandoridae	Pandora glacialis	a	10		
Thraciidae	Thracia devexa	a	10	0.1	
		i	4	2.2	M (0.29)*
Thyasiridae	Axinopsida orbiculata	a	10		
		b	40		
		i	12		
		j	4		
Veneridae	Liocyma fluctuosa	a	10		
		b	10		
		c	10		
Juveniles		a	50		
Phylum:Nemertinea		a	460	3.1	0.83
		b	250		
		c	380	0.1	0.03
		d	320	0.1	0.01
		i	20	0.2	0.07
		j	48		
Phylum:Porifera		c	Pr		
Phylum : Protozoa					
Class : Sarcodina					
Order : Foraminifera					
Family : Elphidiidae	Elphidium arcticum	a	Pr		
		d	Pr		
Fischerinidae	Cornuspira foliacea	a	Pr		
		d	Pr		
		i	Pr		
		j	Pr		
Unidentified Egg Cases		d	Pr		
STATION TOTAL		a	2630	10.1	2.84
		b	2720	6.2	1.40
		c	2040	9.9	1.83
		d	2240	2.5	0.42
		i	914	12.8	1.95
		j	5170	10.1	2.33

Banks Island B83-2

FAMILY TOTALS	Grab	N/M (m-2)	WW (g.m-2)	DW (g.m-2)
Phylum:Annelida				
Class:Oligochaeta	a	30		
	b	30		
	c	10		
	d	20		
	i	30		
	j	750	0.1	0.03
Class:Polychaeta				
Family: Capitellidae	a	40	0.3	0.12
	b	60		
	c	20		
	d	40		
	i	68	0.2	M (0.05)*
	j	68		0.02
Cirratulidae	a	170	0.2	0.05
	b	90	0.1	0.04
	c	40		
	d	30		
	i	44	0.1	0.02
	j	384	0.7	M (0.05)*
Dorvilleidae	a	40		
	b	30		
	c	60		
	d	20		
	i	52	<0.1	0.01
	j	156	0.1	0.02
Glyceridae	j	4	0.2	0.02
Hesionidae	d	10		
	j	4		
Opheliidae	a	60		
	b	10		
	c	50		
	d	10		
	i	4	<0.1	0.02
	j	32	0.1	0.04
Orbiniidae	a	30	1.5	0.69
	b	10		
	c	10		
	j	8	0.1	0.03
Paraonidae	a	10		
	j	8		M
Phyllodocidae	a	310	0.1	0.04
	b	350	0.2	0.04
	c	180	0.1	0.03
	d	220	0.2	0.06
	i	40		
	j	52		
Sabellidae	a	10	0.3	0.10
	b	10		
Sigalionidae	a	50		
	b	20		
	c	20		
	d	10		
	i	4		
	j	16	0.1	0.04

Banks Island B83-2

FAMILY TOTALS	Grab	N/M (m-2)	WW (g.m-2)	DW (g.m-2)
Spionidae	a	70	0.4	0.11
	b	40	0.3	0.09
	c	50	0.6	0.17
	d	80	0.1	0.04
	i	20	0.1	0.04
	j	92	0.1	0.05
Syllidae	a	430		
	b	220		
	c	210		
	d	210		
	i	40		
	j	176		
Fragments and Nematodes	a	Pr	0.2	0.08
	b	Pr	0.1	0.03
	c	Pr	0.1	0.04
	d	Pr	0.2	0.07
	i	Pr		
	j	Pr	0.1	0.04
Phylum:Arthropoda				
Class:Cirripedia				
Order:Thoracica				
Family : Balanidae	d	20		
	j	8		
Class:Malacostraca				
Order:Amphipoda				
Suborder:Gammaridea				
Family : Ampeliscidae	a	30	1.5	M (0.4)*
	b	10	0.1	0.03
	c	20	1.2	0.32
	i	4		
	j	12	0.2	0.03
Calliopiidae	c	20		
	j	4		
Corophiidae	c	20		
Isaeidae	a	80		
	j	4		
Ischyroceridae	a	200		
	b	170		
	c	50		
	d	540	0.2	0.04
	i	4		
	j	816	0.4	0.09
Lysianassidae	d	10		
	j	12	<0.1	0.02
Oedicerotidae	a	240	0.3	0.08
	b	510	1.1	0.26
	c	340	0.7	0.22
	d	350	0.5	0.10
	i	348	0.9	0.20
	j	1260	3.2	0.68
Pleustidae	j	16		
Podoceridae	j	164	0.3	0.06
Stenothoidae	j	16		
Suborder:Hyperiidea (Pelagic)	d	10	0.2	Museum

Banks Island B83-2

FAMILY TOTALS	Grab	N/M (m-2)	WW (s.m-2)	DW (s.m-2)
Order:Cumacea				
Family : Diastylidae	a	80	0.5	0.18
	b	280	1.3	0.52
	c	170	0.5	0.20
	d	120	0.1	0.01
	i	76	0.2	0.08
	j	312	2.6	0.88
Lampropidae	a	50		
	b	300	0.2	0.02
	c	150		
	d	40		
	i	64	<0.1	0.01
	j	596	0.2	0.06
Order:Tanaidacea	a	10		
	b	10		
	c	10		
	d	10		
Class:Mysidacea	i	4	<0.1	0.01
Class:Ostracoda	a	40		
	c	40		
	d	30		
Class:Pycnogonida				
Family : Nymphonidae	j	4		M
Arthropoda Fragments	a	Pr		
	b	Pr		
	c	Pr		
	d	Pr		
	i	Pr		
	j	Pr	0.1	0.03
Phylum:Bryzoa				
Class:Gymnolaemata				
Family:Scrupariidae	d	Pr		
Phylum:Chordata				
Subphlum:Urochordata				
Class:Ascidiacea	b	30		M
	c	60		M
	i	48		M
	j	20		M
Phylum:Cnidaria				
Class:Anthozoa				
Order:Actiniaria	a	10		M
	b	10		M
	c	30	0.3	M (0.03)*
	d	20		M
	i	4		M
	j	16	0.1	M
Order:Alcyonacea				
Family:Nephthyidae	j	Pr		

Banks Island B83-2

FAMILY TOTALS	Grab	N/M (m-2)	WW (g.m-2)	DW (g.m-2)
Class:Hydrozoa				
Family:Campanulariidae	b	PP		
	d	PP		
Phylum : Echinodermata				
Class : Stelleroidea				
Subclass : Ophiuroidea				
Family : Ophiolepididae	j	12	1.4	M (0.13)*
Juveniles	a	10		
	b	80		
	c	20		
	d	30		
	i	4		
	j	76		
Phylum : Mollusca				
Class : Gastropoda				
Subclass : Prosobranchia				
Family : Cylichnidae	a	10	0.3	0.04
	b	10		
	c	20		
	d	10	0.1	0.01
Naticidae	j	4		
Rissoidae	b	20	0.1	0.01
Trochidae	d	10		
Class : Pelecypoda				
Family : Cardiidae	a	20	1.3	0.12
	b	30	2.7	0.33
	c	10	6.3	0.79
	d	10		
	i	20	8.9	1.15
	j	4		
Hiatellidae	b	10		
	c	10		
	d	40		
	j	12		
Myidae	a	10		
	b	20		
	c	10		
	d	10	0.8	0.08
Mytilidae	a	40		
	b	60		
	c	20		
	d	10		
Pandoridae	a	10		
Thraciidae	a	10	0.1	
	i	4	2.2	M (0.29)*
Thyasiridae	a	10		
	b	40		
	i	12		
	j	4		
Veneridae	a	10		
	b	10		
	c	10		
Juveniles	a	50		

Banks Island B83-2

FAMILY TOTALS	Grab	N/M (m-2)	WW (g.m-2)	DW (g.m-2)
Phylum : Nemertiniea	a	460	3.1	0.83
	b	250		
	c	380	0.1	0.03
	d	320	0.1	0.01
	i	20	0.2	0.07
	j	48		
Phylum : Protozoa				
Class : Sarcodina				
Order : Foraminifera				
Family : Elphidiidae	a	Pr		
	d	Pr		
Fischerinidae	a	Pr		
	d	Pr		
	i	Pr		
	j	Pr		
Egg Masses	d	Pr		
STATION TOTAL	a	2630	10.1	2.84
	b	2720	6.2	1.40
	c	2040	9.9	1.83
	d	2240	2.5	0.42
	i	914	12.8	1.95
	j	5170	10.1	2.33

Banks Island BR-83-6

	Genus-Species	Grab	N/M (m-2)	WW (g.m-2)	DW (g.m-2)
Phylum:Annelida					
Class:Oligochaeta		a	30		
		b	480	0.1	0.05
		c	350		
		d	360		
		j	4		
Class:Polychaeta					
Family: Ampharetidae	Melinnampharete sp.	i	40		
Family: Apistobranchidae	Apistobranchus ornatus	b	20		
		d	10		
Capitellidae	Capitella capitata	d	20		
	Capitella sp.	b	20		
		c	40		
		d	10		
		i	40		
Cirratulidae	Chaetozone/Tharyx complex	a	10	0.1	M (0.01)*
		b	40		Museum
		c	30		Museum
		d	70		
		i	8		
Dorvilleidae	Dorvillea sp.	b	80		
		c	90		
		d	190	0.1	0.02
		i	68		
		j	44	<0.1	0.01
Maldanidae	Praxillella praetermissa	j	4	0.2	0.07
	fragments	a	Pr		
		b	Pr		
		c	Pr		
Nephtyidae	Nephtys cornuta	a	10		Museum
		d	10		
	Nephtys longosetosa	a	10	0.6	Museum
		b	10	0.4	0.13
		d	10	0.2	0.06
	Nephtys punctata	j	4	0.2	0.06
Opheliidae	Ophelia limacina	b	10	0.4	Museum
Orbiniidae	Leitoscoloplos panamensis	b	10	0.1	0.04
		c	30	0.2	0.06
		d	6	0.1	0.02
		i	20		
		j	8	0.1	0.03
	Leitoscoloplos pugettensis	j	12	<0.1	0.02
	Leitoscoloplos sp.	b	10		
		c	20		
Paraonidae	Arcidea suecica	d	20		
Phyllodocidae	Eteone ?longa	b	20		
		c	20		Museum
		j	4		
	Eteone sp.2	b	10		
		d	100	0.2	M (0.03)*
		i	8		
	Phyllodoce groenlandica	a	60		
		b	10	1.0	0.25
		c	30		
		d	10		

Banks Island BR-83-6

	Genus-Species	Grab	N/M (m-2)	WW (s.m-2)	DW (s.m-2)
Polynoidae	Harmothoe imbricata	j	4		Museum
Sabellidae	Chone sp	b	30		
	Chone duneri	i	4		
		j	8		0.01
	Euchone analis	c	10		0.02
		d	10		
Sigalionidae	Pholoe minuta	a	50		
		b	40		Museum
		c	10		
		i	8		
		j	12		
Spionidae	Dispio sp.	a	50	0.1	0.02
		b	180	0.1	0.04
		c	220	0.1	0.02
		d	20	0.1	0.02
		i	36	0.1	0.03
		j	148	0.2	0.04
	Prionospio cirrifera	c	20		
	Prionospio sp.	a	10		
	Pygospio elegans	b	10		
		i	4		
		j	12		
	Scolecolepides sp.	a	10	0.1	0.02
		b	70	2.5	0.52
		c	30	0.3	0.10
		d	140	0.2	0.05
		i	8		
	unidentifiable	i	12		
Syllidae	Autolytus ?fallax	a	10		
	Autolytus sp.	a	20		
	Exogone gemmifera	b	10		
	unidentified	i	4		
Terebellidae		d	20		
Fragments and Nematodes		a	Pr	0.1	0.03
		b	Pr	0.1	0.05
		c	Pr	0.1	0.03
		d	Pr	0.1	0.06
		i	Pr	0.1	0.02
		j	Pr		0.02
Phylum:Arthropoda					
Class:Cirripedia					
Order:Thoracica					
Family:Balanidae	Balanus sp.	a	100	1.2	M (0.12)+
Class:Copepoda					
Order:Cyclopoida	Oncaea sp.	d	120		
Order:Harpacticoida		a	20		
		b	90		
		c	60		
Class:Malacostraca					
Order:Amphipoda					
Family : Acanthonotozomatidae	Acanthonotozoma sp.	a	40	0.1	
Ampeliscidae	Byblis gaimardi	j	24	0.1	0.03

Banks Island BR-83-6

	Genus-Species	Grab	N/M (m-2)	WW (g.m-2)	DW (g.m-2)
Atylidae	Atylus carinatus	a	100	1.4	0.28
		d	10		
		i	8	0.1	
		j	28	0.5	0.10
Corophiidae	Erichthonius hunteri	a	80	0.1	
Isaeidae	Protomedeia fasciata	b	50		
		c	30		
Ischyroceridae	Ischyrocerus megacheir	a	900	0.1	
		b	100		
		c	130		
		d	770	0.1	
		i	428	0.2	0.04
		j	504	0.4	0.07
Lysianassidae	Anonyx nugax	j	4		
	Boeckosimus sp.	a	30		
		b	10		
		d	30		
	Boeckosimus plautus	i	4		
		j	20	0.1	0.04
	Orchomene sp.	i	12		
Oedicerotidae	Monoculodes borealis	a	10		
		b	80	0.2	0.04
		c	50	0.1	
		d	30	0.1	
		i	176	0.5	0.12
		j	252	0.8	0.16
	Monoculodes longirostris	a	320	0.1	0.06
		b	40		
		c	100		
		d	40		
		i	320	0.6	0.11
		j	960	2.0	0.34
	Monoculodes sp.	j	4		
	Monoculopsis longicornis	b	110		
		d	20		
		i	24		
Oedicerotidae	Paroediceros lynceus	a	20	0.1	
		d	10		
		i	48		
		j	576	3.8	0.71
	Unidentifiable sp.	a	20		
		i	4		
Pleustidae	Pleustes sp.	i	4		
		j	20	0.1	0.03
Podoceridae	Paradulichia typica	a	110	0.1	
		d	10		
		i	28		
		j	116	0.2	0.04
Stenothoidae	Metopella sp.	a	150	0.1	
		j	8		
Order:Cumacea					
Family : Diastylidae	Diastylis sp.	a	40		
		i	4		

Banks Island BR-83-6

	Genus-Species	Grab	N/M (m-2)	WW (g.m-2)	DW (g.m-2)
Lampropidae	Lamprops fuscata	a	510	0.5	0.06
		b	100		
		c	30		
		d	410	0.2	0.05
		i	136	0.1	0.02
		j	240	0.2	0.02
Nannastacidae	Cumvlaspis costa	a	10		
		d	10		
		j	4		
Order:Isopoda					
Family : Munnidae	Munna kroyeri	j	4		
	Munna sp.	a	20		
Order:Tanaidacea	Leptognathia gracilis	a	20		
		c	10		
		d	10		
		j	4		
Class:Ostracoda		b	10		
		d	70		
Arthropoda Fragments		a	Pr	0.2	0.05
		b	Pr		
		c	Pr		
		d	Pr		
		i	Pr	0.1	0.03
		j	Pr	0.2	0.04
Phylum:Bryzoa					
Class:Gymnolaemata					
Family:Alcyonidiidae	Alcyonidium sp.	a	10		
		b	10		
		i	4		Museum
Scrupariidae	Eucratea loricata	a	Pr		
Phylum:Chordata					
Subphylum:Urochordata					
Class:Ascidiacea		b	30	0.2	M (0.02)*
Phylum:Cnidaria					
Class:Anthozoa					
Order:Actiniaria		c	10		Museum
Class:Hydrozoa					
Family:Campanulinidae	Lafoeina maxima	a	Pr		
Phylum : Echinodermata					
Class : Stelleroidea					
Subclass : Ophiuroidea					
Juveniles		a	10		

Banks Island BR-83-6

	Genus-Species	Grab	N/M (m-2)	WW (g.m-2)	DW (g.m-2)
Phylum : Mollusca					
Class : Gastropoda					
Subclass : Prosobranchia					
Family : Buccinidae	Volutopsius sp 1	b	10	0.7	M (0.09)*
Cylichnidae	Scaphander punctostriatus	a	220	0.8	0.09
		b	290	2.6	0.37
		c	270	0.8	0.10
		d	270	0.9	0.12
		i	80	0.3	0.04
		j	72	0.3	0.03
Naticidae	Natica clausa	b	10	13.0	M (1.69)*
Retusidae	Retusa obtusa	b	20	0.1	0.01
		c	10		
		d	10		
		i	4		
Juveniles		a	10		
		b	20		
		c	20		
Class : Pelecypoda					
Family : Cardiidae	Clinocardium ciliatum	b	10		
	Serripes groenlandicus	a	60	0.9	0.08
		b	10	2.8	0.33
		c	10	2.0	0.25
		d	50	54.9	6.74
		i	16	2.1	0.24
Hiatellidae	Hiatella arctica	a	110		
		b	10		
		i	4	0.1	
Myidae	Mya truncata	a	10	0.2	0.02
Tellinidae	Macoma calcarea	c	30	0.6	0.06
		d	20	0.1	0.02
		j	4	0.1	0.01
Thraciidae	Thracia sp.	b	10		
Thyasiridae	Axinopsida orbiculata	a	200	0.6	0.06
		b	170	0.8	0.05
		c	220	2.5	0.15
		d	20	0.2	0.01
		i	48	0.3	0.02
		j	16	0.1	0.01
	Thyasira gouldii	a	40	0.1	
		b	270	0.5	0.04
		c	100	0.3	0.01
		d	40	0.1	
		i	8		
		j	4		
Veneridae	Liocyma fluctuosa	a	140	1.6	0.14
		b	580	6.2	0.62
		c	380	23.6	2.32
		d	50	2.5	0.18
		i	44	2.4	0.23
		j	32	1.4	0.11
Juveniles		c	80		
		d	10		
Fragments		b	Present		

Banks Island BR-83-6

	Genus-Species	Grab	N/M (m-2)	WW (g.m-2)	DW (g.m-2)
Phylum : Nemertinea		a	70		
		b	40		
		c	50		
		d	30	0.1	0.03
		i	16		
		j	56	0.1	0.01
Phylum : Protozoa					
Class : Sarcodina					
Order : Foraminifera					
Family : Fischerinidae	Cornuspira foliacea	c	Present		
Phylum : Sipuncula		b	10	0.2	0.03
		i	8		0.01
STATION TOTAL		a	3650	9.2	1.04
		b	3150	32.0	4.37
		c	2490	30.6	3.12
		d	3046	60.3	7.41
		i	1688	7.0	0.91
		j	3216	11.1	2.01

Banks Island BR83-6

FAMILY TOTALS	Grab	N/M (m-2)	WW (g.m-2)	DW (g.m-2)
Phylum:Annelida				
Class:Oligochaeta	a	30		
	b	480	0.1	0.05
	c	350		
	d	360		
	j	4		
Class:Polychaeta				
Family: Ampharetidae	i	40		
Apistobranchidae	b	20		
	d	10		
Capitellidae	b	20		
	c	40		
	d	30		
	i	40		
Cirratulidae	a	10	0.1	M (0.01)*
	b	40		
	c	30		
	d	70		
	i	8		
Dorvilleidae	b	80		
	c	90		
	d	190	0.1	0.02
	i	68		
	j	44	<0.1	0.01
Maldanidae	a	Pr		
	b	Pr		
	c	Pr		
	j	4	0.2	0.07
Nephtyidae	a	20	0.6	M
	b	10	0.4	0.13
	d	20	0.2	0.06
	j	4	0.2	0.06
Opheliidae	b	10	0.4	M
Orbiniidae	b	20	0.1	0.04
	c	50	0.2	0.06
	d	60	0.1	0.02
	i	20		
	j	20	0.1	0.05
Paraonidae	d	20		
Phyllodocidae	a	60		
	b	40	1.0	0.25
	c	50		M
	d	110	0.2	M (0.03)*
	i	8		
	j	4		
Polynoidae	j	4		M
Sabellidae	b	30		
	c	10		0.02
	d	10		
	i	4		
	j	8		0.01
Sigalionidae	a	50		
	b	40		
	c	10		
	i	8		
	j	12		

Banks Island BR83-6

FAMILY TOTALS	Grab	N/M (m-2)	WW (g.m-2)	DW (g.m-2)
Spionidae	a	70	0.2	0.04
	b	260	2.6	0.56
	c	270	0.4	0.12
	d	160	0.3	0.07
	i	60	0.1	0.03
	j	160	0.2	0.04
Syllidae	a	30		
	b	10		
	i	4		
Terebellidae	d	20		
Fragments and Nematodes	a	Pr	0.1	0.03
	b	Pr	0.1	0.05
	c	Pr	0.1	0.03
	d	Pr	0.1	0.06
	i	Pr	0.1	0.02
	j	Pr		0.02
Phylum:Arthropoda				
Class:Cirripedia				
Order:Thoracica				
Family:Balanidae	a	100	1.2	M (0.12)*
Class:Copepoda				
Order:Cyclopoida	d	120		
Order:Harpacticoida	a	20		
	b	90		
	c	60		
Class:Malacostraca				
Order:Amphipoda				
Family : Acanthonotozomatidae	a	40	0.1	
Ampeliscidae	j	24	0.1	0.03
Atylidae	a	100	1.4	0.28
	d	10		
	i	8	0.1	
	j	28	0.5	0.10
Corophiidae	a	80	0.1	
Isaeidae	b	50		
	c	30		
Ischyroceridae	a	900	0.1	
	b	100		
	c	130		
	d	770	0.1	
	i	428	0.2	0.04
	j	504	0.4	0.07
Lysianassidae	a	30		
	b	10		
	d	30		
	i	16		
	j	24	0.1	0.04
Oedicerotidae	a	370	0.2	0.06
	b	230	0.2	0.04
	c	150	0.1	
	d	100	0.1	
	i	572	1.1	0.23
	j	1792	6.6	1.21

Banks Island BR83-6

FAMILY TOTALS	Grab	N/M (m-2)	WW (g.m-2)	DW (g.m-2)
Pleustidae	i	4		
	j	20	0.1	0.03
Podoceridae	a	110	0.1	
	d	10		
	i	28		
	j	116	0.2	0.04
Stenothoidae	a	150	0.1	
	j	8		
Order:Cumacea				
Family : Diastylidae	a	40		
	i	4		
Lampropidae	a	510	0.5	0.06
	b	100		
	c	30		
	d	410	0.2	0.05
	i	136	0.1	0.02
	j	240	0.2	0.02
Nannastacidae	a	10		
	d	10		
	j	4		
Order:Isopoda				
Family : Munnidae	a	20		
	j	4		
Order:Tanaidacea	a	20		
	c	10		
	d	10		
	j	4		
Class:Ostracoda	b	10		
	d	70		
Arthropoda Fragments	a	Pr	0.2	0.05
	b	Pr		
	c	Pr		
	d	Pr		
	i	Pr	0.1	0.03
	j	Pr	0.2	0.04
Phylum:Bryzoa				
Class:Gymnolaemata				
Family:Alcyonidiidae	a	10		
	b	10		
	i	4		M
Scrupariidae	a	Pr		
Phylum:Chordata				
Subphylum:Urochordata				
Class:Ascidiacea	b	30	0.2	M (0.02)*
Phylum:Cnidaria				
Class:Anthozoa				
Order:Actiniaria	c	10		M
Class:Hydrozoa				
Family:Campanulariidae	a	Pr		

Banks Island BR83-6

FAMILY TOTALS	Grab	N/M (m-2)	WW (g.m-2)	DW (g.m-2)
Phylum : Mollusca				
Class : Gastropoda				
Subclass : Prosobranchia				
Family : Buccinidae	b	10	0.7	M (0.09)*
Cylichnidae	a	220	0.8	0.09
	b	290	2.6	0.37
	c	270	0.8	0.10
	d	270	0.9	0.12
	i	80	0.3	0.04
	j	72	0.3	0.03
Naticidae	b	10	13.0	M (1.69)*
Retusidae	b	20	0.1	0.01
	c	10		
	d	10		
	i	4		
Juveniles	a	10		
	b	20		
	c	20		
Class : Pelecypoda				
Family : Cardiidae	a	60	0.9	0.08
	b	20	2.8	0.33
	c	10	2.0	0.25
	d	50	54.9	6.74
	i	16	2.1	0.24
Hiatellidae	a	110		
	b	10		
	i	4	0.1	
Myidae	a	10	0.2	0.02
Tellinidae	c	30	0.6	0.06
	d	20	0.1	0.02
	j	4	0.1	0.01
Thraciidae	b	10		
Thyasiridae	a	240	0.7	0.06
	b	440	1.3	0.09
	c	320	2.8	0.16
	d	60	0.3	0.01
	i	56	0.3	0.02
	j	20	0.1	0.01
Veneridae	a	140	1.6	0.14
	b	580	6.2	0.62
	c	380	23.6	2.32
	d	50	2.5	0.18
	i	44	2.4	0.23
	j	32	1.4	0.11
Juveniles	c	80		
	d	10		
Fragments	b	Pr		
Phylum : Nemertinea	a	70		
	b	40		
	c	50		
	d	30	0.1	0.03
	i	16		
	j	56	0.1	0.01
	i	4		M

Banks Island BR83-6

FAMILY TOTALS	Grab	N/M (m-2)	WW (g.m-2)	DW (g.m-2)
Phylum : Protozoa				
Class : Sarcodina				
Order : Foraminifera				
Family : Fischerinidae	c	Pr		
Phylum : Echinodermata				
Class : Stelleroidea				
Subclass : Ophiuroidea				
Juveniles	a	10		
Phylum : Sipuncula	b	10	0.2	0.03
	i	8		0.01
STATION TOTAL	a	3650	9.2	1.04
	b	3150	32.0	4.37
	c	2490	30.6	3.12
	d	3046	60.3	7.41
	i	1688	7.0	0.91
	j	3216	11.1	2.01

Banks Island BR-83-8

	Genus-Species	Grab	N/M (m-2)	WW (s.m-2)	DW (s.m-2)
Phylum:Annelida					
Class:Oligochaeta		a	330		Museum
		b	590	0.1	0.03
		c	280	0.1	0.02
		d	370		
		e	164		
		f	73		
		g	218		
		h	91		
		j	300	0.1	0.03
Class:Polychaeta					
Family: Ampharetidae	Ampharete acutifrons	a	330	0.6	0.20
		b	210	0.4	0.13
		c	170	0.2	0.05
		d	100	0.1	0.06
		e	146	0.2	0.07
		f	91	0.2	0.09
		h	36		
		i	36	0.1	0.03
		j	32		0.02
	Ampharete sp.	a	140	0.4	0.11
		b	190	0.4	0.10
		c	120	0.2	0.07
		d	360	0.5	0.18
		e	255	0.2	0.07
		f	164	0.2	0.05
		g	164	0.4	0.11
		h	237	0.4	0.13
		i	280	0.4	0.08
		j	72	0.1	0.02
Amphictenidae	Pectinaria hyperborea	a	10	8.4**	M (3.00)*
		b	20	6.1**	M (2.20)*
		d	20	5.9**	M (2.10)*
		f	18	4.5**	3.15**
		h	18	1.5	0.62
		i	12	1.8	0.64
Aristobranchidae	Aristobranchus ornatus	a	10		
		c	10		
		d	10		
		f	18		
		i	4		
Capitellidae	Capitella sp.	a	290	0.1	0.05
		b	80		
		c	100		
		d	150	0.1	0.04
		e	91		
		f	109		
		g	18		
		h	36		
		i	24		
		j	32		

** =WEIGHED IN TUBES

Banks Island BR-83-8

	Genus-Species	Grab	N/M (m-2)	WW (g.m-2)	DW (g.m-2)
Cirratulidae	Chaetozone/Tharyx complex	a	10	0.1	0.04
		b	10		
		c	10		
		f	18		
		h	18		
Cossuridae	Cossura soyeri	a	10		
		b	10		
		c	10		
		g	18		
		i	4		
Dorvilleidae	Dorvillea sp.	a	50		
		b	20		
		c	30		
		g	18		
		i	4		
		j	4		
Hesionidae	Castalia aphroditoides	j	4		
Lumbrineridae	Lumbrineris zonata	a	10		
	Lumbrineris sp.	g	18	0.2	0.04
Maldanidae	Praxillella praetermissa	a	20	0.7	0.21
		b	10		
		d	30	0.7	M (0.21)*
	fragmented	a	870	3.1	1.07
		b	140	0.3	0.11
		c	320	1.2	0.48
		d	1160	4.1	1.43
		e	601	1.1	0.33
		f	473	1.6	0.44
		g	364	1.1	0.25
		h	164	0.4	0.15
		i	520	0.4	0.11
		j	36	0.2	0.06
Nephtyidae	Nephtys cornuta	a	60	0.1	0.03
		b	100	0.2	0.05
		c	90	0.1	0.03
		d	70		
		e	55		
		f	73	0.2	0.04
		g	73	0.2	0.04
		h	73	0.2	0.07
		i	44	0.1	0.02
		j	52	0.1	0.03
	Nephtys longosetosa	a	70	1.2	0.33
		b	50	2.4	0.62
		c	10	2.9	M (0.75)*
		d	30	2.8	M (0.72)*
		e	55	2.4	M (0.62)*
		f	18		
		h	18	0.4	0.31
		i	28	1.1	0.22
		j	4	0.4	0.08

Banks Island BR-83-8

	Genus-Species	Grab	N/M (m-2)	WW (g.m-2)	DW (g.m-2)
	Nephtys ?punctata	a	30	3.1	0.70
		b	10	0.2	0.07
		c	30	1.1	M (0.28)*
		d	20	16.0	4.23
		f	55	3.3	M (0.84)*
		h	18	2.0	0.44
		i	28	1.4	M (0.36)*
		j	4	0.6	0.17
	Nephtys sp.	d	10	0.2	M (0.07)*
		g	55	5.6	1.00
Orbiniidae	Leitoscoloplos panamensis	a	20	0.6	0.16
		c	10	0.2	0.09
		e	18	0.4	0.16
		h	18	0.9	0.27
		i	4	<0.1	0.01
		j	4	<0.1	0.02
	Leitoscoloplos pugettensis	a	540	1.6	0.48
		b	140	1.3	M (0.41)*
		b	410	1.5	0.44
		c	220	0.7	0.27
		d	310	1.5	0.47
		e	164	0.5	0.18
		f	273	0.5	0.20
		g	309	1.5	0.36
		h	18	0.2	M (0.02)*
		h	127	0.5	0.04
		i	380	0.4	0.07
		j	248	1.0	0.22
Paraonidae	Aricidea lopezi	a	170	0.3	0.13
		b	230	0.2	0.08
		c	140	0.1	0.05
		d	40		Museum
		d	280	0.3	0.16
		e	91		
		f	109	0.2	0.07
		g	73	0.2	0.05
		h	73		
		i	8		
		j	4		
	Aricidea suecica	a	30		
		b	10		
		g	55		
	Paraonella sp.	a	30		
		b	40		
		c	10		Museum
		d	50		
		e	18		
Phyllodocidae	Eteone ?longa	a	130	0.1	0.02
		b	100	0.1	0.02
		c	100	0.1	0.02
		d	130	0.1	0.02
		e	55		
		f	55		
		h	18		
		i	88	<0.1	0.01
		j	40		

Banks Island BR-83-8

	Genus-Species	Grab	N/M (m-2)	WW (g.m-2)	DW (g.m-2)
	Eteone sp.1	a	20		Museum
		b	20		Museum
		d	10		Museum
		f	18		Museum
		i	12		
	Eteone sp.2	a	10		Museum
		b	10	0.3	M (0.05)*
		c	30	0.3	M (0.05)*
		f	36	1.1	M (0.17)*
		g	18		
		i	8	0.2	0.03
	Eteone sp. juvenile	c	10		
	Mystides ?borealis	e	18		Museum
		i	8		
		j	8		
	Phyllodoce groenlandica	a	140	0.1	0.04
		b	160	0.2	0.04
		c	110	0.1	M (0.04)*
		d	200	0.2	0.06
		e	200	0.2	0.05
		f	55		
		g	55		
		h	146	0.2	0.05
		i	120	0.2	0.04
		j	56	0.2	0.04
	Phyllodoce ?mucosa	c	10	8.8	M (2.17)***
Polynoidae	Antinoella sarsi	h	18	5.5	M (0.90)***
	Melaenis loveni	f	18	0.5	M (0.10)***
Sabellidae	Chone duneri	a	520	2.1	0.64
		b	510	3.6	0.95
		c	160	2.1	0.69
		d	690	3.1	0.90
		e	528	1.8	0.64
		f	182	0.5	0.18
		g	18	0.2	0.07
		h	55	0.2	0.09
		i	36		0.01
		j	24		0.01
	Euchone analis	b	10		
		d	10	0.1	0.02
		i	4		0.02
	Euchone incolor	i	12		
	Euchone sp.	g	18		
		h	18		
Sigalionidae	Pholoe minuta	a	480	0.8	0.20
		b	230	0.3	M (0.09)*
		c	380	0.4	0.13
		d	420	0.3	0.09
		e	346	0.4	0.11
		f	55		
		g	255	0.4	0.07
		h	218	0.4	0.09
		i	196	0.2	0.06
		j	72	0.2	0.06

Banks Island BR-83-8

	Genus-Species	Grab	N/M (m-2)	WW (g.m-2)	DW (g.m-2)
Sphaerodoridae	Sphaerodoropsis minuta	a	10		
Spionidae	Dispio sp.	a	10		
		d	10		
		j	12		
	Polydora sp.	a	20		
		b	20		
		c	80	0.1	M (0.04)*
		d	20		
		e	18		Museum
		f	36		Museum
		g	18		
	Prionospio cirrifera	a	30		
		b	20		
		c	30		
		i	28		
		j	4		
	Prionospio steenstrupi	a	20		Museum
		b	30	0.1	M (0.04)*
		c	10		
		d	10		
		g	18		Museum
		h	18		
		i	16		
	Pygospio elegans	a	1460	0.1	0.05
		b	2740	0.1	M (0.04)*
		c	1720		Museum
		d	2020	0.2	0.07
		e	2002	0.2	0.09
		f	2311	0.4	0.11
		g	1401	0.2	0.05
		h	746		
		i	1548	0.3	0.06
		j	324	<0.1	0.01
	Scolecolepides sp.	g	18	0.2	0.02
	Unidentified (parisitized)	c	10		
		d	10		
	Unidentified	d	10		
Syllidae	Exogone tatarica	b	10		
		c	10		
	Exogone sp.(epitokus)	a	10		
		b	10		
		c	20		
		i	4		
		j	4		
	Unidentified (sexual)	a	10		
		h	10		
Terebellidae	Nicolea zostericola	i	4		
	Proclea graffi	f	18		Museum
		h	18		Museum
		j	4		

Banks Island BR-83-8

	Genus-Species	Grab	N/M (m-2)	WW (g.m-2)	DW (g.m-2)
Trichobranchidae	Terebellides stroemi	a	50	0.3	M (0.07)*
		b	10		
		c	30		
		d	10		
		e	36	1.3	M (0.30)*
		f	36		
		g	18		
		h	18		
		i	28	0.3	0.07
Fragments and Nematodes		a	Pr	0.8	0.32
		b	Pr	0.8	0.13
		c	Pr	0.8	0.11
		d	Pr	0.8	0.20
		e	Pr	0.2	0.07
		f	Pr	0.4	0.13
		g	Pr	0.2	0.04
		h	Pr	0.2	0.05
		i	Pr	0.1	0.04
		j	Pr	0.1	0.03
Phylum:Arthropoda					
Class:Copepoda					
Order:Cyclopoida	Oncaea sp.	a	260		
		c	20		
		d	10		
		g	18		
		h	36		
		i	80		
		j	12		
Order:Harpacticoida		a	40		
		b	60		
		d	80		
		e	109		
		g	18		
		h	18		
		j	4		
Class:Malacostraca					
Order:Amphipoda					
Family : Acanthonotozomatidae	Acanthonotozoma sp.	i	4		
Ampeliscidae	Ampelisca macrocephala	g	18	0.2	M (0.05)*
		i	4		

Banks Island BR-83-8

	Genus-Species	Grab	N/M (m-2)	WW (g.m-2)	DW (g.m-2)
	Byblis gaimardi	a	60		
		b	60	1.4	0.25
		c	30		
		d	40	0.4	0.09
		f	36		
		g	18		
		i	100	0.2	0.04
		j	24		
	Harpoops tubicola	a	10	0.1	0.04
		c	10	0.1	0.03
		h	18	0.9	0.18
Atylidae	Atylus carinatus	a	50	0.2	0.05
		b	40	0.9	0.20
		d	40	0.6	0.12
		e	36	1.6	0.33
		f	18	1.3	0.25
		g	36	0.4	0.09
		i	40	0.8	M (0.15)*
		j	24	0.8	0.15
Corophiidae	Corophium crassicorne	i	8		
	Erichthonius hunteri	c	10		
		d	30	0.1	0.01
		e	36		
		f	18		
		g	73	0.2	0.05
		i	16	<0.1	0.01
		j	12	<0.1	0.01
Isaeidae	Protomedeia fasciata	b	20		Museum
		d	30		
		i	8		
		j	8		
Ischyroceridae	Ischyrocerus anguipes	a	1000	0.3	0.05
		b	930	0.2	0.05
		c	680	0.1	0.04
		d	700	0.2	0.03
		e	1165	0.4	0.07
		f	1128	0.4	0.07
		g	1238	0.2	0.05
		h	619		
		i	492	0.2	0.05
		j	348	0.2	0.03
	Ischyrocerus sp.	b	10		
Lysianassidae	Anonyx nugax	a	20	1.1	0.24
		g	18	2.0	0.33
		i	24	0.3	0.06
		j	4		
	Boeckosimus plautus	a	40	0.5	0.12
		d	30	0.3	0.07
		e	36	0.4	0.13
		g	91		
		i	72	0.6	0.16
		j	88	0.9	0.26

Banks Island BR-83-8

	Genus-Species	Grab	N/M (m-2)	WW (g.m-2)	DW (g.m-2)
	Boeckosimus sp.	a	50		
		b	40		
		c	30		
		e	73		
		f	18		
		g	36		
		h	36		
	Hippomedon holbolli	i	4		Museum
	Orchomene sp.	a	10		
		b	10		
		c	10		
		i	20		
Oedicerotidae	Acanthostepheia behringiensis	j	4	<0.1	0.01
	Aceroides latipes	b	30	0.1	0.02
		i	24	0.1	0.01
	Monoculodes borealis	a	230	0.6	0.16
		b	50	0.1	0.03
		c	20		
		d	120	0.3	0.07
		e	127	0.4	0.09
		f	73		
		g	146	0.5	0.09
		i	184	0.5	0.12
		j	160	0.5	0.10
	Monoculodes longirostris	a	540	0.9	0.15
		b	390	0.8	0.14
		c	170	0.3	0.06
		d	390	0.8	0.14
		e	309	0.5	0.11
		f	237	0.5	0.09
		g	273	0.4	0.09
		h	218	0.4	0.07
		i	476	0.9	0.17
		j	384	0.8	0.14
	Monoculodes sp.	a	180		
		b	30		
		d	80		
		e	146		
		f	146		
		g	146		
		h	109		
		i	40		
		j	28		
	Monoculopsis longicornis	g	18		
		i	4		
	Paroediceros lynceus	a	20	0.7	0.13
		d	10		
		e	18	0.2	0.04
		i	8		
		j	4		

Banks Island BR-83-8

	Genus-Species	Grab	N/M (m-2)	WW (g.m-2)	DW (g.m-2)
Pleustidae	Pleustes sp.	a	10		
		b	10	0.5	M (0.15)*
		d	20	0.1	0.04
		f	18		
		g	55		
		i	16	1.0	M (0.30)*
		j	12	0.1	0.02
Podoceridae	Paradulichia typica	a	40		
		d	10		
		h	18		
		j	8		
Stenothoidae	Metopella sp.	a	70		
		d	20		
		e	36		
		i	28		
		j	4		
Unidentified Amphipoda		d	20		Museum
Order:Cumacea					
Family : Diastylidae	Diastylis edwardsi	a	30	0.1	0.04
		b	60	0.3	0.09
		c	40	0.1	0.04
		d	60	0.3	0.09
		e	18		
		g	18		
		h	18		
		i	32	0.1	0.05
		j	52	0.2	0.07
	Diastylis oxyrhyncha	a	70		
		b	170	0.2	0.08
		c	40	0.5	0.17
		d	160	0.2	0.08
		e	437	0.2	0.05
		f	182		
		g	109	0.7	0.27
		h	164	0.4	0.09
		i	84	0.1	0.04
		j	40	0.1	0.04
	Diastylis sulcata	i	4	0.3	0.13
	Diastylis tumida	i	4		
Lampropidae	Lamprops fuscata	a	200	0.1	0.03
		b	130		
		c	60		
		d	160	0.1	0.02
		e	182		
		f	109		
		g	164		
		h	109		
		i	156	0.1	0.02
		j	144	0.1	0.02

Banks Island BR-83-8

	Genus-Species	Grab	N/M (m-2)	WW (g.m-2)	DW (g.m-2)
Nannastacidae	Campylaspis costata	a	20		
		b	10		
		d	20		
		f	36		
		g	18		
		h	18		
		i	12		
		j	8		
Order:Isopoda					
Family : Munnidae	Munna sp.	d	20		
Order:Mysidacea		f	18	0.2	0.04
		j	4		
Order:Tanaidacea	Leptognathia gracilis	a	70		
		d	40		
		e	18		
		f	55		
		g	18		
		h	36		
		i	64		
Class:Ostracoda		a	470	0.2	
		b	30		
		d	470	0.2	
		e	528	0.1	
		f	260		
		g	50		
		h	150		
		i	30		
		j	20		
Class:Pycnogida					
Family:Nymphonidae	Nymphon sp.	h	18		
		j	4		
Arthropoda Fragments		a	Pr	0.2	0.04
		b	Pr	0.1	0.04
		d	Pr		
		e	Pr		
		g	Pr		
		j	Pr		
Phylum:Bryzoa					
Class:Gymnolaemata					
Family:Alcyonidiidae	Alcyonidium sp.	a	30		Museum
		c	20		Museum
		h	36		Museum
		j	4		Museum
Bicellariellidae	Caulibugula sp.	a	Pr		
		g	Pr		
Scrupariidae	Eucratea loricata	a	Pr		
		d	Pr		
		i	Pr		
		j	Pr		

Banks Island BR-83-8

	Genus-Species	Grab	N/M (m-2)	WW (g.m-2)	DW (g.m-2)
Phylum:Chordata					
SubPhylum:Urochordata					
Class:Ascidiacea		a	10		
		b	20		
		c	10		
Phylum:Cnidaria					
Class:Anthozoa					
Order:Actiniaria		i	12		Museum
Class:Hydrozoa					
Family:Campanulariidae		a	Pr		
		e	Pr		
		f	Pr		
		j	Pr		
Campanulinidae	Lafoeina maxima	d	Pr		
		e	Pr		
		f	Pr		
		g	Pr		
		h	Pr		
		i	Pr		
Phylum : Echinodermata					
Class : Holothuroidea		b	10		
		d	10		
Class : Stelleroidea					
Subclass : Ophiuroidea					
Juveniles		a	30		
		b	20		
		c	20		
		d	50		
		e	73		
		f	91		
		g	91		
		h	109		
		i	32		
		j	28		
Phylum : Mollusca					
Class : Gastropoda					
Subclass : Opisthobranchia					
Order : Cephalaspidea		b	20	0.2	Museum
		d	20	0.2	Museum
		f	36	0.1	Museum
Order : Thecosomata					
Family : Limacinidae	Limacina helicina (pelagic)	c	10	0.1	Museum
Unidentifiable	(pelagic)	a	10	0.1	Museum

Banks Island BR-83-8

	Genus-Species	Grab	N/M (m-2)	WW (g.m-2)	DW (g.m-2)
Subclass : Prosobranchia					
Family : Buccinidae	Buccinium sp.	c	10	7.2	1.02
	Volutopsius sp 1	a	20	0.1	0.02
		b	40	0.1	0.02
		c	10	0.1	0.03
		d	20	0.3	0.02
		e	36	0.2	0.02
		g	18		
		h	18	0.3	0.02
		i	16	0.8	0.07
		j	8		
Cylichnidae	Scaphander punctostriatus	a	530	3.4	0.44
		b	260	2.4	0.35
		c	290	2.8	0.41
		d	200	0.5	0.06
		e	400	2.2	0.33
		f	473	1.1	0.13
		g	200	4.9	0.76
		h	237	0.2	0.02
		i	200	2.3	0.29
		j	196	2.6	0.33
Naticidae	Amauropsis purpurea	b	10	0.1	0.03
		i	4		
	Lunatia pallida	d	10	0.4	M (0.05)*
		f	18	1.1	0.13
		h	18	0.1	0.04
		i	48	0.1	0.01
		j	8	0.3	0.03
	Natica clausa	c	10	1.9	M (0.25)*
		d	10	2.0	M (0.26)*
Retusidae	Retusa obtusa	a	40	0.2	0.02
		b	20	0.1	0.01
		d	60	0.1	0.01
		e	91	0.2	0.02
		g	18	0.1	0.02
		j	8		
Turridae	Oenopota incisula	i	4	0.1	0.01
Juveniles		a	10		
		d	30		
		e	18		
		f	55		
Unidentifiable		j	4		
Class : Pelecypoda					
Family : Cardiidae	Clinocardium ciliatum	c	10	0.2	0.01
		d	30	16.3	1.12
		g	18	14.5	1.69
		i	16	1.4	0.20

Banks Island BR-83-8

	Genus-Species	Grab	N/M (m-2)	WW (g.m-2)	DW (g.m-2)
	Serripes groenlandicus	a	180	80.7	9.08
		b	120	1.0	0.09
		c	260	26.6	3.35
		d	280	18.1	1.82
		e	146	9.6	0.87
		f	55	0.8	1.17
		g	127	1.4	0.15
		h	127	9.7	1.17
		i	128	36.4	5.24
		j	92	10.1	1.20
Hiatellidae	Hiatella arctica	a	50		
		d	10		
		e	36		
		f	18		
		g	18		
		i	12		
Myidae	Mya truncata	a	80 (2 Museum)	55.0	8.27
		b	30	1.8	0.13
		c	60	1.1	0.12
		d	50	5.0	0.63
		f	91	1.7	0.16
		i	72	0.8	0.10
		j	20		
	Mya sp.	d	50		
		e	36		
		g	36		
		h	36		
Mytilidae	Musculus niger	h	18		
		i	8		
	Musculus sp.	a	30		
		b	10		
		c	10		
		d	20		
		g	18		
		j	8		
Nuculanidae	Portlandia arctica	b	10	2.0	0.21
		c	10	2.0	0.21
		d	10	1.9	0.20
		f	18	2.5	0.33
Pandoridae	Pandora glacialis	i	8	0.2	0.01
Tellinidae	Macoma calcarea	a	180	3.5	0.49
		b	180	3.2	0.37
		c	180	2.7	0.33
		d	160	2.3	0.24
		e	109	0.7	0.09
		f	91	1.4	0.15
		g	109	0.9	0.09
		h	164	1.6	0.20
		i	188	2.8	0.34
		j	20	0.5	0.05
Thraciidae	Thracia devexa	e	18	0.6	M (0.08)*

Banks Island BR-83-8

	Genus-Species	Grab	N/M (m-2)	WW (g.m-2)	DW (g.m-2)
Thyasiridae	Axinopsida orbiculata	a	2120	7.8	0.58
		b	1990	4.3	0.31
		c	1730	3.8	0.25
		d	2330	3.4	0.23
		e	1765	2.7	0.18
		f	1511	2.7	0.18
		g	1456	3.2	0.26
		h	1001	1.8	0.15
		i	1280	3.5	0.20
		j	216	1.0	0.06
	Thyasira gouldii	a	340	0.4	0.02
		b	180	0.2	0.03
		c	350	0.3	0.02
		d	280	0.3	0.02
		e	164	0.2	
		f	36		
		g	73	0.1	
		h	109	0.1	0.02
		i	36	0.1	
		j	60	0.2	0.01
Veneridae	Liocyma fluctuosa	a	1040	31.6	3.11
		b	990	30.8	2.19
		c	1000	47.7	3.61
		d	1590	19.5	1.53
		e	1347	27.5	2.29
		f	928	15.9	1.26
		g	892	35.2	3.11
		h	819	40.0	4.13
		i	916	23.8	2.22
		j	368	19.2	1.48
Juveniles		a	710	0.1	0.02
		b	320	0.1	0.01
		c	150		
		d	390		
		e	255		
		f	437		
		g	601	0.1	
		h	273		
		i	20		
		j	8		
Fragments		d	Present	0.1	0.04
		j	Present		
Phylum:Nemertinea		a	130		
		b	150	1.3	0.36
		c	180	0.9	0.09
		d	120	0.1	0.03
		e	218		
		f	146		
		g	400		
		h	200		
		i	116	0.3	0.05
		j	64	0.4	0.07

Banks Island BR-83-8

	Genus-Species	Grab	N/M (m-2)	WW (g.m-2)	DW (g.m-2)
Phylum : Protozoa					
Class : Sarcodina					
Order : Foraminifera					
Family : Elphidiidae	Elphidium arcticum	d	Present		
		f	Present		
	Elphidium sp.1	d	Present		
Miliolidae	Miliolina seminulum	d	Present		
Phylum:Sipuncula		a	20		
		b	60	0.1	0.03
		c	10	0.1	0.03
		d	20		
		e	18		
		f	18		
		g	55	0.2	0.04
		h	55	0.2	0.04
		i	44	0.1	0.03
		j	48	1.8	0.46
Unidentified		d	30		
STATION TOTAL		a	15000	212.5	30.95
		b	12670	70.9	10.75
		c	9720	118.1	13.24
		d	14900	111.1	18.01
		e	12865	56.6	7.39
		f	10686	43.3	9.43
		g	9929	75.6	9.24
		h	7033	68.7	8.46
		i	8686	84.9	11.97
		j	3904	42.8	5.33

Banks Island BR83-8

FAMILY TOTALS	Grab	N/M (m-2)	WW (g.m-2)	DW (g.m-2)
Phylum:Annelida				
Class:Oligochaeta	a	330		M
	b	590	0.1	0.03
	c	280	0.1	0.02
	d	370		
	e	164		
	f	73		
	g	218		
	h	91		
	j	300	0.1	0.03
Class:Polychaeta				
Family: Ampharetidae	a	470	1.0	0.31
	b	400	0.8	0.23
	c	290	0.4	0.12
	d	460	0.6	0.24
	e	401	0.4	0.14
	f	255	0.4	0.14
	g	164	0.4	0.11
	h	273	0.4	0.13
	i	316	0.5	0.11
	j	104	0.1	0.04
Amphictenidae	a	10	8.4**	M (3.00)*
	b	20	6.1**	M (2.20)*
	d	20	5.9**	M (2.10)*
	f	18	4.5**	3.15**
	h	18	1.5	0.62
	i	12	1.8	0.64
Aristobranchidae	a	10		
	c	10		
	d	10		
	f	18		
	i	4		
Capitellidae	a	290	0.1	0.05
	b	80		
	c	100		
	d	150	0.1	0.04
	e	91		
	f	109		
	g	18		
	h	36		
	i	24		
	j	32		
Cirratulidae	a	10	0.1	0.04
	b	10		
	c	10		
	f	18		
	h	18		
Cossuridae	a	10		
	b	10		
	c	10		
	g	18		
	i	4		

** =WEIGHED IN TUBES

Banks Island BR83-8

FAMILY TOTALS	Grab	N/M (m-2)	WW (g.m-2)	DW (g.m-2)
Dorvilleidae	a	50		
	b	20		
	c	30		
	g	18		
	i	4		
	j	4		
Hesionidae	j	4		
Lumbrineridae	a	10		
	g	18	0.2	0.04
Maldanidae	a	890	3.8	1.28
	b	150	0.3	0.11
	c	320	1.2	0.48
	d	1190	4.8	M (1.64)*
	e	601	1.1	0.33
	f	473	1.6	0.44
	g	364	1.1	0.25
	h	164	0.4	0.15
	i	520	0.4	0.11
	j	36	0.2	0.06
Nephtyidae	a	160	4.4	1.06
	b	160	2.8	0.74
	c	130	4.1	M (1.06)*
	d	130	19.0	M (5.02)*
	e	110	2.4	M (0.62)*
	f	146	3.5	M (0.88)*
	g	128	5.8	1.04
	h	109	2.6	0.82
	i	100	2.6	M (0.60)*
	j	60	1.1	0.28
Orbiniidae	a	560	2.2	0.64
	b	550	2.8	M (0.85)*
	c	230	0.9	0.36
	d	310	1.5	0.47
	e	182	0.9	0.34
	f	273	0.5	0.20
	g	309	1.5	0.36
	h	163	1.6	M (0.33)*
	i	384	0.4	0.08
	j	252	1.0	0.24
Paraonidae	a	230	0.3	0.13
	b	280	0.2	0.08
	c	150	0.1	M 0.05
	d	370	0.3	M 0.16
	e	109		
	f	109	0.2	0.07
	g	128	0.2	0.05
	h	73		
	i	8		
	j	4		
Phyllodocidae	a	300	0.2	M 0.06
	b	290	0.6	M (0.11)*
	c	260	9.3	M (2.28)* & ***
	d	340	0.3	M 0.08
	e	273	0.2	M 0.05
	f	164	1.1	M (0.17)*
	g	73		
	h	164	0.2	0.05
	i	236	0.4	0.08
	j	104	0.2	0.04

Banks Island BR83-8

FAMILY TOTALS	Grab	N/M (m-2)	WW (g.m-2)	DW (g.m-2)
Polynoidae	f	18	0.5	M (0.10)***
	h	18	5.5	M (0.90)***
Sabellidae	a	520	2.1	0.64
	b	520	3.6	0.95
	c	160	2.1	0.69
	d	700	3.2	0.92
	e	528	1.8	0.64
	f	182	0.5	0.18
	g	36	0.2	0.07
	h	73	0.2	0.09
	i	52		0.03
	j	24		0.01
Sigalionidae	a	480	0.8	0.20
	b	230	0.3	M (0.09)*
	c	380	0.4	0.13
	d	420	0.3	0.09
	e	346	0.4	0.11
	f	55		
	g	255	0.4	0.07
	h	218	0.4	0.09
	i	196	0.2	0.06
	j	72	0.2	0.06
Sphaerodoridae	a	10		
Spionidae	a	1540	0.1	M 0.05
	b	2810	0.2	M (0.08)*
	c	1850	0.1	M (0.04)*
	d	2080	0.2	0.07
	e	2030	0.2	0.09M
	f	2347	0.4	0.11M
	g	1455	0.4	0.07M
	h	764		
	i	1592	0.3	0.06
	j	340	<0.1	0.01
Syllidae	a	20		
	b	20		
	c	30		
	h	10		
	i	4		
	j	4		
Terebellidae	f	18		M
	h	18		M
	i	4		
	j	4		
Trichobranchidae	a	50	0.3	M (0.07)*
	b	10		
	c	30		
	d	10		
	e	36	1.3	M (0.30)*
	f	36		
	g	18		
	h	18		
	i	28	0.3	0.07

Banks Island BR83-8

FAMILY TOTALS	Grab	N/M (m-2)	WW (g.m-2)	DW (g.m-2)
Annelid Fragments and Nematodes	a	PP	0.8	0.32
	b	PP	0.8	0.13
	c	PP	0.8	0.11
	d	PP	0.8	0.20
	e	PP	0.2	0.07
	f	PP	0.4	0.13
	g	PP	0.2	0.04
	h	PP	0.2	0.05
	i	PP	0.1	0.04
	j	PP	0.1	0.03
Phylum:Arthropoda				
Class:Copepoda				
Order:Cyclopoida	a	260		
	c	20		
	d	10		
	g	18		
	h	36		
	i	80		
	j	12		
Order:Harpacticoida	a	40		
	b	60		
	d	80		
	e	109		
	g	18		
	h	18		
	j	4		
Class:Malacostraca				
Order:Amphipoda				
Family : Acanthonotozomatidae	i	4		
Ampeliscidae	a	70	0.1	0.04
	b	60	1.4	0.25
	c	40	0.1	0.03
	d	40	0.4	0.09
	f	36		
	g	36	0.2	M (0.05)*
	h	18	0.9	0.18
	i	104	0.2	0.04
	j	24		
Atylidae	a	50	0.2	0.05
	b	40	0.9	0.20
	d	40	0.6	0.12
	e	36	1.6	0.33
	f	18	1.3	0.25
	g	36	0.4	0.09
	i	40	0.8	M (0.15)*
	j	24	0.8	0.15
Corophiidae	c	10		
	d	30	0.1	0.01
	e	36		
	f	18		
	g	73	0.2	0.05
	i	24	<0.1	0.01
	j	12	<0.1	0.01

Banks Island BR83-8

FAMILY TOTALS	Grab	N/M (m-2)	WW (g.m-2)	DW (g.m-2)
Isaeidae	b	20		M
	d	30		
	i	8		
	j	8		
Ischyroceridae	a	1000	0.3	0.05
	b	940	0.2	0.05
	c	680	0.1	0.04
	d	700	0.2	0.03
	e	1165	0.4	0.07
	f	1128	0.4	0.07
	g	1238	0.2	0.05
	h	619		
	i	492	0.2	0.05
	j	348	0.2	0.03
Lysianassidae	a	120	1.6	0.36
	b	50		
	c	40		
	d	30	0.3	0.07
	e	109	0.4	0.13
	f	18		
	g	145	2.0	0.33
	h	36		
	i	120	0.9	0.22M
	j	92	0.9	0.26
Oedicerotidae	a	970	2.2	0.44
	b	500	1.0	0.19
	c	190	0.3	0.06
	d	600	1.1	0.21
	e	600	1.1	0.24
	f	456	0.5	0.09
	g	583	0.9	0.18
	h	327	0.4	0.07
	i	736	1.5	0.30
	j	580	1.3	0.25
Pleustidae	a	10		
	b	10	0.5	M (0.15)*
	d	20	0.1	0.04
	f	18		
	g	55		
	i	16	1.0	M (0.30)*
	j	12	0.1	0.02
Podoceridae	a	40		
	d	10		
	h	18		
	j	8		
Stenothoidae	a	70		
	d	20		
	e	36		
	i	28		
	j	4		
Unidentified Amphipoda	d	20		M

Banks Island BR83-8

FAMILY TOTALS	Grab	N/M (m-2)	WW (g.m-2)	DW (g.m-2)
Order:Cumacea				
Family : Diastylidae	a	100	0.1	0.04
	b	230	0.5	0.17
	c	80	0.6	0.21
	d	220	0.5	0.17
	e	455	0.2	0.05
	f	182		
	g	127	0.7	0.27
	h	182	0.4	0.09
	i	124	0.5	0.22
	j	92	0.3	0.11
Lampropidae	a	200	0.1	0.03
	b	130		
	c	60		
	d	160	0.1	0.02
	e	182		
	f	109		
	g	164		
	h	109		
	i	156	0.1	0.02
	j	144	0.1	0.02
Nannastacidae	a	20		
	b	10		
	d	20		
	f	36		
	g	18		
	h	18		
	i	12		
	j	8		
Order:Isopoda				
Family : Munnidae	d	20		
Order:Mysidacea	f	18	0.2	0.04
	j	4		
Order:Tanaidacea	a	70		
	d	40		
	e	18		
	f	55		
	g	18		
	h	36		
	i	64		
Class:Ostracoda	a	470	0.2	
	b	30		
	d	470	0.2	
	e	528	0.1	
	f	260		
	g	50		
	h	150		
	i	30		
	j	20		
Class:Pycnogida				
Family:Nymphonidae	h	18		
	j	4		

Banks Island BR83-8

FAMILY TOTALS	Grab	N/M (m-2)	WW (g.m-2)	DW (g.m-2)
Arthropoda Fragments	a	Pr	0.2	0.04
	b	Pr	0.1	0.04
	d	Pr		
	e	Pr		
	g	Pr		
	j	Pr		
Phylum:Bryzoa				
Class:Gymnolaemata				
Family:Alcyonidiidae	a	30		M
	c	20		M
	h	36		M
	j	4		M
Bicellariellidae	a	Pr		
	g	Pr		
Scrupariidae	a	Pr		
	d	Pr		
	i	Pr		
	j	Pr		
Phylum:Chordata				
Subphylum:Urochordata				
Class:Ascidiacea	a	10		M
	b	20		M
	c	10		M
Phylum:Cnidaria				
Class:Anthozoa				
Order:Actiniaria	i	12		M
Class:Hydrozoa				
Family:Campanulariidae	a	Pr		
	e	Pr		
	f	Pr		
	j	Pr		
Campanulinidae	d	Pr		
	e	Pr		
	f	Pr		
	g	Pr		
	h	Pr		
	i	Pr		
Phylum : Echinodermata				
Class : Holothuroidea	b	10		
	d	10		
Class : Stelleroidea				
Subclass : Ophiuroidea				
Juveniles	a	30		
	b	20		
	c	20		
	d	50		
	e	73		
	f	91		
	g	91		
	h	109		
	i	32		
	j	28		

Banks Island BR83-8

	FAMILY TOTALS	Grab	N/M (m-2)	WW (g.m-2)	DW (g.m-2)
Phylum : Mollusca					
Class : Gastropoda					
Subclass : Opisthobranchia					
Order : Cephalaspidea		b	20	0.2	M
		d	20	0.2	M
		f	36	0.1	M
Order : Thecosomata					
Limacinidae	(pelagic)	c	10	0.1	M
Unidentifiable	(pelagic)	a	10	0.1	M
Subclass : Prosobranchia					
Family : Buccinidae		a	20	0.1	0.02
		b	40	0.1	0.02
		c	20	7.3	1.05
		d	20	0.3	0.02
		e	36	0.2	0.02
		g	18		
		h	18	0.3	0.02
		i	16	0.8	0.07
		j	8		
Cylichnidae		a	530	3.4	0.44
		b	260	2.4	0.35
		c	290	2.8	0.41
		d	200	0.5	0.06
		e	400	2.2	0.33
		f	473	1.1	0.13
		g	200	4.9	0.76
		h	237	0.2	0.02
		i	200	2.3	0.29
		j	196	2.6	0.33
Naticidae		b	10	0.1	0.03
		c	10	1.9	M (0.25)*
		d	20	2.4	M (0.31)*
		f	18	1.1	0.13
		h	18	0.1	0.04
		i	52	0.1	0.01
		j	8	0.3	0.03
Retusidae		a	40	0.2	0.02
		b	20	0.1	0.01
		d	60	0.1	0.01
		e	91	0.2	0.02
		g	18	0.1	0.02
		j	8		
Turridae		i	4	0.1	0.01
Juveniles		a	10		
		d	30		
		e	18		
		f	55		
Unidentifiable		j	4		

Banks Island BR83-8

FAMILY TOTALS	Grab	N/M (m-2)	WW (g.m-2)	DW (g.m-2)
Class : Pelecypoda				
Family : Cardiidae	a	180	80.7	9.08
	b	120	1.0	0.09
	c	270	26.8	3.36
	d	310	34.4	2.94
	e	146	9.6	0.87
	f	55	0.8	1.17
	g	145	15.9	1.84
	h	127	9.7	1.17
	i	144	37.8	5.44
	j	92	10.1	1.20
Hiatellidae	a	50		
	d	10		
	e	36		
	f	18		
	g	18		
	i	12		
Myidae	a	80	55.0	M 8.27
	b	30	1.8	0.13
	c	60	1.1	0.12
	d	100	5.0	0.63
	e	36		
	f	91	1.7	0.16
	g	36		
	h	36		
	i	72	0.8	0.10
	j	20		
Mytilidae	a	30		
	b	10		
	c	10		
	d	20		
	g	18		
	h	18		
	i	8		
	j	8		
Nuculanidae	b	10	2.0	0.21
	c	10	2.0	0.21
	d	10	1.9	0.20
	f	18	2.5	0.33
Pandoridae	i	8	0.2	0.01
Tellinidae	a	180	3.5	0.49
	b	180	3.2	0.37
	c	180	2.7	0.33
	d	160	2.3	0.24
	e	109	0.7	0.09
	f	91	1.4	0.15
	g	109	0.9	0.09
	h	164	1.6	0.20
	i	188	2.8	0.34
	j	20	0.5	0.05
Thraciidae	e	18	0.6	M (0.08)*

Banks Island BR83-8

FAMILY TOTALS	Grab	N/M (m-2)	WW (g.m-2)	DW (g.m-2)
Thyasiridae	a	2460	8.2	0.60
	b	2170	4.5	0.34
	c	2080	4.1	0.27
	d	2610	3.7	0.25
	e	1929	2.9	0.18
	f	1547	2.7	0.18
	g	1529	3.3	0.26
	h	1110	1.9	0.17
	i	1316	3.6	0.20
	j	276	1.2	0.07
Veneridae	a	1040	31.6	3.11
	b	990	30.8	2.19
	c	1000	47.7	3.61
	d	1590	19.5	1.53
	e	1347	27.5	2.29
	f	928	15.9	1.26
	g	892	35.2	3.11
	h	819	40.0	4.13
	i	916	23.8	2.22
	j	368	19.2	1.48
Juveniles	a	710	0.1	0.02
	b	320	0.1	0.01
	c	150		
	d	390		
	e	255		
	f	437		
	g	601	0.1	
	h	273		
	i	20		
	j	8		
Fragments	d	Present	0.1	0.04
	j	Present		
Phylum : Nemertinea	a	130		
	b	150	1.3	0.36
	c	180	0.9	0.09
	d	120	0.1	0.03
	e	218		
	f	146		
	g	400		
	h	200		
	i	116	0.3	0.05
	j	64	0.4	0.07
Phylum : Protozoa				
Class : Sarcodina				
Order : Foraminifera				
Family : Elphidiidae	d	Present		
	f	Present		
Miliolidae	d	Present		

Banks Island BR83-8

FAMILY TOTALS	Grab	N/M (m-2)	WW (g.m-2)	DW (g.m-2)
Phylum : Sipuncula	a	20		
	b	60	0.1	0.03
	c	10	0.1	0.03
	d	20		
	e	18		
	f	18		
	g	55	0.2	0.04
	h	55	0.2	0.04
	i	44	0.1	0.03
	j	48	1.8	0.46
Unknown	d	30		
STATION TOTAL	a	15000	212.5	30.95
	b	12670	70.9	10.75
	c	9720	118.1	13.24
	d	14900	111.1	18.01
	e	12865	56.6	7.39
	f	10686	43.3	9.43
	g	9929	75.6	9.24
	h	7033	68.7	8.46
	i	8686	84.9	11.97
	j	3904	42.8	5.33

Banks Island BR-Rock Sample	Genus-Species	Grab	N/M (m-2)	WW (g.m-2)	DW (g.m-2)
Phylum:Annelida					
Class:Polychaeta					
Family: Dorvilleidae		RS	192		
Hesionidae	Castalia sp.	RS	18		
Lumbrineridae	Lumbrineris sp.	RS	18		
Nereidae		RS	6		
Polynoidae	Harmothoe imbricata	RS	60		
	unidentified	RS	42		
Sabellidae	Chone duneri	RS	6		
Serpulidae		RS	42		
Sigalionidae	Pholoe sp.	RS	90		
Spionidae		RS	36		
Fragments and Nematodes					
Phylum:Arthropoda					
Class:Cirripedia					
Order:Thoracica					
Family:Balanidae		RS	>6000		
Class:Malacostraca					
Order:Amphipoda					
Family:Acanthonotozomatidae	Acanthonotosoma sp.	RS	12		
Calliopiidae		RS	102		
Corophiidae	Erichthonius hunteri	RS	1128		
Oedicerotidae	Monoculodes longirostris	RS	18		
Stenothoidae	Metopella sp.	RS	102		
Order:Isopoda					
Family:Munnidae	Munna sp.	RS	6		
Arthropod fragments		RS	Pr		
Phylum:Bryzoa					
Class:Gymnolaemata					
Family:Bicellariellidae	Caulibugula sp.	RS	Pr		
Scrupariidae	Eucratea loricata	RS	Pr		
Phylum:Cnidaria					
Class:Hydrozoa					
Family:Campanulariidae		RS	Pr		
Campanulinidae	Lafoeina maxima	RS	Pr		
Phylum : Mollusca					
Class : Gastropoda					
Subclass : Opisthobranchia					
Order : Nudibranchia		RS	30		
Subclass : Prosobranchia					
Family : Cylichnidae	Scaphander punctostriatus	RS	6		
Juveniles		RS	6		
Class : Pelecypoda					
Family : Hiatellidae	Hiatella arctica	RS	606		
Myidae	Mya truncata	RS	30		
Mytilidae	Musculus discors	RS	18		
Thyasiridae	Axinopsida orbiculata	RS	12		
Veneridae	Liocyma fluctuosa	RS	6		

Banks Island BR-Rock Sample

	Genus-Species	Grab	N/M (m-2)	WW (g.m-2)	DW (g.m-2)
Phylum : Protozoa					
Class : Sarcodina					
Order : Foraminifera					
Family : Elphidiidae	Elphidium arcticum	RS	Present		
Phylum : Echinodermata					
Class : Echinoidea					
Juveniles		RS	12		
Class : Stelleroidea					
Subclass : Ophiuroidea					
Juveniles		RS	48		
SAMPLE TOTAL		RS	2652		

APPENDIX B.1 Methods used for Community Analysis

The descriptions provided here are based on Hill (1973), Gauch (1977), Gauch et al. (1977), Greenacre and Degos (1977), Greenacre (1978) and cited references.

(a) Ordination

In ecology, ordination is used to arrange samples (or species) in relation to axes that correspond to either environmental gradients or other variables which have ecological meaning. The method is designed to express the observations in terms of as few variables as possible while still maintaining the integrity of the data. Specifically, ordination of a data set of n observations (samples) and variables (e.g., species abundance) transforms the data set into a matrix which preserves the information of the original number of variables. That is, the reduction in the number of variables is achieved in a way that minimizes the loss of information caused by the reduction.

Reciprocal averaging (RA) may be described as a weighed-average ordination obtained by successive approximations which reveal correspondences between two types of information, such as species and samples (Hill, 1973; Gauch et al., 1977). According to the "direct iteration" procedure as presented by Hill (reproduced here as part of Appendix B), species are weighted by positions along a proposed initial gradient and the weights are used to compute sample scores. These sample scores as weights are then used to derive a new and better calibration of the species. In return, the new species weights are used to improve the precision of the sample scores and so on. Consequently, the iterative calculations converge to a stable, optimal solution that does not depend on the initial arrangement. The process is called 'reciprocal averaging' because the species-scores are averages of the sample-scores and reciprocally the sample-scores are averages of the species-scores. It follows that, for reciprocal averaging species ordinations and sample ordinations come in dual pairs, neither of which has logical dominance (Hill, 1973). Gauch et al. (1977) compared the effectiveness of RA, principal components analysis (PCA) and polar ordination (PO) under a wide range of data set conditions. They concluded that RA is a preferred method for indirect ordination (based on species distributions alone) for revealing first, major direction of sample variation in response to environment. The method is heuristic and its results can be useful in forming hypotheses about the distribution and abundance of organisms in relation to environmental variables.

The relative advantages of RA and PCA have also been discussed by Tuxen (1973).

Examples of the use of ordination in benthic analysis are presented in Cassie and Michael (1968), Lie and Kelley (1970), Hughes and Thomas (1971a and b), and Conlan and Ellis (1979).

A worked example of ordination by reciprocal averaging (reproduced verbatim from Hill, 1973; for additional information consult Hill)

	(i)	(ii)	(iii)	(iv)	(v)	(vi)	(vii)	(viii)	(R)	(1)	(2)	(2a)	(3)
(i)	1	0	0	1	1	0	0	1	4	100	52.5	55	44.3
(ii)	0	1	1	0	0	1	0	1	4	0	37.5	0	36.2
(iii)	1	1	0	0	0	1	1	0	4	100	65.0	100	63.4
(iv)	1	1	1	1	1	0	0	1	6	0	43.3	21	39.3
(v)	1	1	0	1	0	0	0	1	4	100	56.7	70	47.2
(vi)	1	0	0	0	1	0	0	0	2	0	46.7	33	46.0
(C)	5	4	2	3	3	2	1	4	24				
(1)	60.0	50.0	0.0	66.7	33.3	50.0	100.0	50.0					
(2)	55.8	47.8	10.5	48.7	36.3	50.0	100.0	36.5					
(11)	31.8	50.5	48.4	19.7	10.0	86.0	100.0	32.7					
(11a)	24	52	42	11	0	8.4	100	25					

The calculations are represented schematically in the foregoing table. The data-matrix is given in the top left-hand corner, and (R) and (C) are the row (species) and column (stand) totals respectively. Column (1) is an arbitrarily chosen set of starting scores. In practice these should be chosen to reflect what is suspected of being the main gradient. A good choice will much reduce the amount of calculation required.

Row (1) is derived from column (1) by averaging. Thus the entry in row (1) column (v) is 33.3, being the average of 100, 0 and 0, which are the scores in column (1) corresponding to the non-zero entries of column (v). Column (2) is defined similarly. Thus the entry in column (2) row (i) is the average of 60.0, 66.7, 33.3 and 50.0 - these being the scores in row (1) corresponding to the non-zero entries of row (i). Column (2a) is derived from column (2) by rescaling, and is given by the formula:

$$\text{column (2a)} = 100 \times (\text{column (2)} - 37.5)/27.5.$$

This ensures that the range of column (2a) is 0 to 100, since 27.5 is the range of column (2) and 37.5 is its minimum value. By continuing in this manner, the following sequence of species (row) scores is obtained.

(1)	(2a)	(3a)	(4a)	(5a)	(6a)	(7a)	(8a)	(9a)	(10a)	(11a)	(12a)	(12)
100	55	30	8	0	0	0	2	3	4	5	5	23.5
0	0	0	6	23	40	52	60	66	70	72	73	55.9
100	100	100	100	100	100	100	100	100	100	100	100	68.6
0	21	11	0	3	10	14	18	21	23	25	26	33.2
100	70	40	18	12	16	19	24	26	28	29	30	35.1
0	33	36	26	16	10	5	0	0	0	0	0	20.9

It takes eleven iterations to reach stability of the scores, but this is the result of making a bad initial choice. Three or four iterations should normally suffice if a good initial choice is made. The final stand (column) scores are derived by rescaling row (11) to form row (11a) as indicated in the original table. The eigenvalue (latent root) corresponding to the first axis is a measure of how much the range of the scores contracts in one iteration. The range of column (12) (shown after column (12a)) is 47.7, and it is derived from column (11a) which has a range of 100. Hence the estimate of the eigenvalue is 0.477. These calculations should be done with the data on one piece of quadrille paper and the scores on another, matching the two side by side.

When the first axis has been obtained, the second is considered. A good starting point for the scores of the second axis is obtained by using a set of scores which were fairly near to the final ones for the first axis. In this case column (8a) is used. Before iteration, these scores have to be adjusted by subtracting a multiple of the final first axis. This multiple is estimated as follows.

z	R	Rz	$R\bar{z}$	x	y	(13)	(13a)	(14a)	(15a)
5	4	20	165	- 145	2	- 3.0	71	62	59
73	4	292	165	127	60	- 12.4	0	0	0
100	4	400	165	235	100	0.8	100	94	89
26	6	156	247	- 91	18	- 7.8	35	34	33
30	4	120	165	- 45	24	- 5.8	50	45	41
0	2	0	82	- 82	0	0 94	100	100	
	24	988		- 1					

The column z is the first axis; R is the row totals and y is the set of scores to be adjusted (in this case equal to column (8a)). Multiply R by z to form Rz. Form $\bar{z}$ a weighted mean value of z by taking $\bar{z} = \Sigma Rz / \Sigma R$.

In this case,

$$\bar{z} = 988/24 = 41.17.$$

Form a column $R\bar{z}$ by multiplying R by $\bar{z}$; then subtract $R\bar{z}$ to derive $x = Rz - R\bar{z}$. (A check at this point is that, apart from round-off error, x should sum to zero.) The multiple of z to be subtracted from y is given by

$$\Sigma xy / \Sigma xz,$$

which in this case is 0.992. Column (13) is therefore y - 0.992z, and after rescaling to derive column (13a) the iterations are continued in the usual way. The first axis will slowly re-establish itself if the appropriate multiple of z (i.e., $\Sigma xy'/\Sigma xz$) is not at intervals subtracted from subsequent scores y'; but this need not be done very often. The column (15a) derived after two iterations from (13a) has not been further corrected for the first axis, but it may nonetheless be taken as a reasonable estimate of the second. The estimate of the second eigenvalue, derived from column (15) (not shown), is 0.305.

These calculations are rather laborious. They would be worth the trouble if a good ordination were required in the absence of a computer.

(b) Correspondence Analysis

A detailed description of correspondence analysis was initially presented by Benzecri (1973) and an outline of the method was given by Teil (1975). Several demonstrations of the origin of the correspondence analysis problem have been presented by Hill (1974). Greenacre (1978) has provided a description of correspondence analysis as an objective method of graphical display for summarizing, simplifying and explaining non-negative data in a matrix form.

Correspondence analysis is a descriptive statistical method related to multidimensional scaling and PCA (Greenacre and Degos, 1977). The aim of all of these procedures is to represent a data set by a number of points in multidimensional space to permit a visual interpretation of patterns in the data. If the data points are imagined to occupy a space of high dimension, then each method tries to identify a subspace of much lower dimension in which the structure of the data is meaningfully represented and which is not too out of character with its true high dimensional structure. There are two major ways in which correspondence analysis distinguishes itself from the other methods. First, it supplies a distance function which defines the relative positions of the points in the space of the observations (i.e., between rows and between columns) and secondly, it defines criteria that determine the "optimal" subspace, one which gives a realistic picture of the true structure. The distance function used in correspondence analysis is the chi-square (χ^2) distance or chi-square metric.

To further the following description of correspondence analysis which is based on Greenacre and Degos (1977), we consider our observations form a n x m matrix of positive numbers (k_{ij}). In our case, this matrix consists of species abundances (no. m^{-2}) such that k_{ij} is the abundance of species j in the sample i.

Samples figure as rows and species as column of the matrix. First, we transform this matrix so that the sum of all its entries is one:

$$\text{for all i and j: } f_{ij} = k_{ij} / \Sigma_i \Sigma_j \, k_{ij}$$

The row and column sums of the matrix (f_{ij}) are written as follows:

$$\text{for each row } i = 1....n: \qquad r_i \quad f_{i.} = \sum_{j=1}^{n} f_{ij},$$

$$\text{and for each column } j = 1....m: \quad c_j \quad f_{.j} = \sum_{i=1}^{m} f_{ij}.$$

The square of the χ^2-distance between two rows i and i' is defined as:

$$d_{ii'}^2 = \sum_{j=1}^{m} \frac{1}{c_j} \left(\frac{f_{ij}}{r_i} - \frac{f_{i'j}}{r_{i'}} \right)^2 \qquad (1)$$

This may be expressed as the quadratic form:

$$d_{ii'}^2 = (p_i - p_{i'})^t \; D_c^{-1} \; (p_i - p_{i'}), \qquad (2)$$

where p_i is the m x 1 vector of elements f_{ij}/r, $j = 1,...,m$ and D_c is the diagonal matrix of column sums c_j.

In a completely symmetric manner the square of the ^{2}-distance between two columns j and j' is defined as:

$$d_{jj'}^2 = \sum_{i=1}^{n} \frac{1}{r_i} \left(\frac{f_{ij}}{c_j} - \frac{f_{ij'}}{c_{j'}} \right)^2$$

$$= (q_j - q_{j'})^t \; D_r^{-1} \; (q_j - q_{j'}),$$

where q_j is the n x 1 vector of elements f_{ij}/c_j, $i = 1,....n$ and D_r is the diagonal matrix of row rums r_i.

Examining the χ^2 distance function **(2)** more closely, we note that, first, associated with each row i we have a m x 1 vector p_i which is the ith row of the maxtrix (f_{ij}) divided by its row sum r_i. We call p_i the profile of row i and r_i the mass of row i. Similarly the profile of column j, q_i, is the jth column of (f_{ij}) divided by its mass c_j. Therefore, the χ^2 distance between rows i and i' is a weighted sum of squares of the difference in profiles of the rows, where the weights are the inverse of the column sums (or masses). In parallel fashion, the χ^2 distance between columns j and j' is a weighted sum of squares of the difference in profiles of these columns, where the weights are the inverse of the row sums or masses. To generalize these definitions, we allow the row and column masses to be arbitrarily chosen. In this general setting, correspondence analysis is the special case when row and column masses are equal to the row and column sums, respectively. In comparison, PCA is the special case when all row and column masses are equal to one. The χ^2-distance under this condition reduces to the usual Euclidean distance defined between rows and between columns of the matrix (f_{ij}).

To proceed further in the description of correspondence analysis, we draw an analogy to certain concepts in mechanics, particularly the notions of the center of gravity and inertia. (The concept of mass has already been introduced.) Let us consider the rows (i). So far each of the n rows is represented as a point vector in a m-dimensional space. Interpoint distances are defined by the χ^2-distance of equation (1), and each point is assigned a certain mass r_i. As in mechanics, the center of gravity p of this cloud of points is defined as the weighted sum of the point vectors:

$$p = \sum_{i=1}^{n} r_i p_i$$

Substituting for p_i, the jth element of vector p is

$$\sum_{i=1}^{n} r_i \frac{f_{ij}}{r_i} = \sum_{i=1}^{n} f_{ij} = f_{\cdot j} \quad c_j.$$

Therefore the center of gravity p is the point vector of the column mass: $p = c$.

Again from mechanics we define the total inertial I of the cloud of points (understood, with respect to its center of gravity which becomes the new origin in space) as the weighted sum of squared distances of points from the center of gravity, the weights being the row masses:

$$I = \sum_{i=1}^{n} r_i (p_i - p)^t D_c^{-1} (p_i - p)$$

$$= \sum_{i=1}^{n} r_i \sum_{j=1}^{m} \frac{1}{c_j} \left(\frac{f_{ij}}{r_i} - c_j \right)^2$$

$$= \sum_{i=1}^{n} \sum_{j=1}^{m} \frac{(f_{ij} - r_i c_j)^2}{r_i c_j} \qquad (3)$$

The inertia can be considered as a measure of the dispersion of the points in space. Another interpretation of the total inertia is now clear: consider the matrix (f_{ij}) as a contingency table where the row and column sums are (r_i) and (c_j), respectively. The null hypothesis that row and column effects be independent is H_o: for all i and j $f_{ij} = r_i c_j$. The chi-square variate which tests this hypothesis is exactly the inertia defined in equation (3). The quantity I may be considered as a measure of the deviation in the data from this hypothesis.

Finally the inertia of the cloud of points along an axis u (or subspace S) is the total inertia of the orthogonal projections of these points onto the axis (or subspace). Here orthogonality is in the sense of the χ^2 metric.

Having defined the above concepts, a correspondence analysis may be defined as the identification of a subspace S along which the inertia is a maximum. The identification of the subspace S is carried out in much the same way as that of principal component axes (see Anderson 1958). A first axis through the origin (center of gravity) is defined as that axis along which the inertia is a maximum. The second axis is that one, among all axes orthogonal to the first one, along which the inertia is a maximum. And the third is chosen among all axes orthogonal to the first and second, etc. The idea is that we need only consider the subspace of the first few axes derived in this way, since this subspace reflects a sufficiently large percentage of the total inertia. In principal components analysis, where all the row and column masses are 1, the argument is identical, and the inertia reduces to the variance. Here total variance is systematically decomposed along a set of orthogonal axes, whereas in correspondence analysis it is the total inertia which is decomposed along the axes,

termed the principal axes of inertia. Thus, it is the role of the masses which distinguishes correspondence analysis from principal components analysis. In both cases we are interested in the pattern of dispersion of points in space. Principal components analysis will indicate the axes of greatest spread purely from a point of view of relative distance, whereas the principal axes defined in correspondence analysis will be influenced both by the distances and the masses associated with the points.

The description above of correspondence analysis of the rows (i) holds in a similar and completely symmetric fashion for the analysis of the columns (j). The center of gravity of the points representing the columns is shown to be r, the vector of row sums (masses), and the total inertia of this cloud of points is identical to equation (3). (Note the symmetry of this formula in i and j.) This is the primary advantage of correspondence analysis - rows and columns are treated symmetrically. Intuitively we seem to have two separate problems; however, in correspondence analysis the solutions of both problems are linearly related so that one solution can be obtained from the other. To demonstrate this we simply mention the following relevant results.

First, the set of n points representing the rows in m-dimensional space and the set of m points representing the columns in n-dimensional space each occupy a subspace of dimension k which has its origin at the respective center of gravity of each set of points; where k is equal to the rank of the matrix of observation (f_{ij}) minus 1. (Hence if (f_{ij}) is of full rank, then k = min (n, m) - 1.).

Second, in both of these subspaces the decomposition of inertia along the principal axes is identical. That is, suppose the total inertia I is decomposed along the k axes of the first subspace (subspace of rows) as follows:

$$I = \sum_{\alpha=1}^{k} \lambda_\alpha \text{, where } \lambda_1 \geq \lambda_2 \geq \ldots \geq \lambda_k \geq 0$$

Then in the second subspace the inertia along the first principal axis is also λ_1, along the second λ_2, etc. The λ_α are termed the moments of inertia.

Third, suppose the coordinates of the points in the first subspace with respect to the principal axes are contained in a n x k matrix A (e.g., the ith row of A ($a_{i\alpha}$, α = 1,....k) contains the coordinates of the point representing the ith row). Similary let B be the m x k matrix of coordinates of the points in the second subspace with respect to the k principal axes. Then the elements of A and B are linearly related as follows:

$$\text{for all} \quad i = 1,\ldots n: \; a_{i\alpha} = \lambda_\alpha^{-\frac{1}{2}} \sum_{j=1}^{n} \left(\frac{f_{ij}}{r_i} \right) b_{j\alpha} \qquad (4)$$

$$(\text{i.e., } A = D_r^{-1} F B D \lambda^{-\frac{1}{2}});$$

$$\text{for all} \quad j = 1,\ldots m: \; b_{j\alpha} = \lambda_\alpha^{-\frac{1}{2}} \sum_{i=1}^{m} \left(\frac{f_{ij}}{c_j} \right) a_{i\alpha} \qquad (5)$$

$$(\text{i.e., } B = D_c^{-1} F^t A D \lambda^{-\frac{1}{2}}).$$

where D_r and D_c are, as before, the diagonal matrices of row and column masses respectively. D_λ is the diagonal matrix of moments of inertia λ_α, and F is the n x m matrix (f_{ij}).

Because of the symmetry of these formulas, we are able to plot the points representing the rows and columns of the matrix F with respect to the same principal axes in one single subspace where the two origins are identified. Formula **(4)** states that the coordinates of the point i on axis α is, up to a constant of $\lambda_\alpha^{-\frac{1}{2}}$, at the center of gravity of the coordinates $(b_{j\alpha})$ weighted by the profile (f_{ij}/r_i). Thus a point i lies in the vicinity of those points j for which its profile values, f_{ij}/r_i, are high. A symmetric argument holds for formula **(5)**. This result is an important characteristic of correspondence analyis.

Finally note that formulas **(4)** and **(5)** permit the addition a posteriori of new rows and columns to the graphical representation, termed supplementary elements. These are elements which for a certain reason we wish to include in the analysis without their contributing to the inertia and the calculation of the principal axes. They may be considered as points with zero mass.

In summary, therefore, the rows and columns of a data matrix (in our application, samples and species, respectively) are represented by two clouds of points in multidimensional space. The inertia of these clouds can be considered as a measure of dispersion or spread of these points, taking into account both their distances and their attributed masses. Correspondence analysis provides a visual interpretation of the relative positions of both these clouds in a common subspace of low dimension. A large percentage of the inertia is explained by this subspace which reflects the main directions of spread of these clouds.

APPENDIX B.2 Benthic Community Associations

RESULTS AND DISCUSSION OF COMMUNITY ANALYSES

A qualitative community analysis of the 1981 Banks Island benthic data at the family level by the Zurich-Montpellier (Z-M) method indicated that several groups of taxonomic families could be distinguished which appeared to be associated with certain sedimentary conditions (Heath et al. 1982a). This appendix reports the detailed results of community analyses by reciprocal averaging ordination (RA) and correspondence analysis (CA) on the combined 1981 and 1983 faunal composition data, at the species taxonomic level wherever practical. A brief comparison with the Z-M results described by Heath et al. (1982a) is also presented.

The RA results determined that 50.3% of the total variation among samples was accounted for by the first three axes. Of these, the first two axes are most important (38.8% of variation) and will be interpreted here. Gauch et al. (1977) have indicated that second and higher order axes of RA should be interpreted with caution due to possible curlinear relationships with lower axes. Therefore, the principal emphasis will be placed on interpretation of Axis 1 scores.

The ordination of sample scores on the first two axes of variation (Figure B.2-1) indicates a distinct clustering of samples along Axis 1. (Note that within station samples are closely grouped, indicating satisfactory sampling replication). Samples (1-10) in Group 1 nearest the origin are from the reference stations with sandy sediments sampled in 1981. Samples in Group 2 (30-70 on Axis 1) are from the dredging stations B83-1 and 2 (samples 25-36) and nearby reference station BR83-6 (samples 37-42). The third group of samples are from reference station BR83-8 (samples 43-52) and the remaining baseline stations sampled in 1981 (samples 11-24). This group of samples contained heterogeneous sediments, including silt, sand and occasionally gravel (cf. Figure 3).

The three groups of stations had statistically significant differences in values of faunal indices. Group 3 samples (heterogeneous sediments) had statistically greater average numbers of species and individuals of benthic fauna ($P < 0.001$, ANOVA 4, 5) than samples from the other station groups. The mean biomass levels ($\log_e$ transformed) in Group 3 samples were also statistically higher than those of Group 2 ($\pm < 0.01$, ANOVA 6). The differences between Group 1 and Group 2 samples were not significantly different ($P > 0.05$, ANOVA 4-6).

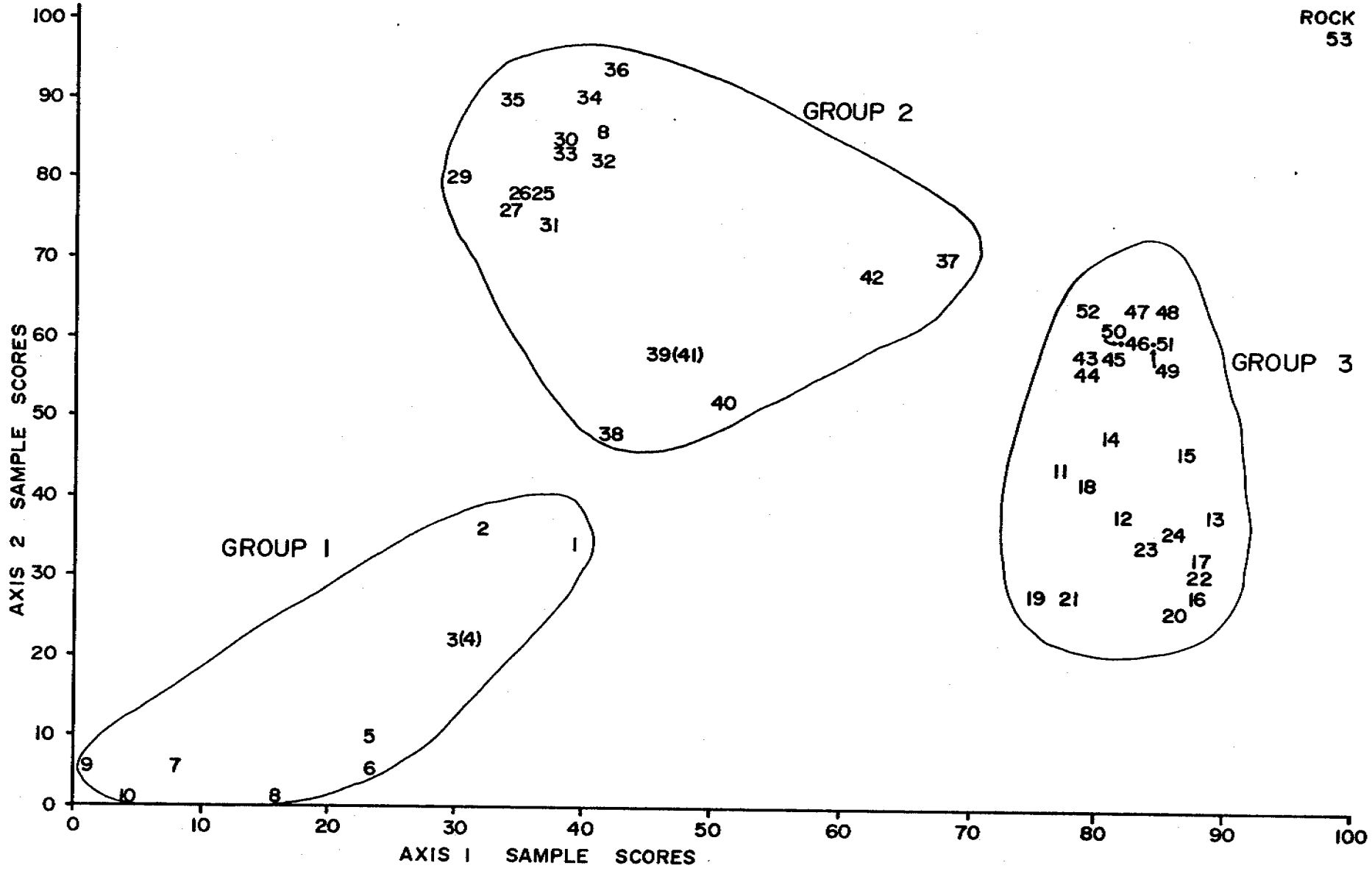


Figure B.2-1 Ordination of samples of the first two axes of variation determined by reciprocal averaging (RA) of benthos species data for the Banks Island Gravel Borrow Area, 1981 and 1983. Sample numbers are assigned in Table 3.

The species ordination (Figure B.2-2) indicates the relative association of dominant species of benthos with the three station groups along Axis 1. For example, the polychaetes Ampharete acutifrons, Chone duneri and Pygospio elegans tended to be associated with the silty "heterogeneous" sediments of samples in Group 3 (Figure 5). The amphipods, Monoculodes borealis and M. longirostris and the cumacean, Lamprops fuscata, were prevalent in samples from the dredge area (Group 2). The bivalve, Thyasira gouldii, was most closely associated with the sandy samples from Group 1 stations (Figure 5).

A comparison of the species level RA results for 1981 samples with the family level Z-M results reported by Heath et al. (1982a) can only be roughly made. There is agreement on the recognition of two major groups of samples and faunal assemblage from the stations sampled in 1981: those from the sandy sediments of Stations B81-1 to -4 and BC81-1, and those from the heterogeneous sediments of Stations B81-5 to -10 and BC81-2.

The second method of community analysis used on the combined results for 1981 and 1983 was correspondence analysis (CA). With this technique, the principal contribution to the analysis was from 17 of the dominant taxa, referred to as "basic" species. The remaining 58 taxa were included as "supplementary" species (see Appendix B.1 for details). Their positions relative to the basic species and samples have been given a posteriori in graphical form (Figures B.2-3 and -4). The designations of the 75 taxa included in the analysis are listed in Table B.2-1.

The analysis of the Banks Island benthos data by CA was interpreted by the method of principal axes (Greenacre 1978) which is primarily concerned with decomposing the total inertia (i.e., dispersion of the points in space, see Appendix B.1) into (i) "interpretable" or "non-random" inertia and into (ii) "error" or "random" inertia. The interpretable inertia of the axes is then partitioned into contributary parts due to samples and species to extend the interpretation. The first three principal axes accounted for 74.3% of the total inertia, as follows: Axis 1 (31.8%), Axis 2 (26%) and Axis 3 (16.5%). The fourth axis accounted for only an additional 5%. Therefore, only the first three axes will be interpreted.

As Greenacre (1978) has stressed, in the interpretation of the graphical display of the points projected onto the various planes of the principal axes, it is important to remember that each axis has it particular orientation because the inertia of the cloud of points is a maximum.

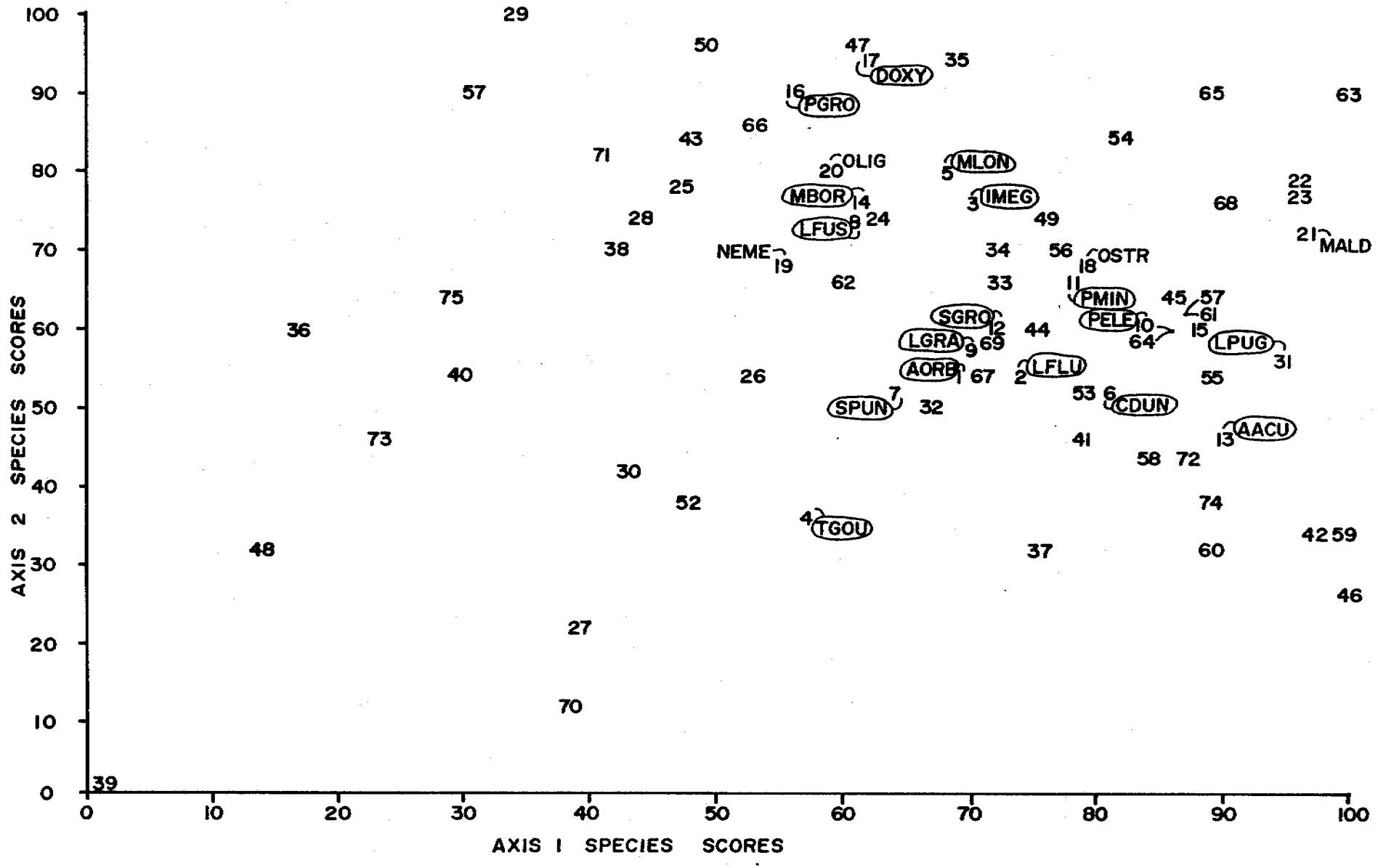


Figure B.2-2 Ordination of species on the first two axes of variation determined by RA of benthos species data for Banks Island Borrow Area, 1981 and 1983. Refer to Table B.2-1 for a list of acronyms used in this figure. Ellipses indicate basic species in correspondene analysis (cf. Figures B.2-3 and B.2-4)

TABLE B.2-1

LIST OF SPECIES NAMES, ACRONYMS AND DESIGNATIONS FOR COMMUNITY ANALYSIS USED IN FIGURES B.2-2, B.2-3 and B.2-4

SPECIES NUMBER	TAXONOMIC NAME	ACRONYM (Figures B.2-2, B.2-3, B.2-4) (if used)	CA VARIABLE DESIGNATION
1	Axinopsida orbiculata	AORB	Basic
2	Liocyma fluctuosa	LFLU	Basic
3	Ischyrocerus megacheir	IMEG	Basic
4	Thyasira gouldii	TGOU	Basic
5	Monoculodes longirostris	MLON	Basic
6	Chone duneri	CDUN	Basic
7	Scaphander punctostriatus	SPUN	Basic
8	Lamprops fuscata	LFUS	Basic
9	Leptognathia gracilis	LGRA	Basic
10	Pygospio elegans	PELE	Basic
11	Pholoe minuta	PMIN	Basic
12	Serripes groenlandicus	SGRO	Basic
13	Ampharete acutifrons	AACU	Basic
14	Monoculodes borealis	MBOR	Basic
15	Leitoscoloplos pugettensis	LPUG	Basic
16	Phyllodoce groenlandica	PGRO	Basic
17	Diastylis oxyrhyncha	DOXY	Basic
18	Ostracoda		Supplementary
19	Nemertea		Supplementary
20	Oligochaeta		Supplementary
21	Maldanidae		Supplementary
22	Ampharete sp.		Supplementary
23	Aricidea lopezi		Supplementary
24	Capitella sp.		Supplementary
25	Dorvillea sp.		Supplementary
26	Eteone longa		Supplementary
27	Euchone analis		Supplementary
28	Exogene sp.		Supplementary
29	E. tatarica		Supplementary
30	Leitoscoloplos panamensis		Supplementary
31	Nephtys cornuta		Supplementary
32	N. longosetosa		Supplementary
33	Oncaea sp.		Supplementary
34	Harpacticoidia		Supplementary
35	Ophiuroidea (juvenile)		Supplementary
36	Ophelia limacina		Supplementary
37	Praxillella sp.		Supplementary
38	Tharyx/Chaetozone complex		Supplementary

TABLE B.2-1 (continued)

LIST OF SPECIES NAMES, ACRONYMS AND DESIGNATIONS FOR COMMUNITY ANALYSIS USED IN FIGURES B.2-2, B.2-3 and B.2-4

SPECIES NUMBER	TAXONOMIC NAME	ACRONYM (Figures B.2-2, B.2-3, B.2-4) (if used)	CA VARIABLE DESIGNATION
39	Travisia forbesii		Supplementary
40	Ascidiacea		Supplementary
41	Sipunculida		Supplementary
42	Aceroides latipes		Supplementary
43	Atylus carinatus		Supplementary
44	Boeckosimus plautus		Supplementary
45	Byblis gaimardi		Supplementary
46	Melita dentata		Supplementary
47	Monoculodes sp.		Supplementary
48	Bonoculopsis longicornis		Supplementary
49	Paradulichia typica		Supplementary
50	Paroediceros lynceus		Supplementary
51	Diastylis edwardsi		Supplementary
52	Retusa obtusa		Supplementary
53	Clinocardium ciliatum		Supplementary
54	Hiatella arctica		Supplementary
55	Macoma sp.		Supplementary
56	Mya truncata		Supplementary
57	Exogene verugera		Supplementary
58	Aricidea suecica		Supplementary
59	Euchone incolor		Supplementary
60	Nephtys sp.		Supplementary
61	Terebellides stroemi		Supplementary
62	Boeckosimus sp.		Supplementary
63	Erichthonius hunteri		Supplementary
64	Haploops tubicola		Supplementary
65	Metopella sp.		Supplementary
66	Protomedeia fasciata		Supplementary
67	Campylaspis costa		Supplementary
68	Volutopsius sp. 1		Supplementary
69	Musculus sp.		Supplementary
70	Thracia sp.		Supplementary
71	Actiniaria		Supplementary
72	Prionospio cirrifera		Supplementary
73	Scolecolepides sp.		Supplementary
74	Spio sp.		Supplementary
75	Dispio sp.		Supplementary

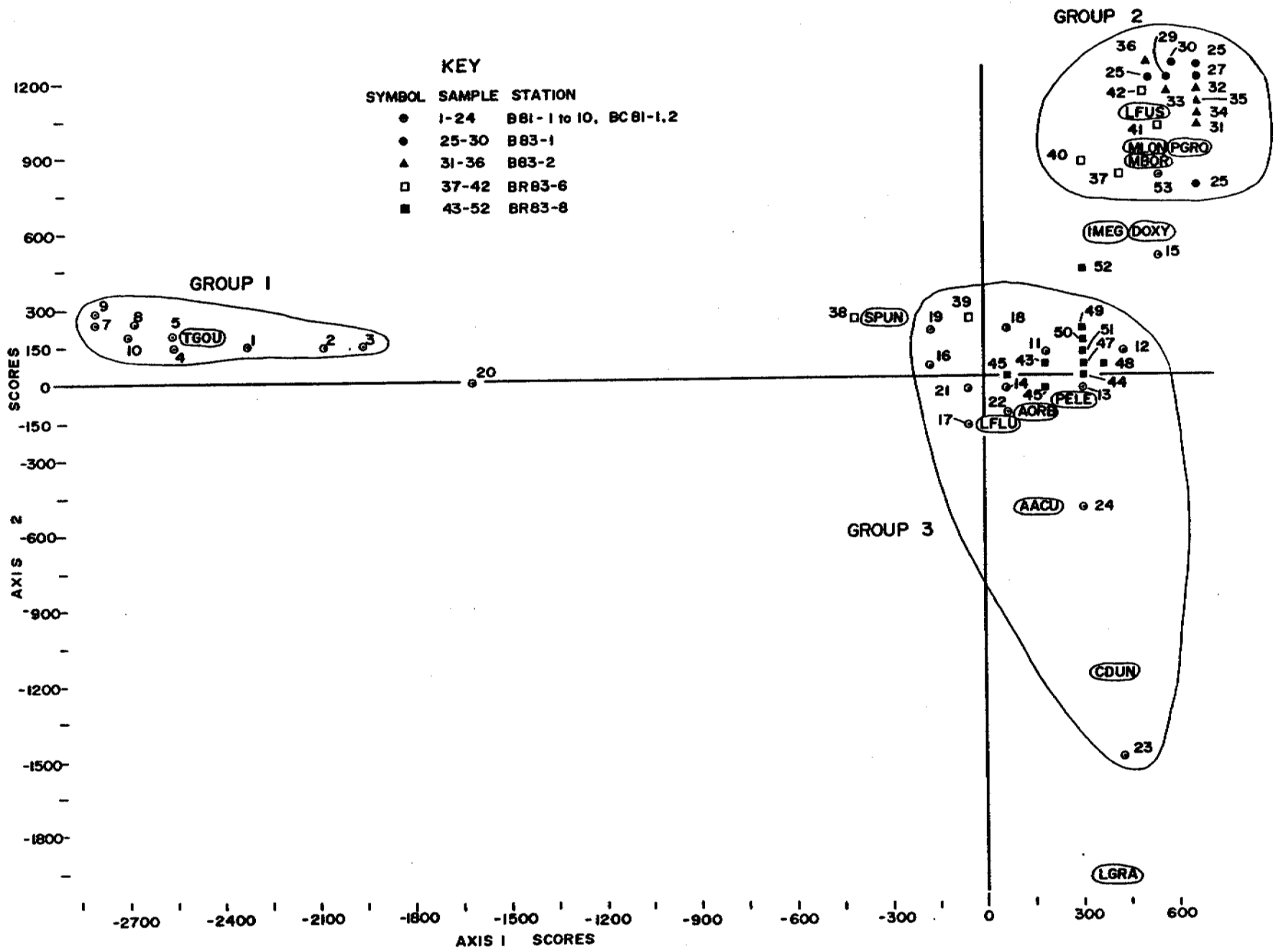


Figure B.2-3 Correspondence analysis for Banks Island Borrow Area benthos samples, 1981 and 1983: plane of first and second principal axes. The samples and their species are shown except where overlap of points prevents full representation. Basic species are indicated by an ellipse. Refer to Table B.2-1 for a list of acronyms used in this figure.

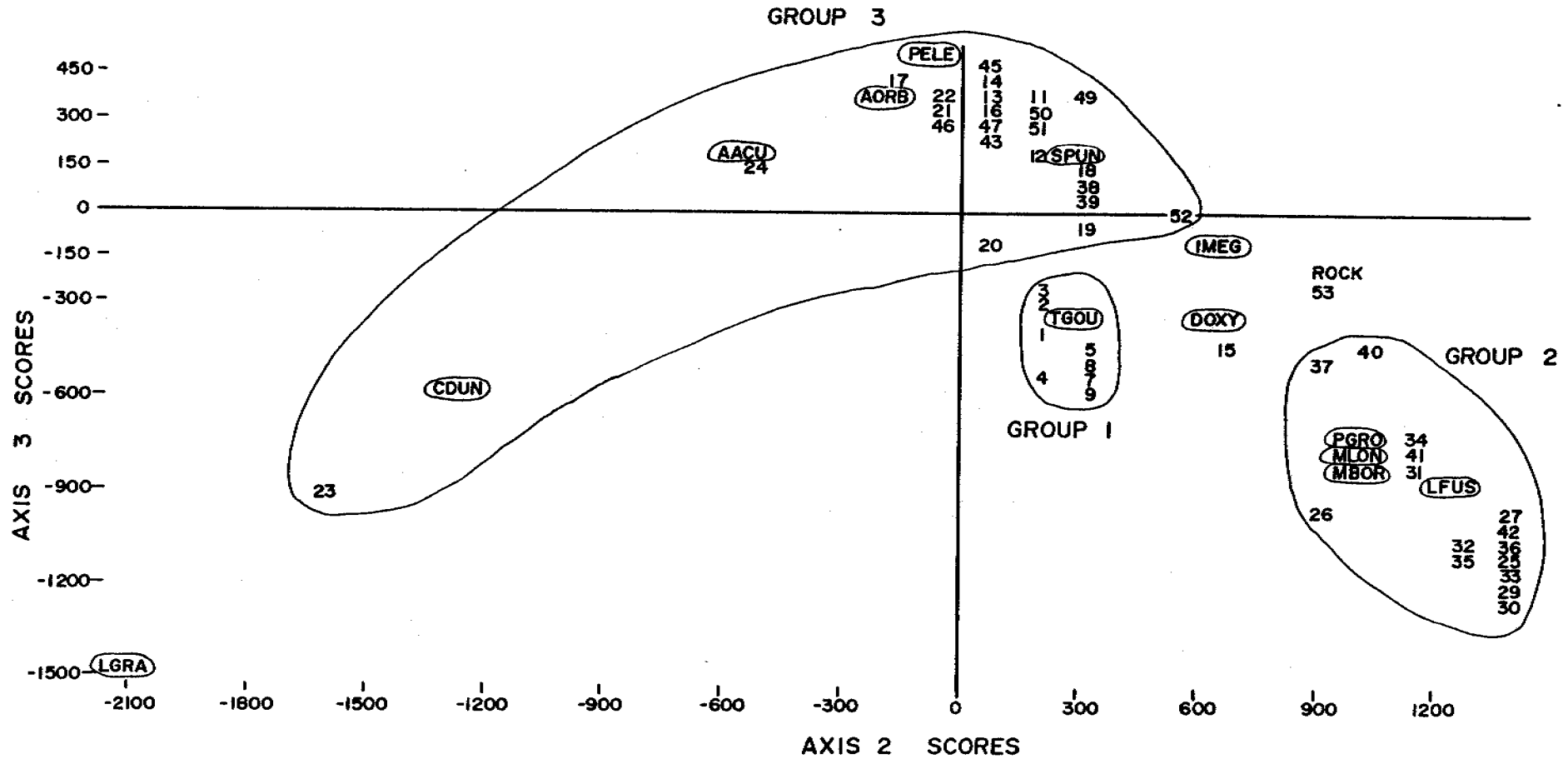


Figure B.2-4 Correspondence analysis for Banks Island Borrow Area benthos samples, 1981 and 1983: plane of second and third principal axes. The samples and their species are shown except where overlap of points prevents full representation. Basic species are indicated by an ellipse. Refer to Table B.2-1 for a list of acronyms used in this figure.

In Figure B.2-3, the first and second axes describe a plane which explains 57.8% of the total inertia. This plane (Figure B.2-3) shows the separation along Axis 1 between samples from sandy sediments (Group 2 Stations B81-1 to -4 and BC81-1) and samples from the dredge area (Group 2 Stations B83-1 and -2, BR83-6) and those from "heterogeneous" sediments (Group 3 Stations B81-5 to -10, BC81-2 and BR83-8). The samples from the dredge area are separated from those of Group 3 along Axis 2. The sample groups distinguished by this technique are the same as those recognized by the RA method.

The CA results also indicate which basic species are associated with the sample groups. For instance, the bivalve, Thyasira gouldii, contributes primarily to the inertia of Axis 1 because of its association with Group 1 samples Lamprops fuscata (Group 2), Chone duneri (Group 3) and Leptognathia gracilis (Group 3) contribute highly to the inertia of Axis 2.

A comparison of the species ordination (Figure B.2-2) with the CA results (Figure B.2-3) suggests that, in both cases, species such as Ampharete acutifrons, Chone duneri and Pygospio elegans, are associated with Group 3 samples with heterogeneous sediments. Similarly, Lamprops fuscata, Monoculodes borealis and M. longirostris are closely allied with samples from Group 2 (dredge area) according to both techniques. It is apparent that although distance scaling and axes orientation are different in the scatter plots of the two techniques, many of the same key species and samples are grouped similarly and are separated from other assemblages of points.

In Figure B.2-4, the second and third principal CA axes form a plane which explains 42.5% of the total inertia. Axis 2 again distinguishes the separation of Group 2 and Group 3 samples and associated species. Axis 3 shows the extent of variation within the groups. Note that in this representation, Axis 1 is orthogonal to the plane of Axes 2 and 3 (that is, Axis 1 passes through the origin perpendicular to the plane of the page).

In summary, the first three principal CA axes explain 74.3% of the total inertia of the points. The samples and their associated species are positioned in a three-dimensional space for examination of their inter-relationships. The most conspicuous feature of the sample space is the separation along Axis 1 between the "sandy" Group 1 samples and their biota and the other samples in Groups 2 and 3. Axis 2 shows the distinction between samples of Groups 2 (dredge area) and 3 (heterogeneous sediments). Replicate samples from most stations show consistent

trends in dominant species composition. The concordance in results between the independent statistical methods (RA and CA analyses) is strong support that the assemblages of samples and species are real entities rather than random groupings.

APPENDIX C.1

STATISTICAL TESTS OF HYPOTHESES

The hypotheses concerning comparisons of means of indices for sample or station groups or sampler types presented in Section 3.1.3 and Appendix C.2 are tested here by one-way classification analysis of variance (ANOVA) and Scheffe's S test. The sequence of tests follows that of the above sections, with similar notation.

ANOVA-1: One-way classification ANOVA and Scheffe's S test; Species Diversity (no. of taxa/sample)

H_o ("null hypothesis"): The means for species diversity are not significantly different among the four 1983 stations.

H_1 ("alternate hypothesis"): There are significant differences in species diversity means among the stations sampled in 1983.

Data: The species diversity data used in deriving the following ANOVA table are from Table 3, Part B, van Veen samples (a-d) for each station.

Source of Variation	df	SS	MS	Observed F	F_{cr} for Significance Level	
					5%	0.1%
Station	3	3293.2	1097.7	22.5****	3.49	10.8
Residual	12	584.4	48.7			
Total	15					

Conclusions:

Since the observed F = 22.5 > F_{cr} = 10.8 at the 0.1% significance level, there is a highly significant difference (P < 0.001) denoted by ****) among the means. To

find which means are different, Scheffe's S test was applied. The least significant different (L.S.D.) is derived as:

$$L.S.D. = S \times s_{\bar{d}}$$

where $S = (df_{stn} \times F_{cr})^{1/2}$ is the (critical sum of squares)$^{1/2}$

and $s_{\bar{d}} = (MS_{res} (\frac{1}{n_i} + \frac{1}{n_j})^{1/2}$ is the standard error of $\bar{d} = \bar{X}_i - X_j$

The comparison of means and the corresponding L.S.D. values are tabulated below:

	I	II	III	IV
Station	B83-1	BR83-6	B83-2	BR83-8
Mean	37.0	41.75	42.75	73.25

(n_i, n_j) Observations	Comparisons	Differences	L.S.D.	Conclusion
(4,4)	IV - III	30.5	25.3	*
(4,4)	IV - II	29.5	25.3	*
(4,4)	IV - I	36.75	25.3	*
(4,4)	III - I	5.75	25.3	N.S.
(4,4)	II - I	4.75	25.3	N.S.

* significant at the 95% level
N.S. not significant at the 95% level

ANOVA-2: One-way ANOVA and Scheffe's S test; Population Density

H_o ("null hypothesis"): The means for population density (ln-transformed) are not significantly different among the four stations sampled in 1983.

H_1 ("alternate hypothesis"): There are significant differences in population density (ln-transformed) means among the stations sampled in 1983.

Data: Natural log-transformed data in Population Density column of Table 3, Part B, van Veen samples (a-d) for each station.

Source of Variation	df	SS	MS	Observed F	F_{cr} for Significance Level	
					5%	0.1%
Station	3	9.56	3.18	25.9****	3.49	10.8
Residual	12	1.47	0.123			
Total	15					

Conclusion:

Reject H_o; the mans are very significantly different ($P < 0.001$). To find which means are different, we apply Scheffe's S test:

	I	II	III	IV
Station	B83-1	B83-2	BR83-6	BR83-8
Mean	7.433	7.78	8.025	9.464

(n_i, n_j) Observations	Comparisons	Differences	L.S.D.	Conclusion
(4,4)	IV - III	1.44	1.27	*
(4,4)	IV - II	1.68	1.27	*
(4,4)	IV - I	2.03	1.27	*
(4,4)	III - I	0.59	1.27	N.S.

ANOVA-3: One-way ANOVA and Scheffe's S test; Wet Biomass

H_o ("null hypothesis"): The means for wet biomass (are not significantly different among the four stations sampled in 1983.

H_1 ("alternate hypothesis"): There are significant differences in wet biomass means among the stations sampled in 1983.

Data: Wet biomass column of Table 3, Part B, van Veen samples (a-d) for each station.

Source of Variation	df	SS	MS	Observed F	F_{cr} for Significance Level	
					5%	0.1%
Station	3	38,152.3	12,717.4	12.3****	3.49	10.8
Residual	12	12,406.8	1,033.9			
Total	15					

Conclusion:

Reject H_o; the means are significantly different ($P < 0.001$). To find which means are different, we apply Scheffe's S test.

	I	II	III	IV
Station	B83-2	B83-1	BR83-6	BR83-8
Mean	7.2	12.7	33.0	128.2

(n_i, n_j) Observations	Comparisons	Differences	L.S.D.	Conclusion
(4,4)	IV - III	95.2	116.4	N.S.
(4,4)	IV - II	115.5	116.4	N.S.
(4,4)	IV - I	121	116.4	*
(4,4)	III - I	25.8	116.4	N.S.

ANOVA-4: One-way ANOVA and Scheffe's S test; Species Diversity

H_o ("null hypothesis"): The means for species diversity are not significantly different among the three faunal assemblages identified by community analyses.

H_1 ("alternate hypothesis"): There are significant differences among the species diversity means for the three faunal assemblages.

Data: No. of species column Table 3, Parts A and B.

Source of Variation	df	SS	MS	Observed F	F_{cr} for Significance Level	
					5%	0.1%
Group	2	9,123	4,561.5	38.6****	3.19	6.17
Residual	49	5,785.7	118.1			
Total	51					

Conclusion:

Reject H_O; the means are significantly different ($P < 0.001$). To find which means are different, we apply Scheffe's S test.

	I	II	III
Assemblage	Group2	Group 1	Group 3
Mean	40.3	44.6	70.3

(n_i, n_j) Observations	Comparisons	Differences	L.S.D.	Conclusion
(24,10)	III - I	25.7	14.3 (α=0.001)	****
(24,18)	III - II	30.0	11.9 (α=0.001)	****
(18,10)	II - I	4.3	10.8 (α=0.05)	N.S.

ANOVA-5: One-way ANOVA and Scheffe's S test; Population Density

H_O ("null hypothesis"): The means for population density (ln-transformed) are not significantly different among the three faunal assemblages.

H_1 ("alternate hypothesis"): There are significant differences among the means of ln-transformed population density for the three faunal assemblages.

Data: Population density column (ln-transformed), Table 3, Parts A and B.

Source of Variation	df	SS	MS	Observed F	F_{cr} for Significance Level	
					5%	0.1%
Group	2	10.21	5.11	8.92****	3.19	6.17
Residual	49	28.07	0.57			
Total	51					

Conclusion:

Reject H_o; the means are significantly different ($P < 0.001$). To find which means are different, we apply Scheffe's S test.

	I	II	III
Assemblage	Group2	Group 1	Group 3
Mean	7.386	7.664	8.434

(n_i, n_j) Observations	Comparisons	Differences	L.S.D.	Conclusion
(24,10)	III - I	1.048	1.00 α =0.001	****
(24,18)	III - II	0.770	0.594 α =0.05	*
(18,10)	II - I	0.278	0.752 α =0.05	N.S.

ANOVA-6: One-way ANOVA and Scheffe's S test; Wet Biomass

H_0 ("null hypothesis"): The means for wet biomass (ln-transformed) are not significantly different among the three faunal assemblages.

H_1 ("alternate hypothesis"): There are significant differences among the means of ln-transformed wet biomass for the three faunal assemblages.

Data: Wet biomass column (ln-transformed), Table 3, Parts A and B.

Source of Variation	df	SS	MS	Observed F	F_{cr} for Significance Level	
					5%	0.1%
Group	2	22.19	11.09	19.5****	3.19	6.17
Residual	49	27.9	0.569			
Total	51					

Conclusion:

Reject H_0; the means are significantly different ($P < 0.001$). To find which means are different, we apply Scheffe's S test.

	I	II	III
Assemblage	Group 2	Group 1	Group 3
Means	2.371	3.369	3.953

(n_i, n_j) Observations	Comparisons	Differences	L.S.D.	Conclusion
(24,10)	III - II	0.534	0.715 α=0.05	N.S.
(24,18)	III - I	1.582	0.824 α=0.001	****
(10,18)	II - I	0.998	0.948 α=0.01	**

Therefore, the mean wet biomass of Group 2 is significantly lower than in both of the other two groups.

ANOVA-7: One-way ANOVA and Scheffe's S test; Species Diversity

7a

H_o ("null hypothesis"): The means for species diversity obtained from van Veen grab hauls and airlift samples are not significantly different at Station B83-1.

H_1 ("alternate hypothesis"): The means for species diversity from van Veen and airlift samples are significantly different at Station B83-1.

Data: No. of species; Table 3, Part B, Station B83-1

Source of Variation	df	SS	MS	Observed F	F_{cr} 5%
Sampler	1	37.5	37.5	0.76 N.S.	7.71
Residual	4	198	49.5		
Total	5				

Conclusion:

Accept H_o; there is no significant difference ($P > 0.05$).

7b

H_o ("null hypothesis"): The means for species diversity obtained from van Veen and airlift samples are not significantly different at Station B83-2.

H_1 ("alternate hypothesis"): The means for species diversity from van Veen and airlift samples are significantly different at Station B83-2.

Data: No. of species; Table 3, Part B, Station B83-2

Source of Variation	df	SS	MS	Observed F	F_{cr} 5%
Sampler	1	0.78	0.78	$0.01^{N.S.}$	7.71
Residual	4	291.25	72.8		
Total	5				

Conclusion:

Accept H_o; there is no significant difference ($P > 0.05$).

APPENDIX C.2

BENTHOS SAMPLING METHODS AND VARIABILITY

Two sampling methods for benthos have been used in the sampling programs near Banks Island; airlift sampling and grab sampling. The baseline sampling was performed only by airlift because the study area was expected, on the basis of preliminary information, to include a significant amount of rocky bottom habitat which can only be effectively sampled by airlift. The baseline benthos surveys indicated that grab sampling would also be feasible to supplement airlift sampling. Grab sampling was included also to provide further data for comparisons of sampling effectiveness between the diver-operated airlift and remotely operated grabs, such as the 0.1 m^2 van Veen (No. 214WA265, Kahlsico) and the 0.055 m^2 Ponar (No. 214WA010 screen-top sediment sampler, Kahlsico).

The results of benthos sampling by the three instruments in 1983 at dredged stations (B83-1 and B83-2) and reference sites (BR83-6 and BR83-8) are graphically compared in Figure C.2-1. There is generally good agreement in values of the three faunal indices for all techniques. Note that airlift samples from inside and outside the trenches at B83-1 and B83-2 have been combined for the comparison because of their similar composition (Section 3.1.3). Ponar grab hauls were attempted at all four stations but were successful only at BR83-8.

Statistical comparisons confirm the graphical results of Figure C.2-1. There were no statistically significant differences in mean values of the faunal indices estimated by the various methods within each station in 1983 ($P > 0.05$, e.g. ANOVA-7).

Another aspect of benthos sampling which was investigated near Banks Island was the adequacy of replication in sampling to obtain a high percentage of the species present in the study area. To determine the minimum number of samples necessary, the results of sampling at Station BR83-8 were examined by construction of species/area cumulative curves. The methods of Holme (1953) and Ursin (1960) were both used; the curves are shown in Figure C.2-2. In Holme's (1953) method, the number of species encountered in successive hauls is plotted on a cumulative basis against the number of hauls (or area represented). Ursin's (1960) method uses the mean number of species of all samples in the set representing agiven area rather than the simple cumulative number of species. For example, the mean number in two

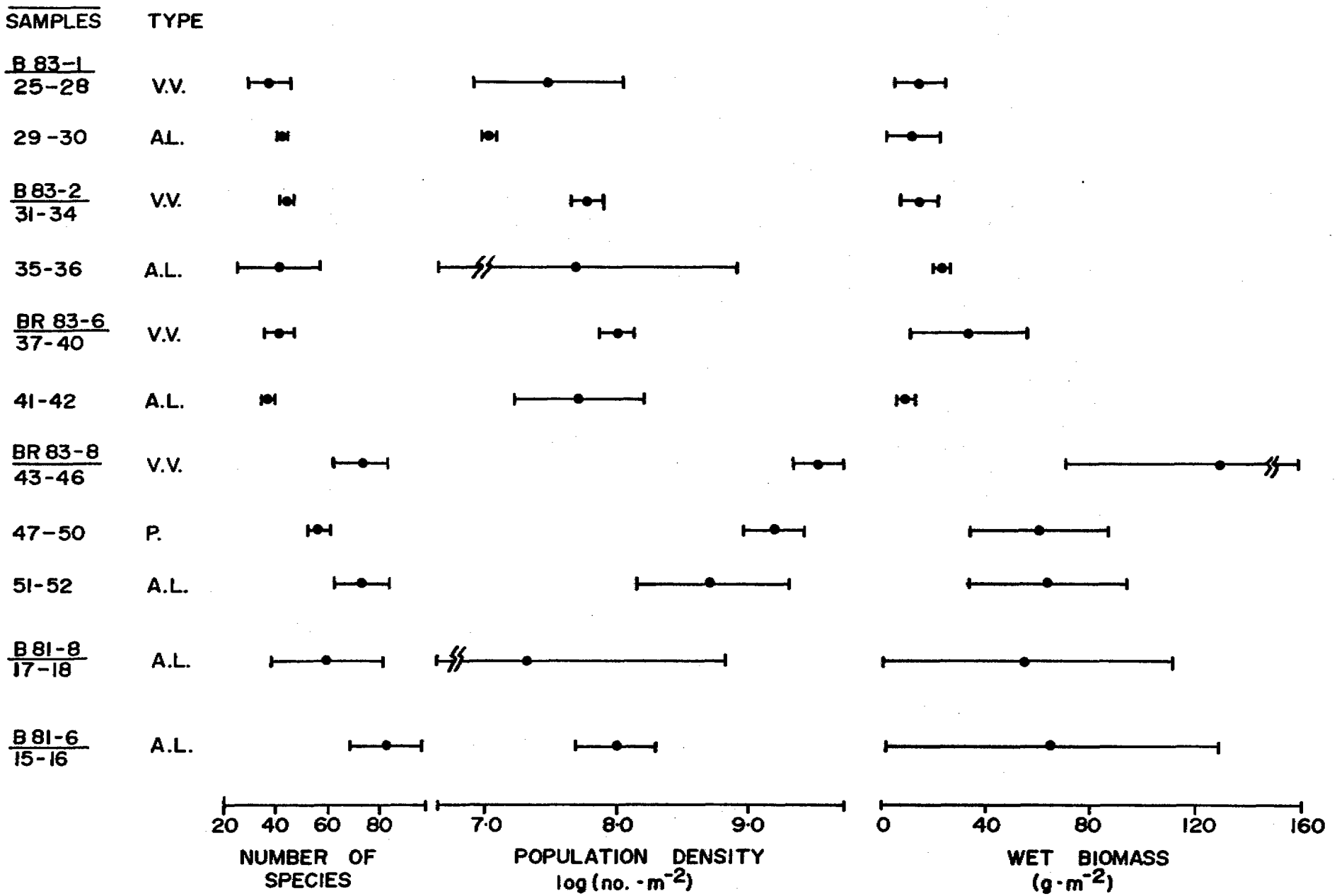


Figure C.2-1 Comparison of mean values of faunal indices for samples collected by Van Veen (V.V.) grab, Ponar (P) grab and airlift (A.L.) sampler at Banks Island Borrow Area in 1983. Bars indicate one standard deviation.

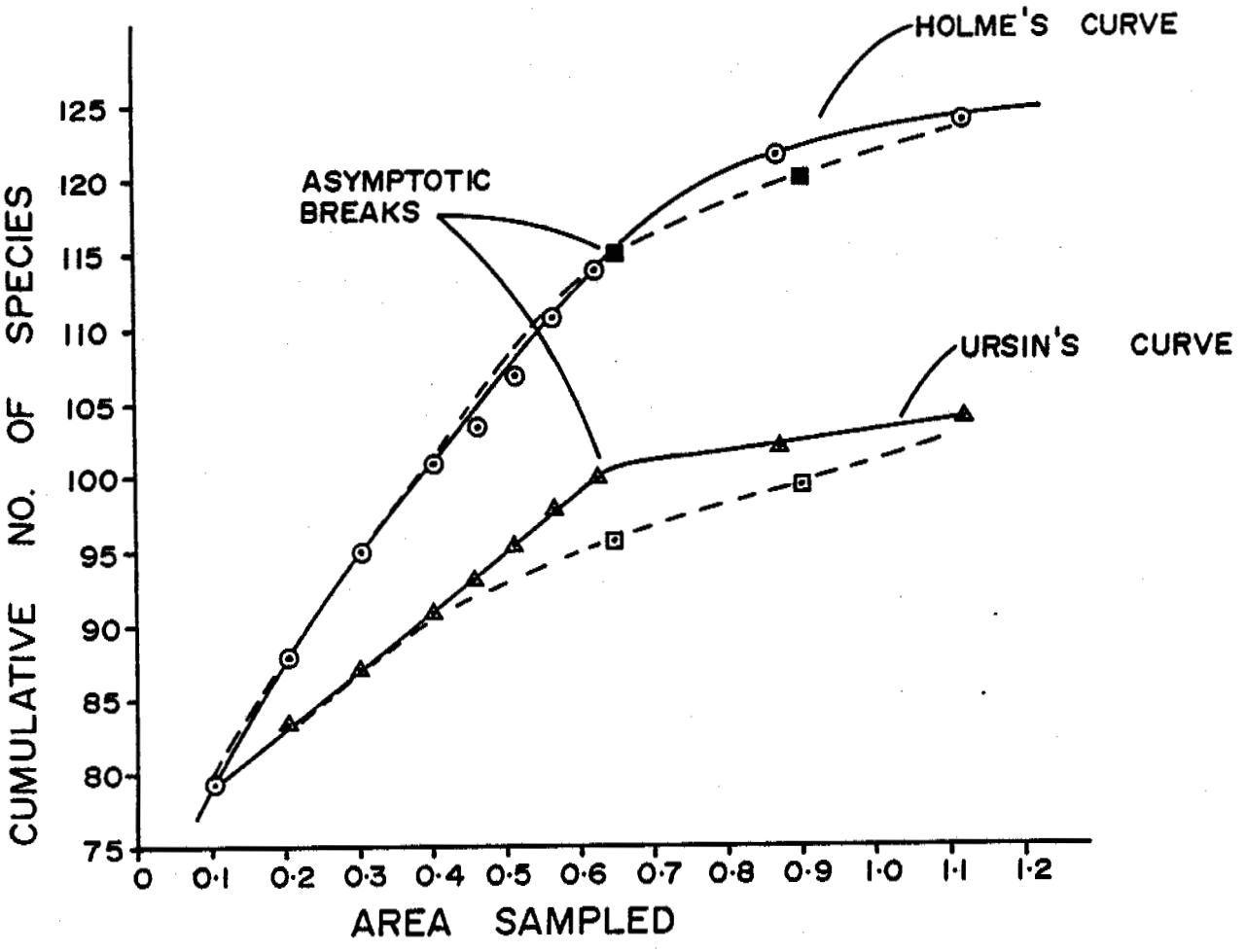


Figure C.2-2 Holme's (1953) and Ursin's (1960) methods for construction of a species/area cumulative curve. The asymptotic break occurs at about 0.65 m^2 for both methods when all samples are included. Solid lines includes Van Veen, Ponar and airlift samples. Dashed lines includes only Van Veen and airlift samples. The curves can be used to determine how many samples (area sampled) are required to collect a given proportion of the species present in the study area.

samples is obtained by taking the first two samples together, the mean in three samples is obtained by taking the first three samples together, and so on. The mean numbers are plotted against the cumulative area represented. This method avoids the possible bias to the slope of the curve which might result from the position of one sample which had nearly all of the species in the total set (Ursin 1960).

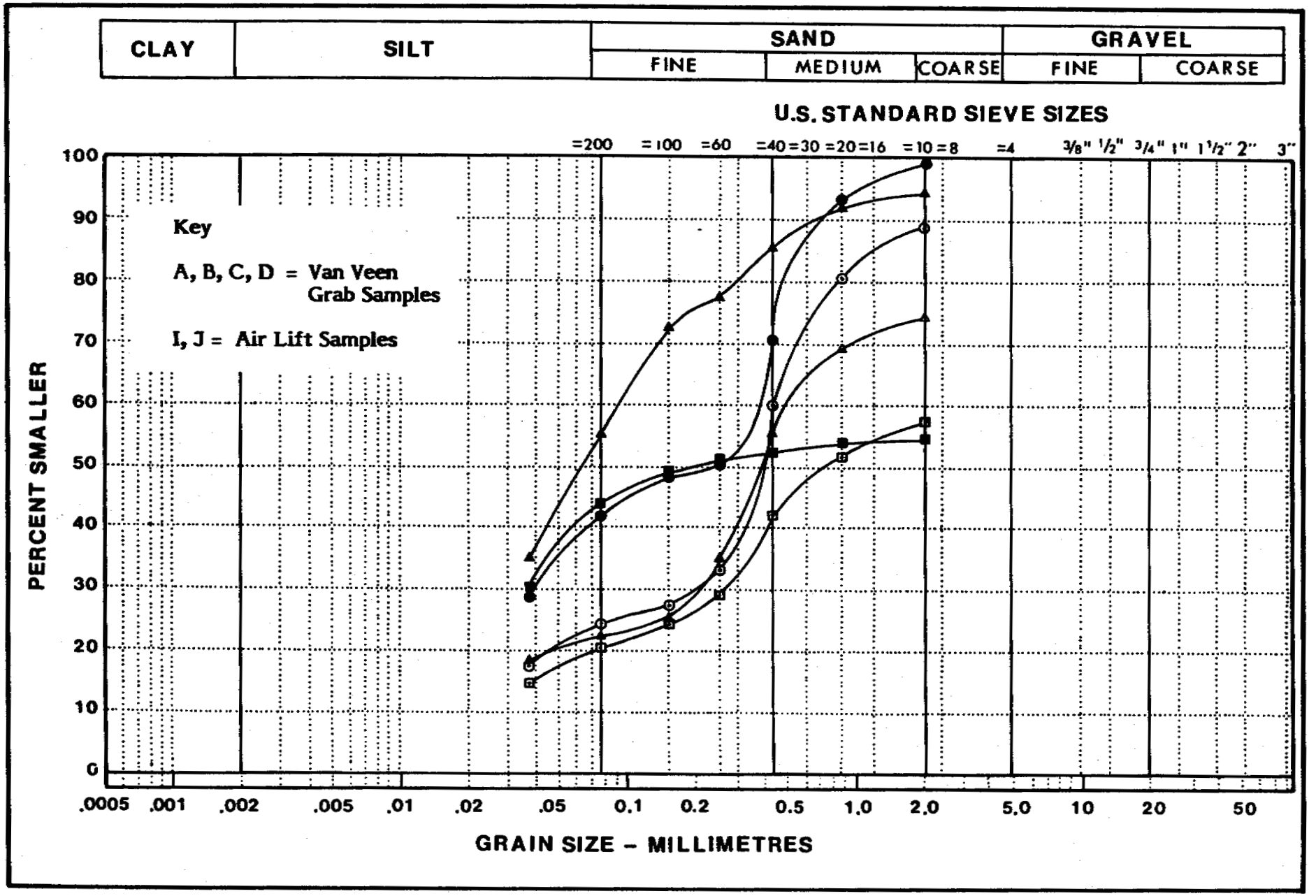
The species/area cumulative curves constructed by both methods indicated that the minimum sampling area for adequate collection of the species present was about 0.65 m^2. This is indicated by the positions of the asymptotic breaks (change in slope) of the curves (Figure C.2-1). The practice of collecting four van Veen samples and two airlift samples at each station (covering a total area of 0.9 m^2) was quite adequate because 96% of the total number of species encountered in 1.12 m^2 (which included the Ponar samples) is recovered in the 0.9 m^2 area.

B-83-1

A ○ B ●
C □ D ■
I △ J ▲

SAMPLE

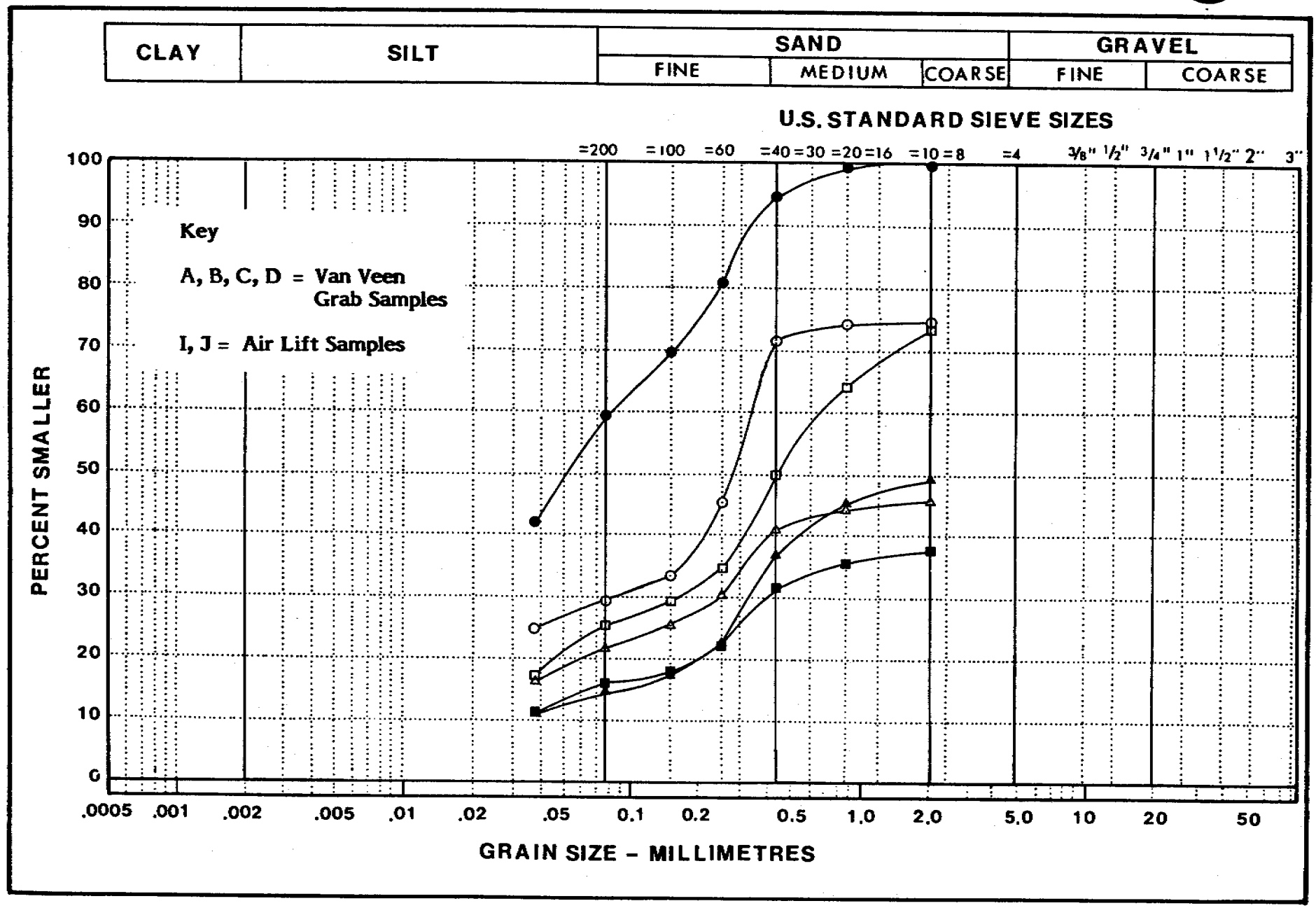
PARTICLE-SIZE ANALYSIS OF SOILS



B-83-2
A ○ B ●
C □ D ■
I △ J ▲

SAMPLE

PARTICLE-SIZE ANALYSIS OF SOILS

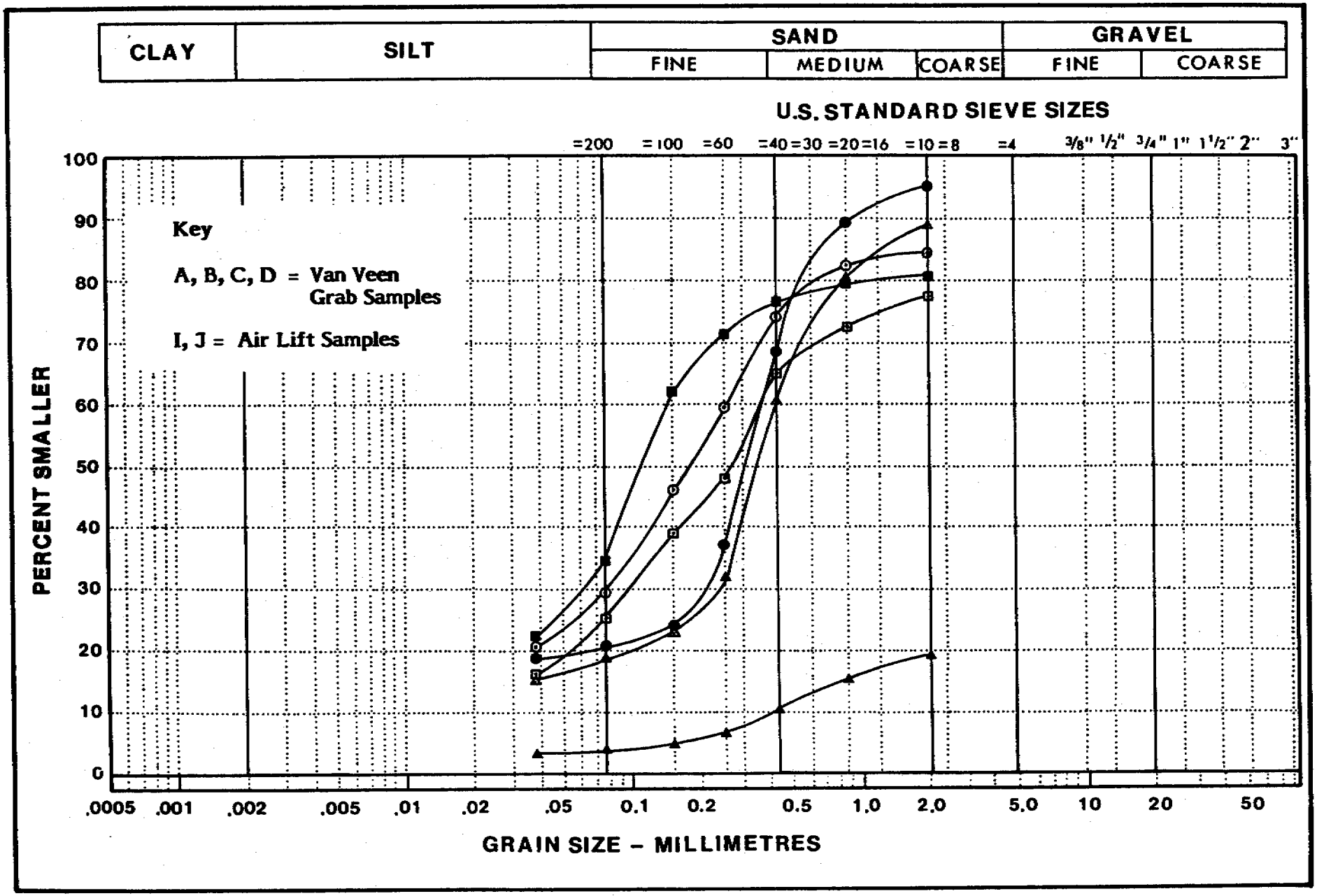


BR 83-6

A ○ B ●
C □ D ■
I △ J ▲

SAMPLE

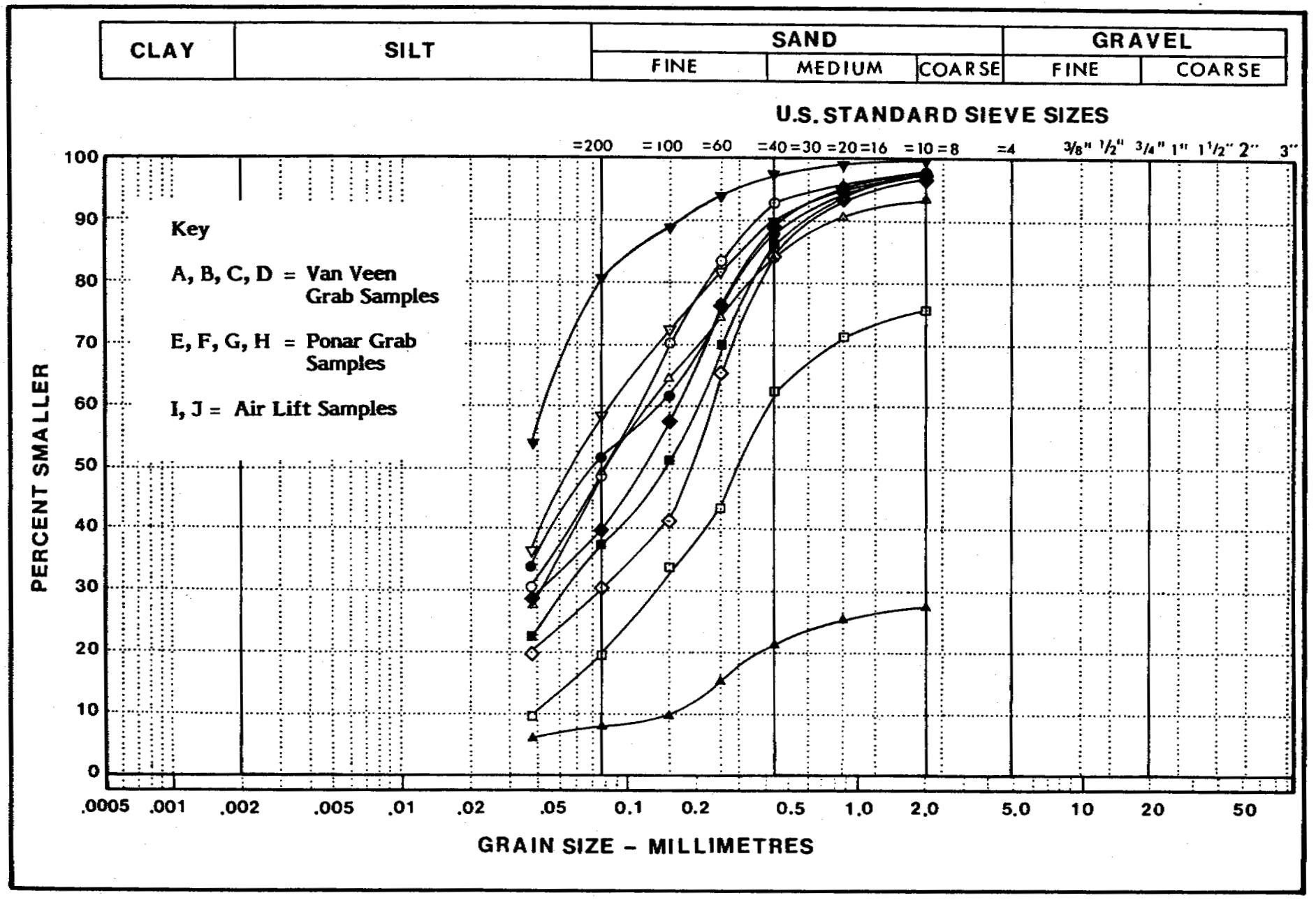
PARTICLE-SIZE ANALYSIS OF SOILS



B-83-8

SAMPLE A ○ B ● I △ C □ D ■ J ▲ E ▽ F ▼ G ◇ H ◆

PARTICLE-SIZE ANALYSIS OF SOILS



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